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160. Reuters, "Bulgaria Calls Rise in Airspace Violations by Russian Aircraft 'a Provocation,'" July 24, 2016, http://www.reuters.com/article/us-bulgaria-russia-nato-airspace-idUSKCN1040JE (accessed September 9, 2016); "RAF Jets Intercept Two Russian Bombers Nearing UK Airspace," *The Guardian*, February 17, 2016, http://www.theguardian.com/world/2016/feb/17/raf-fighters-intercept-two-russian-bombers-uk-airspace (accessed June 27, 2016).
161. Hans M. Kristensen, "Nuclear Exercises Amidst Ukrainian Crisis: Time for Cooler Heads," Federation of American Scientists, May 16, 2014, http://fas.org/blogs/security/2014/05/nuke-exercises/ (accessed March 27, 2015).
162. Andrew Rettman, "Sweden: Who Needs Nato, When You Have the Lisbon Treaty?" *EUobserver*, April 22, 2013, http://euobserver.com/defence/119894 (accessed March 27, 2015).
163. 2016 WWTA, p. 16.
164. News Transcript, "Department of Defense Press Briefing by Adm. Haney in the Pentagon Briefing Room," U.S. Department of Defense, March 24, 2015, http://www.defense.gov/transcripts/transcript.aspx?source=GovDelivery&transcriptid=5605 (accessed September 9, 2016).
165. Micah Zenko, "Dangerous Space Incidents," Council on Foreign Relations, Center for Preventive Action *Contingency Planning Memorandum* No. 21, April 2014, http://www.cfr.org/space/dangerous-space-incidents/p32790 (accessed March 27, 2015).
166. Admiral C. D. Haney, Commander, United States Strategic Command, statement before the Committee on Armed Services, U.S. Senate, March 19, 2015, http://www.armed-services.senate.gov/hearings/15-03-19-us-strategic-command-us-transportation-command-and-us-cyber-command (accessed March 27, 2015).
167. Bill Gertz, "Military Gears Up for Space Warfare," *The Washington Free Beacon*, March 26, 2015, http://freebeacon.com/national-security/military-gears-up-for-space-warfare/ (accessed June 27, 2016).
168. 2016 WWTA, p. 9.
169. Ibid., p. 10.
170. Andy Pasztor, "China and Europe in Talks on Space Exploration Program," *The Wall Street Journal*, July 17, 2014, http://online.wsj.com/articles/china-europe-in-talks-on-space-cooperation-1405592579 (accessed March 27, 2015).
171. David J. Smith, "How Russia Harnesses Cyberwarfare," American Foreign Policy Council *Defense Dossier*, Issue 4 (August 2012), p. 4, http://www.afpc.org/files/august2012.pdf (accessed March 27, 2015).
172. 2016 WWTA, p. 3.
173. U.S. Department of Homeland Security, International Control Systems Cyber Emergency Response Team (ICS-CERT), "Cyber-Attack Against Ukrainian Critical Infrastructure," IR-Alert-H-16-056-01, February 25, 2016, https://ics-cert.us-cert.gov/alerts/IR-ALERT-H-16-056-01 (accessed September 9, 2016).
174. Kim Zetter, "Inside the Cunning, Unprecedented Hack of Ukraine's Power Grid," *Wired*, March 3, 2016, https://www.wired.com/2016/03/inside-cunning-unprecedented-hack-ukraines-power-grid/ (accessed June 27, 2016); Evan Perez, "U.S. Official Blames Russia for Power Grid Attack in Ukraine," CNN, February 11, 2016, http://www.cnn.com/2016/02/11/politics/ukraine-power-grid-attack-russia-us/ (accessed June 28 2016).
175. Patrik Maldre, "The Russian Cyber Threat: Views from Estonia," Center for European Policy Analysis, Information Warfare Initiative, May 18, 2016, http://cepa.org/The-Russian-Cyber-Threat-Views-from-Estonia (accessed September 9, 2016).
176. Bill Gertz, "DIA: Russian Software Could Threaten U.S. Industrial Control Systems," *The Washington Free Beacon*, March 1, 2016, http://freebeacon.com/national-security/dia-russian-software-could-threaten-u-s-industrial-control-systems/ (accessed September 9, 2016).
177. Mary-Ann Russon, "Russia Blamed for Crashing Swedish Air Traffic Control to Test Electronic Warfare Capabilities," *International Business Times*, April 14, 2016, http://www.ibtimes.co.uk/russia-blamed-bringing-down-swedish-air-traffic-control-test-electronic-warfare-capabilities-1554895 (accessed June 27, 2016).
178. Kjetil Stormark, "Sweden Issued Cyber Attack Alert," Aldrimer, April 12, 2016, https://www.aldrimer.no/sweden-issued-cyber-attack-alert-as-its-air-traffic-reeled/ (accessed June 27, 2016).
179. Gerard O'Dwyer, "Finnish Defense Ministry Hit by DDoS Cyber Attack," *Defense News*, April 4, 2016, http://www.defensenews.com/story/defense/international/2016/04/04/finnish-defense-ministry-hit-ddos-cyberattack/82608438/ (accessed June 27, 2016).
180. BNS/TBT Staff, "Cyber attack on Lithuanian Parliament Over," *The Baltic Times*, April 12, 2016, http://www.baltictimes.com/cyber_attack_on_lithuanian_parliament_over/ (accessed September 9, 2016).
181. Dannielle Correa, "BfV Agency Says Russia Is Behind German Cyber-Attacks," *SC Magazine*, May 16, 2016, http://www.scmagazine.com/bfv-agency-says-russia-is-behind-german-cyber-attacks/article/496571/ (accessed June 27, 2016).

182. 2016 WWTA, p. 3.

183. International Institute for Strategic Studies, *The Military Balance 2016*, pp. 189–202.

184. NewsMilitary.com, "Russian 'Bear' Bombers Set to Be Grounded Again Following Far East Crash—IHS Jane's 360," July 14, 2015, http://newsmilitary.com/pages/54824779-russian-bear-bombers-set-to-be-grounded-again-following-far (accessed September 13, 2016).

185. David Cenciotti, "Russia Has Grounded All Its Tu-95 Strategic Bombers After One Bear Skidded off Runway and Caught Fire," *The Aviationist*, June 9, 2015, http://theaviationist.com/2015/06/09/tu-95-incident-at-ukrainka/ (accessed June 27, 2016).

186. International Institute for Strategic Studies, *The Military Balance 2016*, p. 164.

187. Ibid., p. 159.

188. Ibid.

189. Ibid., p. 163.

190. Ibid., p. 159.

191. Cooper, *Russia's State Armament Programme to 2020*, p. 51.

192. Franz-Stefan Gady, "Russia's Military Built or Modernized More Than 1,200 Aircraft," *The Diplomat* , April 19, 2016, http://thediplomat.com/2016/04/russias-military-built-or-modernized-more-than-1200-aircraft/ (accessed June 27, 2016).

193. Cooper, *Russia's State Armament Programme to 2020*, p. 35.

Middle East

Threats to the Homeland

Radical Islamist terrorism in its many forms remains the most immediate global threat to the safety and security of U.S. citizens at home and abroad, and most of the actors posing such a threat originate in the greater Middle East. More broadly, threats to the U.S. homeland and to Americans abroad include terrorist threats from non-state actors such as al-Qaeda that use the ungoverned areas of the Middle East as bases from which to plan, train, equip, and launch attacks; terrorist threats from state-supported groups such as Hezbollah; and the developing ballistic missile threat from Iran.

Terrorism Originating from al-Qaeda, Its Affiliates, and the Islamic State (IS). Although al-Qaeda has been damaged by targeted strikes that have killed key leaders in Pakistan, including Osama bin Laden, the terrorist network has evolved in a decentralized fashion, and regional affiliates continue to pose potent threats to the U.S. homeland. The regional al-Qaeda groups share the same long-term goals as the parent organization, but some have developed different priorities related to their local conflict environments.

Al-Qaeda in the Arabian Peninsula (AQAP) has emerged as one of the leading terrorist threats to homeland security since the al-Qaeda high command was forced into hiding in Pakistan.

Yemen has long been a bastion of support for militant Islamism in general and al-Qaeda in particular. Many Yemenis who migrated to Saudi Arabia to find work during the 1970s oil boom were exposed to radicalization there. Yemenis made up a disproportionate number of the estimated 25,000 foreign Muslims who flocked to Afghanistan to join the war against the Soviet occupation in the 1980s. They also make up a large segment of al-Qaeda, which was founded by veterans of that war to expand the struggle into a global revolutionary campaign.

Al-Qaeda's first terrorist attack against Americans occurred in Yemen in December 1992, when a bomb was detonated in a hotel used by U.S. military personnel involved in supporting the humanitarian food relief flights to Somalia. Al-Qaeda launched a much deadlier attack in Yemen in October 2000 when it attacked the USS *Cole* in the port of Aden with a boat filled with explosives, killing 17 American sailors.[1]

Yemen was a site for the radicalization of American Muslims such as John Walker Lindh, who traveled there to study Islam before being recruited to fight in Afghanistan. Seven Yemeni Americans from Lackawanna, New York, were recruited by al-Qaeda before 9/11. Six were convicted of supporting terrorism and sent to prison, and the seventh became a fugitive who later surfaced in Yemen.

Yemen has become increasingly important as a base of operations for al-Qaeda in recent years after crackdowns in other countries. In September 2008, al-Qaeda launched a complex attack on the U.S. embassy in Yemen that killed 19 people, including an American woman. Yemen's importance to al-Qaeda increased further in January 2009 when al-Qaeda members who had been pushed out of Saudi Arabia merged with the

Yemeni branch to form Al-Qaeda in the Arabian Peninsula.

AQAP's Anwar al-Aulaqi, a charismatic American-born Yemeni cleric, reportedly incited several terrorist attacks on U.S. targets before being killed in a drone air strike in 2011. He inspired Major Nidal Hassan, who perpetrated the 2009 Fort Hood shootings that killed 13 soldiers,[2] and Umar Farouk Abdulmutallab, the failed suicide bomber who sought to destroy an airliner bound for Detroit on Christmas Day 2009.[3] Aulaqi is also suspected of playing a role in the November 2010 AQAP plot to dispatch parcel bombs to the U.S. in cargo planes.

AQAP, estimated to have had as many as 4,000 members in 2015,[4] has greatly expanded in the chaos of Yemen's civil war, particularly since the overthrow of Yemen's government by Iran-backed Houthi rebels in 2015. AQAP has exploited alliances with powerful, well-armed Yemeni tribes (including the Aulaq tribe from which Osama bin Laden and the radical cleric Aulaqi claimed descent) to establish sanctuaries and training bases in Yemen's rugged mountains. This is similar to al-Qaeda's *modus operandi* in Afghanistan before 9/11 and in Pakistan today. In April 2015, AQAP seized the city of al Mukalla and expanded its control of rural areas in southern Yemen. After AQAP withdrew in April 2016, the city was recaptured by pro-government Yemeni troops and troops from the United Arab Emirates (UAE), a member of the Saudi-led coalition that intervened in March 2015 in support of the Yemeni government. AQAP remains a potent force in Yemen.

The Islamic State (IS), formerly known as the Islamic State of Iraq and Syria (ISIS) or the Islamic State in Iraq and the Levant (ISIL), and before that as the Islamic State of Iraq and Al-Qaeda in Iraq, emerged as an al-Qaeda splinter group but has outstripped its parent organization in terms of the threats it poses to U.S. national interests. It seeks to overthrow the governments of Iraq, Syria, Lebanon, and Jordan and establish a nominal Islamic state governed by a harsh and brutal interpretation of Islamic law that is an existential threat to Christians, Shiite Muslims, Yazidis, and other religious minorities. Its long-term goals are to launch what it considers a jihad (holy war) to drive Western influence out of the Middle East; destroy Israel; diminish and discredit Shia Islam, which it considers apostasy; and become the nucleus of a global Sunni Islamic empire.

The Islamic State is composed of Sunni Muslims drawn to radical Islamist ideology. U.S. intelligence officials estimated in May 2016 that it commanded between 19,000 and 25,000 fighters in Iraq and Syria even after suffering extensive losses.[5] Most of its members are Iraqi and Syrian Arabs, although it also has attracted more than 25,000 foreign fighters who have joined its ranks on a temporary or permanent basis, including at least 6,000 from Tunisia, 2,275 from Saudi Arabia, 2,000 from Jordan, 1,700 from Russia, 1,550 from France, 1,400 from Turkey, and 1,200 from Lebanon.[6] Many of the foreign fighters have been killed or fled from Iraq and Syria as IS has been pushed back on several fronts.

The group was established as Al-Qaeda in Iraq (AQI) in 2004 by Abu Musab al-Zarqawi, a Palestinian Islamist extremist born in Jordan who fought in Afghanistan against the Soviet invasion. He was a close associate of Osama bin Laden, although he did not formally join al-Qaeda until 2004 when he was recognized as the leader of AQI. His organization has always taken a harder line against Shiites, whom it denigrates as apostates who deserve death, than has other franchises of the al-Qaeda network.

Zarqawi was killed in a U.S. air strike in 2006, and his organization was decimated by a U.S.-led counterterrorism campaign. The group made a comeback in Iraq after the withdrawal of U.S. troops in 2011 took the pressure off it and Iraqi Prime Minister Nouri al-Maliki's Shia-dominated government alienated Sunni Iraqis, driving many of them to see ISIS as the lesser evil.

The IS began as a branch of al-Qaeda before it broke away from the core al-Qaeda

leadership in 2013 in a dispute over leadership of the jihad in Syria. The IS shares a common ideology with its al-Qaeda parent organization but differs with respect to how to apply that ideology. It now rejects the leadership of bin Laden's successor, Ayman al-Zawahiri, who criticized its extreme brutality, which has alienated many Muslims. This is a dispute about tactics and strategies, not long-term goals. It may also be prompted by a personal rivalry between Zawahiri and IS leader Abu Bakr al-Baghdadi, who sees himself as bin Laden's true successor and the leader of a new generation of jihadists. Baghdadi also declared the formation of a caliphate with himself as the leader in June 2014, a claim that al-Qaeda rejects as illegitimate.

In 2014, the IS greatly expanded its control of a wide swath of western Iraq and eastern Syria, territory that it can use as a launching pad for operations in the heart of the Arab world and beyond. By May 2016, the United States and its allies had reduced the territory controlled by the Islamic State at its zenith by 45 percent in Iraq and 20 percent in Syria,[7] But the IS continued to expand elsewhere, particularly in Libya, Egypt, Yemen, Afghanistan, Bangladesh, and Pakistan. Boko Haram, the Nigeria-based Islamist terrorist group, also pledged allegiance to the IS in March 2015.

The Islamic State poses a primarily regional threat. It has launched terrorist attacks inside Egypt, Jordan, Kuwait, Lebanon, Libya, Saudi Arabia, Tunisia, and Turkey, among other countries. It also claimed responsibility for the October 31, 2015, downing of a Russian passenger jet over Egypt's Sinai Peninsula that killed 224 people.

The Islamic State's early success in attracting the support of foreign militants, including at least 4,500 from Western countries and at least 250 from the United States, has amplified its potential threat as these foreign supporters, many of whom received military training, return home.[8] IS foreign fighters teamed with local Islamist militants to launch terrorist attacks that killed 130 people in Paris, France, in November 2015 and 32 people in Brussels, Belgium, in March 2016, as well as a string of smaller attacks.

IS leader al-Baghdadi threatened to strike "in the heart" of America in July 2012.[9] The IS reportedly has tried to recruit Americans who have joined the fighting in Syria and would be in a position to carry out this threat after returning to the United States.[10] It also has inspired several terrorist attacks by self-radicalized "stray dogs" or "lone wolves" who have acted in its name, such as the foiled May 3, 2015, attack by two Islamist extremists who were fatally shot by police before they could commit mass murder in Garland, Texas; the July 16, 2015, shootings that killed four Marines and a sailor in Chattanooga, Tennessee; the December 2, 2015, shootings that killed 14 people in San Bernardino, California; and the June 12, 2016, shootings at a nightclub in Orlando, Florida, that killed 49 people. Such terrorist attacks, incited but not directed by the IS, are likely to continue for the foreseeable future.

The al-Nusra Front, al-Qaeda's official affiliate in Syria, has an estimated 5,000 to 10,000 members and has emerged as one of the top two or three rebel groups fighting Syria's Assad dictatorship.[11] It was established as an offshoot of Al-Qaeda in Iraq (now renamed the Islamic State) in late 2011 by Abu Muhammad al-Julani, a lieutenant of AQI leader Abu Bakr al-Baghdadi.[12] It has adopted a more pragmatic course than its extremist parent organization and has cooperated with moderate Syrian rebel groups against the Assad regime, as well as against the Islamic State.

When Baghdadi unilaterally proclaimed the merger of his organization and al-Nusra in April 2013 to form the Islamic State of Iraq and Syria, Julani rejected the merger and renewed his pledge to al-Qaeda leader Ayman al-Zawahiri. The two groups have clashed repeatedly, causing an estimated 3,000 deaths by March 2014.[13]

Al-Nusra has focused its attention on overthrowing the Syrian regime and has not emphasized its hostility to the United States, but

that could easily change if it consolidates power within Syria. It already poses a potential threat because of its recruitment of a growing number of foreign Islamist militants, including some from Europe and the United States. According to U.S. officials, al-Qaeda leader al-Zawahiri dispatched a cadre of experienced al-Qaeda operatives to Syria, where they were embedded with al-Nusra and charged with organizing terrorist attacks against Western targets. Many members of the group, estimated to number in the dozens, were veterans of al-Qaeda's operations in Afghanistan and Pakistan (part of what was called Khorasan in ancient times) and were referred to as the "Khorasan group" by U.S. officials.[14]

An American Muslim recruited by al-Nusra, Moner Mohammad Abusalha, conducted a suicide truck bombing in northern Syria on May 25, 2014, the first reported suicide attack by an American in Syria.[15] At least five men have been arrested inside the United States for providing material assistance to al-Nusra, including Abdirahman Sheik Mohamud, a naturalized U.S. citizen born in Somalia who was arrested in April 2015 after returning from training in Syria, possibly to launch a terrorist attack inside the United States.[16] The Khorasan group was targeted by a series of U.S. air strikes in 2014–2015 that degraded its capacity to organize terrorist attacks in Western countries. By mid-2015, the FBI assessed that the Islamic State had eclipsed al-Nusra as a threat to the U.S. homeland.[17]

FBI Director James Comey has stated that tracking Americans who have returned from Syria is one of the FBI's top counterterrorism priorities.[18] Then-Attorney General Eric Holder urged his international counterparts to block the flow of thousands of foreign fighters to Syria, which he termed "a cradle of violent extremism." Speaking at a conference in Norway in July 2014, Holder warned:

We have a mutual and compelling interest in developing shared strategies for confronting the influx of U.S.-[born] and European-born violent extremists into Syria. And because our citizens can freely travel, visa free, from the U.S. to Norway and other European states—and vice versa—the problem of fighters in Syria returning home to any of our countries is a problem for all of our countries.[19]

Al-Qaeda in the Islamic Maghreb (AQIM), one of al-Qaeda's weaker franchises before the Arab Spring uprisings began in 2011, has flourished in recent years in North Africa and is now one of al-Qaeda's best-financed and most heavily armed elements. The 2011 overthrow of Libyan dictator Muammar Qadhafi pried open a Pandora's box of problems that AQIM has exploited to bolster its presence in Algeria, Libya, Mali, Morocco, and Tunisia. AQIM accumulated large quantities of arms, including man-portable air defense systems (MANPADS), looted from Qadhafi's huge arms depots.

The fall of Qadhafi also led hundreds of heavily armed Tuareg mercenaries formerly employed by his regime to cross into Mali, where they joined a Tuareg separatist insurgency against Mali's weak central government. In November 2011, they formed the separatist National Movement for the Liberation of Azawad (MNLA) and sought to carve out an independent state. In cooperation with AQIM and the Islamist movement Ansar Dine, they gained control of northern Mali, a territory as big as Texas and the world's largest terrorist sanctuary until the January 2013 French military intervention dealt a major setback to AQIM and its allies.

AQIM is estimated to have several hundred militants operating in Algeria, Libya, Mali, Niger, and Tunisia.[20] Many AQIM cadres pushed out of Mali by the French intervention have regrouped in southwestern Libya and remain committed to advancing AQIM's self-declared long-term goal of transforming the Sahel "into one vast, seething, chaotic Somalia."[21]

The September 11, 2012, attack on the U.S. diplomatic mission in Benghazi underscored the extent to which Islamist extremists have grown stronger in the region, particularly in eastern Libya, a longtime bastion of Islamic fervor. The radical Islamist group that launched the attack, Ansar al-Sharia, has

links to AQIM and shares its violent ideology. Ansar al-Sharia and scores of other Islamist militias have flourished in post-Qadhafi Libya because the weak central government has been unable to tame fractious militias, curb tribal and political clashes, or dampen rising tensions between Arabs and Berbers in the West and between Arabs and the Toubou tribe in the South.

AQIM does not pose as much of a threat to the U.S. homeland as other al-Qaeda offshoots pose, but it does threaten regional stability and U.S. allies in North Africa and Europe, where it has gained supporters and operates extensive networks for the smuggling of arms, drugs, and people.

WWTA: The WWTA reports that "Sunni violent extremism has been on an upward trajectory since the 1970s and has more groups, members, and safe havens than at any other point in history" and characterizes the Islamic State as "the preeminent terrorist threat because of its self-described caliphate in Syria and Iraq, its branches and emerging branches in other countries, and its increasing ability to direct and inspire attacks against a wide range of targets around the world." The WWTA further assesses that al-Qaeda's affiliates "are positioned to make gains in 2016, despite counterterrorism pressure that has largely degraded the network's leadership in Afghanistan and Pakistan," and that "US-based HVEs [homegrown violent extremists] will probably continue to pose the most significant Sunni terrorist threat to the US homeland in 2016."[22]

Summary: Al-Qaeda offshoots based in the Middle East pose a growing threat to the U.S. homeland as a result of the recruitment of Muslim militants from Western countries, including the United States, and their efforts to inspire terrorist attacks by homegrown Islamist extremists.

Hezbollah Terrorism. Hezbollah (Party of God), the radical Lebanon-based Shiite revolutionary movement, poses a clear terrorist threat to international security. Hezbollah terrorists have murdered Americans, Israelis, Lebanese, Europeans, and citizens of many other nations. Originally founded in 1982, this Lebanese group has evolved from a local menace into a global terrorist network that is strongly backed by regimes in Iran and Syria, assisted by a political wing that has dominated Lebanese politics and funded by Iran and a web of charitable organizations, criminal activities, and front companies.

Hezbollah regards terrorism not only as a useful tool for advancing its revolutionary agenda, but also as a religious duty as part of a "global jihad." It helped to introduce and popularize the tactic of suicide bombings in Lebanon in the 1980s, developed a strong guerrilla force and a political apparatus in the 1990s, provoked a war with Israel in 2006, intervened in the Syrian civil war after 2011 at Iran's direction, and has become a major destabilizing influence in the ongoing Arab–Israeli conflict.

Hezbollah murdered more Americans than any other terrorist group before September 11, 2001. Despite al-Qaeda's increased visibility since then, Hezbollah remains a bigger, better equipped, better organized, and potentially more dangerous terrorist organization, in part because it enjoys the support of the two chief state sponsors of terrorism in the world today: Iran and Syria. Hezbollah's demonstrated capabilities led former Deputy Secretary of State Richard Armitage to dub it "the A-Team of Terrorists."[23]

Hezbollah has expanded its operations from Lebanon to regional targets in the Middle East and then far beyond. It now is a global terrorist threat that draws financial and logistical support from its Iranian patrons as well as from the Lebanese Shiite diaspora in the Middle East, Europe, Africa, Southeast Asia, North America, and South America. Hezbollah fundraising and equipment procurement cells have been detected and broken up in the United States and Canada. Europe is believed to contain many more of these cells.

Hezbollah has been implicated in numerous terrorist attacks against Americans, including:

- The April 18, 1983, bombing of the U.S. embassy in Beirut, which killed 63 people, including 17 Americans;
- The October 23, 1983, suicide truck bombing of the Marine barracks at Beirut Airport, which killed 241 Marines and other personnel deployed as part of the multinational peacekeeping force in Lebanon;
- The September 20, 1984, bombing of the U.S. embassy annex in Lebanon; and
- The 1996 Khobar Towers bombing, which killed 19 American servicemen stationed in Saudi Arabia.

Hezbollah also was involved in the kidnapping of several dozen Westerners, including 14 Americans, who were held as hostages in Lebanon in the 1980s. The American hostages eventually became pawns that Iran used as leverage in the secret negotiations that led to the Iran–Contra affair in the mid-1980s.

Hezbollah has launched numerous attacks outside of the Middle East. It perpetrated the two deadliest terrorist attacks in the history of South America: the March 1992 bombing of the Israeli embassy in Buenos Aires, Argentina, which killed 29 people, and the July 1994 bombing of a Jewish community center in Buenos Aires that killed 96 people. The trial of those who were implicated in the 1994 bombing revealed an extensive Hezbollah presence in Argentina and other countries in South America.

Hezbollah has escalated its terrorist attacks against Israeli targets in recent years as part of Iran's intensifying shadow war against Israel. In 2012, Hezbollah killed five Israeli tourists and a Bulgarian bus driver in a suicide bombing near Burgas, Bulgaria. Hezbollah terrorist plots against Israelis were foiled in Thailand and Cyprus during that same year.

In 2013, Hezbollah admitted that it had deployed several thousand militia members to fight in Syria on behalf of the Assad regime. By 2015, Hezbollah forces had become crucial in propping up the Assad regime after the Syrian army was hamstrung by casualties, defections, and low morale. Hezbollah also deployed personnel to Iraq after the 2003 U.S. intervention to assist pro-Iranian Iraqi Shia militias that were battling the U.S.-led coalition.

Although Hezbollah operates mostly in the Middle East, it has a global reach and has established a presence inside the United States. Hezbollah cells in the United States generally are focused on fundraising, including criminal activities such as those perpetrated by over 70 used-car dealerships identified as part of a scheme to launder hundreds of millions of dollars of cocaine-generated revenue that flowed back to Hezbollah.[24]

Covert Hezbollah cells could morph into other forms and launch terrorist operations inside the United States. Given Hezbollah's close ties to Iran and its past record of executing terrorist attacks on Iran's behalf, there is a real danger that Hezbollah terrorist cells could be activated inside the United States in the event of a conflict between Iran and the U.S. or Israel.

WWTA: The WWTA concludes that "Iran and Hizballah remain a continuing terrorist threat to U.S. interests and partners worldwide."[25]

Summary: Hezbollah operates mostly in the Middle East, but it has established cells inside the United States that could be activated, particularly in the event of a military conflict with Iran, Hezbollah's creator and chief backer.

Palestinian Terrorist Threats. A wide spectrum of Palestinian terrorist groups threaten Israel, including Fatah (al-Aqsa Martyrs Brigade); Hamas; Palestinian Islamic Jihad; the Popular Front for the Liberation of Palestine (PFLP); the Popular Front for the Liberation of Palestine–General Command (PFLP–GC); the Palestine Liberation Front; and the Army of Islam. Most of these groups are also hostile to the United States, which they denounce as Israel's primary source of foreign support.

Although they are focused more on Israel and regional targets, these groups also pose a limited potential threat to the U.S. homeland, particularly should the Israeli–Palestinian peace process break down completely and the Palestinian Authority be dissolved. In the event of a military confrontation with Iran, Tehran also might seek to use Palestinian Islamic Jihad, the PFLP–GC, or Hamas as surrogates to strike the United States. Jihadist groups based in Gaza, such as the Army of Islam, also could threaten the U.S. homeland even if a terrorist attack there would set back Palestinian national interests. In general, however, Palestinian groups present a much bigger threat to Israel, Jordan, Egypt, and other regional targets than they do to the United States.

WWTA: The WWTA does not reference the potential threat of Palestinian terrorist attacks on the U.S. homeland.

Summary: Palestinian terrorist groups are focused primarily on Israeli targets and potentially on Egypt and Jordan, which are perceived as collaborating with Israel. They also, however, pose a limited potential threat to the U.S. homeland because of the possibility that, if the Israeli–Palestinian peace process broke down completely or Iran became involved in a military conflict with the U.S., Palestinian surrogates could be used to target the U.S. homeland.

Iran's Ballistic Missile Threat. Iran has an extensive missile development program that has received key assistance from North Korea and more limited support from Russia and China before sanctions were imposed by the U.N. Security Council. The National Air and Space Intelligence Center noted in 2013 that:

> Iran could develop and test an ICBM capable of reaching the United States by 2015. Since 2008, Iran has conducted multiple successful launches of the two-stage Safir space launch vehicle and has also revealed the larger two-stage Simorgh space launch vehicle, which could serve as a test bed for developing ICBM technologies.[26]

Although Tehran's missile arsenal primarily threatens U.S. bases and allies in the region, Iran eventually could expand the range of its missiles to include the continental United States. In its January 2014 report on Iran's military power, the Pentagon assessed that "Iran continues to develop technological capabilities that could be applicable to nuclear weapons and long-range missiles, which could be adapted to deliver nuclear weapons, should Iran's leadership decide to do so."[27]

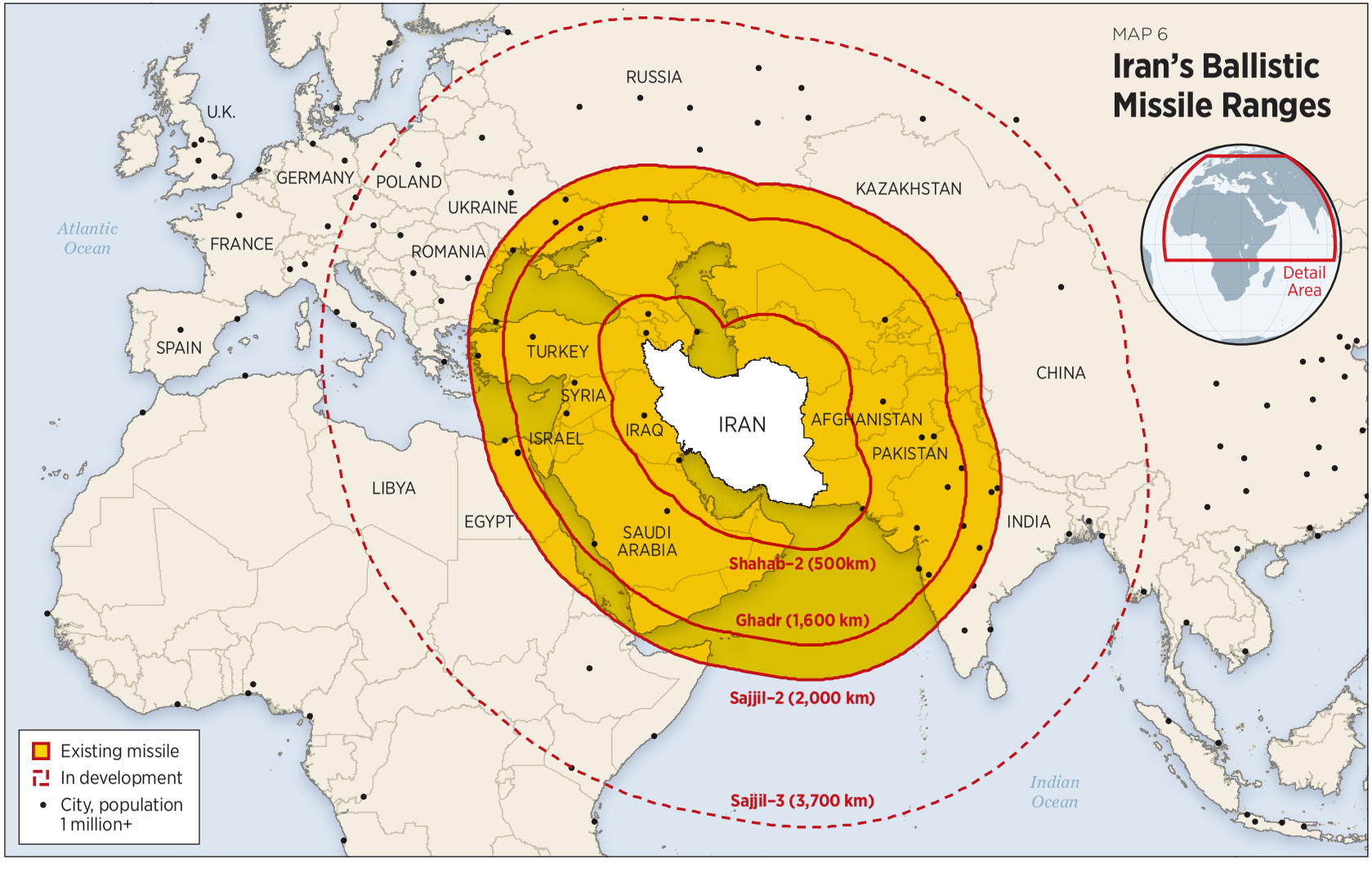
WWTA: The WWTA assesses that "Iran's ballistic missiles are inherently capable of delivering WMD, and Tehran already has the largest inventory of ballistic missiles in the Middle East." In addition, "Iran's progress on space launch vehicles—along with its desire to deter the United States and its allies—provides Tehran with the means and motivation to develop longer-range missiles, including ICBMs."[28]

Summary: Iran's ballistic missile force poses a regional threat to the U.S. and its allies, but Tehran eventually could expand the range of its missiles to threaten the continental United States.

Threat of Regional War

The Middle East region is one of the most complex and volatile threat environments faced by the United States and its allies. Iran, various al-Qaeda offshoots, Hezbollah, Arab–Israeli clashes, and a growing number of radical Islamist militias and revolutionary groups in Egypt, Iraq, Libya, Syria, and Yemen pose actual or potential threats to the U.S. and its allies.

Iranian Threats in the Middle East. Iran is an anti-Western revolutionary state that seeks to tilt the regional balance of power in its favor by driving out the Western presence, undermining and overthrowing opposing governments, and establishing its hegemony over the oil-rich Persian Gulf region. It also seeks to radicalize Shiite communities and advance their interests against Sunni rivals. Iran has a long record of sponsoring terrorist attacks against American allies and



SOURCES: International Institute for Strategic Studies, *The Military Balance 2014* (London: Routledge, 2014), and Michael Elleman, "Iran's Ballistic Missile Program," United States Institute of Peace, http://iranprimer.usip.org/resource/irans-ballistic-missile-program (accessed August 25, 2015).

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other interests in the region. With regard to conventional threats, Iran's ground forces dwarf the relatively small armies of the other Gulf states, and its formidable ballistic missile forces pose significant threats to its neighbors.

The July 14, 2015, Iran nuclear agreement, which lifted nuclear-related sanctions on Iran in January 2016, gave Tehran access to about $100 billion in restricted assets and allowed it to expand its oil and gas exports, its chief source of state revenues. This sanctions relief will boost Iran's economy and enable Iran to enhance its strategic position, military capabilities, and support for surrogate networks and terrorist groups. Tehran announced in May 2016 that it was increasing its military budget for 2016–2017 to $19 billion, a 90 percent increase over the previous year.[29]

The lifting of sanctions also has allowed Tehran to emerge from diplomatic isolation and strengthen strategic ties with Russia that will allow it to purchase advanced arms and modernize its military forces. Russian President Vladimir Putin traveled to Iran in November 2015 to meet with Ayatollah Khamenei, Iran's Supreme Leader, and other officials. Both regimes called for enhanced military cooperation.

This growing strategic relationship could result in Iran's largest arms imports since the 1979 revolution. Tehran announced in April 2016 that Russia had started deliveries of up to five S-300 *Favorit* long-range surface-to-air missile systems, which can track up to 100 aircraft and engage six of them simultaneously at a range of 200 kilometers.[30] Moscow also began negotiations to sell Iran T-90 tanks and advanced Sukhoi Su-30 *Flanker* fighter jets.[31] The warplanes will significantly improve Iran's air defense and long-range strike capabilities.

After the nuclear agreement, Iran and Russia escalated their strategic cooperation in propping up Syria's embattled Assad regime. Iran's growing military intervention in Syria was partly eclipsed by Russia's military intervention and launching of an air campaign against Assad's enemies in September 2015, but Iran's Islamic Revolutionary Guard Corps (IRGC) and surrogate groups have played the leading role in spearheading the ground offensives that clawed back territory from Syrian rebel groups and tilted the military balance in favor of the Assad regime. By October 2015, Iran had deployed an estimated 7,000 IRGC troops and paramilitary forces in Syria, along with an estimated 20,000 foreign fighters from Iran-backed Shiite militias from Lebanon, Iraq, Afghanistan, and Pakistan.[32]

Terrorist Attacks. Iran has adopted a political warfare strategy that emphasizes irregular warfare, asymmetric tactics, and the extensive use of proxy forces. The Islamic Revolutionary Guard Corps has trained, armed, supported, and collaborated with a wide variety of radical Shia and Sunni militant groups, as well as Arab, Palestinian, Kurdish, and Afghan groups that do not share its radical Islamist ideology. The IRGC's elite Quds (Jerusalem) Force has cultivated, trained, armed, and supported numerous proxies, particularly the Lebanon-based Hezbollah; Iraqi Shia militant groups; Palestinian groups such as Hamas and Palestine Islamic Jihad; and groups that have fought against the governments of Afghanistan, Bahrain, Egypt, Israel, Iraq, Jordan, Kuwait, Saudi Arabia, Turkey, and Yemen.

Iran is the world's foremost state sponsor of terrorism and has made extensive efforts to export its radical Shia brand of Islamist revolution. It has found success in establishing a network of powerful Shia revolutionary groups in Lebanon and Iraq; has cultivated links with Afghan Shia and Taliban militants; and has stirred Shia unrest in Bahrain, Iraq, Libya, Saudi Arabia, and Yemen. In recent years, Iranian arms shipments have been intercepted regularly by naval forces off the coasts of Bahrain and Yemen, and Israel has repeatedly intercepted arms shipments, including long-range rockets, bound for Palestinian militants in Gaza.

Mounting Missile Threat. Iran possesses the largest number of deployed missiles in the Middle East.[33] The backbone of the Iranian

ballistic missile force is formed by the Shahab series of road-mobile surface-to-surface missiles, which are based on Soviet-designed Scud missiles. The Shahab missiles are potentially capable of carrying nuclear, chemical, or biological warheads in addition to conventional high-explosive warheads. Their relative inaccuracy (compared to NATO ballistic missiles) limits their effectiveness unless they are employed against large, soft targets such as cities.

Iran's heavy investment in such weapons has fueled speculation that the Iranians intend eventually to replace the conventional warheads in their longer-range missiles with nuclear warheads. The Nuclear Threat Initiative has concluded that "[r]egardless of the veracity of these assertions, Tehran indisputably possesses a formidable weapons delivery capability, and its ongoing missile program poses serious challenges to regional stability."[34]

Iran is not a member of the Missile Technology Control Regime, and it has sought aggressively to acquire, develop, and deploy a wide spectrum of ballistic missile, cruise missile, and space launch capabilities. During the 1980–1988 Iran–Iraq war, Iran acquired Soviet-made Scud-B missiles from Libya and later acquired North Korean–designed Scud-C and No-dong missiles, which it renamed the Shahab-2 (with an estimated range of 500 kilometers or 310 miles) and Shahab-3 (with an estimated range of 900 kilometers or 560 miles). It now can produce its own variants of these missiles as well as longer-range Ghadr-1 and Qiam missiles.

Iran's Shahab-3 and Ghadr-1, which is a modified version of the Shahab-3 with a smaller warhead but greater range (about 1,600 kilometers or 1,000 miles), are considered more reliable and advanced than the North Korean No-dong missile from which they are derived. The then-Director of the Defense Intelligence Agency, Lieutenant General Michael T. Flynn, warned in 2014 that:

> Iran can strike targets throughout the region and into Eastern Europe. In addition to its growing missile and rocket inventories, Iran is seeking to enhance lethality and effectiveness of existing systems with improvements in accuracy and warhead designs. Iran is developing the Khalij Fars, an anti-ship ballistic missile which could threaten maritime activity throughout the Persian Gulf and Strait of Hormuz.[35]

Iran's ballistic missiles pose a major threat to U.S. bases and allies from Turkey, Israel, and Egypt in the west to Saudi Arabia and the other Gulf states to the south and Afghanistan and Pakistan to the east. However, it is Israel, which has fought a shadow war with Iran and its terrorist proxies, that is most at risk from an Iranian attack. In case the Israeli government had any doubt about Iran's implacable hostility, the Revolutionary Guards displayed a message written in Hebrew on the side of one of the Iranian missiles tested in March 2016: "Israel must be wiped off the earth."[36] The development of nuclear warheads for Iran's ballistic missiles would seriously degrade Israel's ability to deter attacks, an ability that the existing (but not officially acknowledged) Israeli monopoly on nuclear weapons in the Middle East currently provides.

For Iran's radical regime, hostility to Israel, to which Iran sometimes refers as the "little Satan," is second only to hostility to the United States, which the leader of Iran's 1979 revolution, Ayatollah Khomeini, dubbed the "great Satan." But Iran poses a greater immediate threat to Israel than it does to the United States, since Israel is a smaller country with fewer military capabilities and located much closer to Iran. It already is within range of Iran's Shahab-3 missiles. Moreover, all of Israel can be hit with the thousands of shorter-range rockets that Iran has provided to Hezbollah in Lebanon and to Hamas and Palestine Islamic Jihad in Gaza.

Weapons of Mass Destruction. Tehran has invested tens of billions of dollars since the 1980s in a nuclear weapons program that was masked within its civilian nuclear power program. It built clandestine underground facilities to enrich uranium, which were subsequently discovered near Natanz and Fordow,

and is building a heavy-water reactor near Arak that will give it a second potential route to nuclear weapons.[37]

As of June 2015, Iran had accumulated enough low-enriched uranium to build eight nuclear bombs if enriched to weapons-grade levels, and it could enrich enough uranium to arm one bomb in less than two months.[38] Clearly, the development of an Iranian nuclear bomb would greatly amplify the threat posed by Iran. Even if Iran did not use a nuclear weapon or pass it on to one of its terrorist surrogates to use, the regime in Tehran could become emboldened to expand its support for terrorism, subversion, and intimidation, assuming that its nuclear arsenal would protect it from retaliation as has been the case with North Korea.

On July 14, 2015, President Barack Obama announced that the United States and Iran, with China, France, Germany, Russia, the United Kingdom, and the European Union High Representative for Foreign Affairs and Security Policy, had reached a "comprehensive, long-term deal with Iran that will prevent it from obtaining a nuclear weapon."[39] The agreement, however, did a much better job of dismantling sanctions against Iran than it did of dismantling Iran's nuclear infrastructure.

In fact, the agreement did not require that any of the illicit facilities that Iran covertly built be dismantled. Tehran was allowed to continue use of its uranium enrichment facilities at Natanz and Fordow, although the latter facility is to be repurposed at least temporarily as a research site. The heavy-water reactor at Arak was also retained with modifications that will reduce its yield of plutonium. All of these facilities, built covertly and housing operations prohibited by multiple U.N. Security Council Resolutions (UNSCRs), have been legitimized by the agreement.

Under the agreement, Tehran not only gets to keep all of its illicit nuclear facilities, but also merely has to mothball—not destroy—centrifuges used to enrich uranium. This means that Iran can quickly expand its enrichment activities and rapidly shorten its nuclear breakout timeline when restrictions on the number of centrifuges and uranium enrichment levels expire in 10 to 15 years.

Iran can quickly reverse all of its concessions if it decides to renege on the deal in the future. Sanctions on Iran, however, especially at the U.N., will not "snap back" into place, but will take considerable time to re-impose and take effect—assuming that they can be reimposed at all. If the Russians or Chinese were to object, it would further delay the inherent time lag before sanctions could have any significant effect and might even derail U.N. sanctions completely.

The Iran nuclear agreement marked a risky departure from more than five decades of U.S. nonproliferation efforts under which Washington opposed the spread of sensitive nuclear technologies, such as uranium enrichment, even for allies. Iran got a better deal on uranium enrichment under the agreement than such U.S. allies as the United Arab Emirates, South Korea, and Taiwan have received from Washington in the past. In fact, the Obama Administration gave Iran better terms on uranium enrichment than the Ford Administration gave to the Shah of Iran, a close U.S. ally before the 1979 revolution.

Although Washington has downplayed the risks inherent in the nuclear agreement, worried governments in the region are bound to take out insurance policies against a nuclear Iran in the form of their own nuclear programs. This could spur a cascade of nuclear proliferation from threatened states such as Saudi Arabia, Egypt, Turkey, and the UAE. Saudi officials already have announced plans for building up to 16 nuclear power plants by 2040. The Saudi government signed agreements with Rosatom, Russia's state-run nuclear company, in June 2015 and with China in January 2016 that will significantly advance the Saudi nuclear program,[40] And Egypt signed a November 2015 agreement with Russia to build four nuclear reactors. Although these are civilian nuclear programs, they could be used to mask a push for nuclear weapons, as happened in Iran.

Iran is a declared chemical weapons power that claims to have destroyed all of its chemical weapons stockpiles. U.S. intelligence agencies assess that Iran maintains the capability to produce chemical warfare (CW) agents and "probably" has the capability to produce some biological warfare agents for offensive purposes if it should decide to do so.[41] Iran also has threatened to disrupt the flow of Persian Gulf oil exports by closing the Strait of Hormuz in the event of a conflict with the U.S. or its allies.

WWTA: The WWTA assesses that Iran "presents an enduring threat to US national interests because of its support to regional terrorist and militant groups and the Asad regime, as well as its development of advanced military capabilities." Its "intent is to thwart US, Saudi, and Israeli influence, bolster its allies, and fight ISIL's expansion. Tehran might even use American citizens detained when entering Iranian territories as bargaining pieces to achieve financial or political concessions in line with their strategic intentions."[42]

With respect to the nuclear issue, the WWTA assesses that "Iran probably views the Joint Comprehensive Plan of Action (JCPOA) as a means to remove sanctions" and "to eventually expand its nuclear infrastructure." In addition, "Iran's overarching strategic goals... have led it to pursue capabilities to meet its nuclear energy and technology goals and give it the ability to build missile-deliverable nuclear weapons...."[43]

Summary: Iran poses a major potential threat to U.S. bases, interests, and allies in the Middle East by virtue of its ballistic missile capabilities, continued nuclear ambitions, longstanding support for terrorism, and extensive support for Islamist revolutionary groups.

Arab Attack on Israel. In addition to threats from Iran, Israel faces the constant threat of attack from Palestinian, Lebanese, Egyptian, Syrian, and other Arab terrorist groups. The threat posed by Arab states, which lost four wars against Israel in 1948, 1956, 1967, and 1973 (Syria and the PLO lost a fifth war in 1982 in Lebanon), has gradually declined. Egypt and Jordan have signed peace treaties with Israel. Iraq, Libya, and Syria have disintegrated in increasingly brutal civil wars. Although the conventional military threat to Israel from Arab states has declined, the unconventional military and terrorist threats, especially from an expanding number of substate actors, have risen substantially.

Iran has systematically bolstered many of these groups, even if it did not necessarily share their ideology. Today, Iran's surrogates, Hezbollah and Palestinian Islamic Jihad, along with Hamas, a more distant ally, pose the chief immediate threats to Israel. After Israel's May 2000 withdrawal from southern Lebanon and the September 2000 outbreak of fighting between Israelis and Palestinians, Hezbollah stepped up its support for such Palestinian extremist groups as Hamas, Palestinian Islamic Jihad, the al-Aqsa Martyrs' Brigades, and the Popular Front for the Liberation of Palestine. It also expanded its own operations in the West Bank and Gaza and provided funding for specific attacks launched by other groups.

In July 2006, Hezbollah forces crossed the Lebanese border in an effort to kidnap Israeli soldiers inside Israel, igniting a military clash that claimed hundreds of lives and severely damaged the economies on both sides of the border. Hezbollah has since rebuilt its depleted arsenal with help from Iran and Syria. Israeli officials estimate that Hezbollah has amassed around 150,000 rockets, including a number of long-range Iranian-made missiles capable of striking cities throughout Israel.[44]

Since Israel's withdrawal from the Gaza Strip in 2005, Hamas, Palestinian Islamic Jihad, and other terrorist groups have fired more than 11,000 rockets into Israel, sparking wars in 2008–2009, 2012, and 2014.[45] Over 5 million Israelis out of a total population of 8.1 million live within range of rocket attacks from Gaza, although the successful operation of the Iron Dome anti-missile system greatly mitigated this threat during the Gaza conflict in 2014. In that war, Hamas also unveiled a sophisticated tunnel network that it used to

infiltrate Israel to launch attacks on Israeli civilians and military personnel.

Israel also faces a growing threat of terrorist attacks from Syria. Islamist extremist groups fighting the Syrian government, including the al-Qaeda–affiliated al-Nusra Front, have attacked Israeli positions in the Golan Heights, which Israel captured in the 1967 Arab–Israeli war.

WWTA: The WWTA does not reference Arab threats to Israel.

Summary: The threat posed to Israel by Arab states has declined in recent years as a result of the overthrow or weakening of hostile Arab regimes in Iraq and Syria. However, there is a growing threat from sub-state actors such as Hamas, Hezbollah, the Islamic State, and other terrorist groups in Egypt, Gaza, Lebanon, and Syria. Given the region's inherent volatility, the general destabilization that has occurred as a consequence of Syria's civil war, the growth of the Islamic State as a major threat actor, and the United States' long-standing support for Israel, any concerted attack on Israel would be a major concern for the U.S.

Terrorist Threats from Hezbollah. Hezbollah is a close ally of, frequent surrogate for, and terrorist subcontractor for Iran's revolutionary Islamist regime. Iran played a crucial role in creating Hezbollah in 1982 as a vehicle for exporting its revolution, mobilizing Lebanese Shia, and developing a terrorist surrogate for attacks on its enemies.

Tehran provides the bulk of Hezbollah's foreign support: arms, training, logistical support, and money. Iran provides at least $100 million in annual financial support for Hezbollah, and some experts estimate that this could run as high as $200 million annually.[46] Tehran has lavishly stocked Hezbollah's expensive and extensive arsenal of rockets, sophisticated land mines, small arms, ammunition, explosives, anti-ship missiles, anti-aircraft missiles, and even unmanned aerial vehicles (UAVs) that Hezbollah can use for aerial surveillance or remotely piloted terrorist attacks. Iranian Revolutionary Guards have trained Hezbollah terrorists in Lebanon's Bekaa Valley and in Iran.

Iran has used Hezbollah as a club to hit not only Israel and Tehran's Western enemies, but also many Arab countries. Iran's revolutionary ideology has fueled its hostility to other Middle Eastern states, many of which it seeks to overthrow and replace with radical allies. During the Iran–Iraq war, Iran used Hezbollah to launch terrorist attacks against Iraqi targets and against Arab states that sided with Iraq. Hezbollah launched numerous terrorist attacks against Saudi Arabia and Kuwait, which extended strong financial support to Iraq's war effort, and participated in several other terrorist operations in Bahrain and the United Arab Emirates.

Iranian Revolutionary Guards conspired with the branch of Hezbollah in Saudi Arabia to conduct the 1996 Khobar Towers bombing in Saudi Arabia. Hezbollah collaborated with the IRGC's Quds Force to destabilize Iraq after the 2003 U.S. occupation. It also helped to train and advise the Mahdi Army, the radical anti-Western Shiite militia led by militant cleric Moqtada al-Sadr.

Hezbollah threatens the security and stability of the Middle East and Western interests in the Middle East on a number of fronts. In addition to its murderous actions against Israel, Hezbollah has used violence to impose its radical Islamist agenda and subvert democracy in Lebanon. Although some experts believed that Hezbollah's participation in the 1992 Lebanese elections and subsequent inclusion in Lebanon's parliament and coalition governments would moderate its behavior, its political inclusion did not lead it to renounce terrorism.

Hezbollah also poses a potential threat in Europe to America's NATO allies. Hezbollah established a presence inside European countries in the 1980s amid the influx of Lebanese citizens seeking to escape Lebanon's civil war. It took root among Lebanese Shiite immigrant communities throughout Europe. German intelligence officials estimate that roughly 900 Hezbollah members live in Germany alone.

Hezbollah also has developed an extensive web of fundraising and logistical support cells throughout Europe.[47]

France and Britain have been the principal European targets of Hezbollah terrorism, in part because both countries opposed Hezbollah's agenda in Lebanon and were perceived as enemies of Iran, Hezbollah's chief patron. Hezbollah has been involved in many terrorist attacks against Europeans, including:

- The October 1983 bombing of the French contingent of the multinational peacekeeping force in Lebanon (on the same day as the U.S. Marine barracks bombing), which killed 58 French soldiers;
- The December 1983 bombing of the French embassy in Kuwait;
- The April 1985 bombing of a restaurant near a U.S. base in Madrid, Spain, which killed 18 Spanish citizens;
- A campaign of 13 bombings in France in 1986 that targeted shopping centers and railroad facilities, killing 13 people and wounding more than 250; and
- A March 1989 attempt to assassinate British novelist Salman Rushdie that failed when a bomb exploded prematurely, killing a terrorist in London.

Hezbollah attacks in Europe trailed off in the 1990s after Hezbollah's Iranian sponsors accepted a truce in their bloody 1980–1988 war with Iraq and no longer needed a surrogate to punish states that Tehran perceived as supporting Iraq. Significantly, the participation of European troops in Lebanese peacekeeping operations, which became a lightning rod for Hezbollah terrorist attacks in the 1980s, could become an issue again if Hezbollah attempts to revive its aggressive operations in southern Lebanon. Troops from European Union member states may someday find themselves attacked by Hezbollah with weapons financed by Hezbollah supporters in their home countries.

As of 2015, Hezbollah operatives were deployed in countries throughout Europe, including Belgium, Bulgaria, Cyprus, France, Germany, and Greece.[48]

WWTA: The WWTA assesses that "Iran and Hizballah remain a continuing terrorist threat to U.S. interests and partners worldwide."[49]

Summary: Hezbollah poses a major potential terrorist threat to the U.S. and its allies in the Middle East and Europe.

Al-Qaeda: A Continuing Regional Threat. The Arab Spring uprisings that began in 2011 have created power vacuums that al-Qaeda, the Islamic State, and other Islamist extremist groups have exploited to advance their hostile agendas. The al-Qaeda network has taken advantage of failed or failing states in Iraq, Libya, Mali, Syria, and Yemen. The fall of autocratic Arab regimes and the subsequent factional infighting within the ad hoc coalitions that ousted them created anarchic conditions that have enabled al-Qaeda franchises to expand the territories that they control. Rising sectarian tensions resulting from conflicts in Iraq, Syria, and Yemen also have presented al-Qaeda and other Sunni extremist groups with major opportunities to expand their activities.

Jonathan Evans, Director General of the British Security Service (MI5), has warned that "parts of the Arab world have once more become a permissive environment for al-Qaeda."[50] In Egypt, Libya, Syria, Tunisia, and Yemen, the collapse or purge of intelligence and counterterrorism organizations removed important constraints on the growth of al-Qaeda and similar Islamist terrorist groups. Many dangerous terrorists were released or escaped from prison. Al-Qaeda and other revolutionary groups were handed new opportunities to recruit, organize, attract funding for, train, and arm a new wave of followers and to consolidate safe havens from which to mount future attacks.

The Arab Spring uprisings were a golden opportunity for al-Qaeda, coming at a time

when its sanctuaries in Pakistan had become increasingly threatened by U.S. drone strikes. Given al-Qaeda's Arab roots, the Middle East and North Africa provide much better access to potential Arab recruits than is provided by the more distant and remote regions along the Afghanistan–Pakistan border, where many al-Qaeda cadres fled after the fall of the Taliban regime in Afghanistan in 2001. The countries destabilized by the Arab uprisings also could provide easier access to al-Qaeda's Europe-based recruits, who pose dangerous threats to the U.S. homeland by virtue of their European passports and greater ability to blend into Western societies.

WWTA: The WWTA assesses that affiliates of al Qaeda "are positioned to make gains in 2016, despite counterterrorism pressure that has largely degraded the network's leadership in Afghanistan and Pakistan," and "will continue to pose a threat to local, regional, and even possibly global interests.... Other Sunni terrorist groups retain the ability to attract recruits and resources."[51]

Summary: The al-Qaeda network and the Islamic State have exploited the political turbulence of the Arab Spring to expand their strength and control of territory in the Middle East. They pose growing regional threats to the U.S. and its allies.

Growing Threats to Jordan. Jordan, a key U.S. ally, faces external threats from Syria's Assad regime and from Islamist extremists, including the Islamic State, who have carved out sanctuaries in Syria and Iraq. Jordan's cooperation with the United States, Saudi Arabia, and other countries in the 2014–2015 air campaign against the IS in Syria and in supporting moderate elements of the Syrian opposition has angered both the Assad regime and Islamist extremist rebels. Damascus could retaliate for Jordanian support for Syrian rebels with cross-border attacks, air strikes, ballistic missile strikes, or the use of terrorist attacks by such surrogates as Hezbollah or the PFLP–GC.

The Islamic State is committed to overthrowing the government of Jordan and replacing it with an Islamist dictatorship. In its previous incarnation as al-Qaeda in Iraq, the IS mounted attacks against targets in Jordan that included the November 2005 suicide bombings at three hotels in Amman that killed 57 people.[52] The IS also burned to death a Jordanian Air Force pilot captured in Syria after his plane crashed and released a video of his grisly murder in February 2015. Jordan also faces threats from Hamas and from Jordanian Islamist extremists, particularly some based in the southern city of Maan who organized pro-IS demonstrations in 2014. Although Jordanian security forces have successfully foiled several IS terrorist plots, six Jordanian border guards were killed by a car bomb on June 21, 2016, prompting Jordan to close the border.

WWTA: The WWTA does not reference threats to Jordan.

Summary: Jordan faces rising security threats from the Islamic State, which has expanded its control of territory in neighboring Syria and Iraq. Because Jordan is one of the very few Arab states that maintain a peaceful relationship with Israel and has been a key regional partner in fighting Islamist terrorism, its destabilization would be a troubling development.

Terrorist Attacks on and Possible Destabilization of Egypt. The 2011 ouster of President Hosni Mubarak's regime undermined the authority of Egypt's central government and allowed disgruntled Bedouin tribes, Islamist militants, and smuggling networks to grow stronger and bolder in Egypt's Sinai Peninsula. President Mohamed Morsi's Muslim Brotherhood–backed government, elected to power in 2012, took a relaxed attitude toward Hamas and other Gaza-based Islamist extremists, enabling Islamist militants in the Sinai to grow even stronger with support from Gaza. They carved out a staging area in the remote mountains of the Sinai that they have used as a springboard for attacks on Israel, Egyptian security forces, tourists, the Suez Canal, and a pipeline carrying Egyptian natural gas to Israel and Jordan.

The July 2013 coup against Morsi resulted in a military government that took a much harder line against the Sinai militants, but it also raised the ire of more moderate Islamists, who could turn to terrorism to avenge Morsi's fall. Terrorist attacks, which had been limited to the Sinai, expanded in lethality and intensity to include bomb attacks in Cairo and other cities by early 2014. In November 2014, the Sinai-based terrorist group Ansar Bayt al-Maqdis (Supporters of Jerusalem) declared its allegiance to the Islamic State and renamed itself the Sinai Province of the Islamic State. It has launched a growing terrorist campaign against the Egyptian army, police, and other government institutions. It also claimed responsibility for the October 31, 2015, bombing of a Russian passenger plane flying to Saint Petersburg from Sharm-el-Sheikh that killed 224 people.

Egypt also faces potential threats from Islamist militants and al-Qaeda affiliates based in Libya. The Egyptian air force bombed Islamic State targets in Libya on February 16, 2015, the day after the terrorist organization released a video showing the decapitation of 21 Egyptian Christians who had been working in Libya. Egypt has stepped up security operations along the border with Libya to block the smuggling of arms and militants into Egypt. Cairo also has supported Libyans fighting Islamist extremists in eastern Libya.

During the 2014 conflict between Hamas and Israel, Egypt closed tunnels along the Gaza–Sinai border that have been used to smuggle goods, supplies, and weapons into Gaza. It has continued to uncover and destroy tunnels to disrupt an important source of external support for Sinai Province terrorists. Egypt has continued to uphold its peace treaty with Israel and remains an important ally against Islamist terrorist groups.

WWTA: The WWTA assesses that "Egypt faces a persistent threat of terrorist and militant activity directed primarily at state security forces in both the Sinai Peninsula and in mainland Egypt. The security services have initiated a counterterrorism campaign to disrupt and detain Sinai-based militants; however, terrorist groups still retain the ability to conduct attacks." The ongoing terrorist threat "places further strain on Egypt's economy by harming Egypt's tourism industry, a key source of revenue. The country is also grappling with high poverty and unemployment rates."[53]

Summary: Egypt is threatened by Islamist extremist groups that have established bases in the Sinai Peninsula, Gaza, and Libya. Left unchecked, these groups could foment greater instability not only in Egypt, but also in neighboring countries.

Threats to Saudi Arabia and Other Members of the Gulf Cooperation Council. Saudi Arabia and the five other Arab Gulf states—Bahrain, Kuwait, Oman, Qatar, and the United Arab Emirates—formed the Gulf Cooperation Council (GCC) in 1981 to deter and defend against Iranian aggression. Iran remains the primary external threat to their security. Tehran has supported groups that launched terrorist attacks against Bahrain, Kuwait, Saudi Arabia, and Yemen. It sponsored the Islamic Front for the Liberation of Bahrain, a surrogate group that plotted a failed 1981 coup against Bahrain's ruling Al Khalifa family, the Sunni rulers of the predominantly Shia country. Iran also has long backed Bahraini branches of Hezbollah and the Dawa Party.

When Bahrain was engulfed in a wave of Arab Spring protests in 2011, its government charged that Iran again exploited the protests to back the efforts of Shia radicals to overthrow the royal family. Saudi Arabia, fearing that a Shia revolution in Bahrain would incite its own restive Shia minority, led a March 2011 GCC intervention that backed Bahrain's government with about 1,000 Saudi troops and 500 police from the United Arab Emirates.

Bahrain has intercepted several shipments of Iranian arms, including sophisticated bombs employing explosively formed penetrators (EFPs). The government withdrew its ambassador to Tehran when two Bahrainis with ties to the IRGC were arrested after their arms

shipment was intercepted off Bahrain's coast in July 2015. Iranian hardliners have steadily escalated pressure on Bahrain. In March 2016, a former IRGC general who is a close adviser to Ayatollah Khamenei stated that "Bahrain is a province of Iran that should be annexed to the Islamic Republic of Iran."[54] After Bahrain stripped the citizenship of a senior Shiite cleric, Sheikh Isa Qassim, General Qassim Suleimani, the commander of the IRGC's Quds Force, threatened to make Bahrain's royal family "pay the price and disappear."[55]

Saudi Arabia also has criticized Iran for its support for radical Saudi Shiites, its intervention in Syria, and its support for Shiite Islamists in Lebanon, Iraq, and Yemen. In January 2016, Saudi Arabia executed a Shiite cleric charged with sparking anti-government protests and cut diplomatic ties with Iran after Iranian mobs enraged by the execution attacked and set fire to the Saudi embassy in Tehran.

Saudi Arabia also faces threats from Islamist extremists, including al-Qaeda offshoots in Iraq and Yemen that have attracted many Saudi recruits. Al-Qaeda launched a series of bombings and terrorist attacks inside the kingdom in 2003 and a major attack on the vital Saudi oil facility in Abqaiq in 2006, but a security crackdown drove many of its members out of the country by the end of the decade. Many of them joined Al-Qaeda in the Arabian Peninsula in neighboring Yemen. AQAP has flourished, aided by the instability fostered by Arab Spring protests and the ouster of the Yemeni government by Iran-backed Houthi rebels in early 2015.

In addition to terrorist threats and possible rebellions by Shia or other disaffected internal groups, Saudi Arabia and the other GCC states face possible military threats from Iran. Tehran is unlikely to launch direct military attacks against these countries because of their close security ties with the United States, but it has backed Shiite terrorist groups within GCC states such as Saudi Hezbollah and has supported the Shiite Houthi rebels in Yemen. In March 2015, Saudi Arabia led a 10-country coalition that launched an air campaign against Houthi forces and provided support for ousted Yemeni President Abdu Rabu Mansour Hadi, who took refuge in Saudi Arabia. The Saudi Navy also established a blockade of Yemeni ports to prevent Iran from aiding the rebels.

WWTA: The WWTA assesses that "Tehran views itself as leading the 'axis of resistance'—which includes the Asad regime and subnational groups aligned with Iran, especially Lebanese Hizballah and Iraqi Shia militants. Their intent is to thwart US, Saudi, and Israeli influence, bolster its allies, and fight ISIL's expansion."[56]

Summary: Saudi Arabia and other members of the Gulf Cooperation Council face continued threats from Iran as well as rising threats from Islamist extremist groups such as al-Qaeda, the Islamic State, and Houthi militias in Yemen. Though Saudi citizens and Islamic charities have supported Islamist extremist groups and the Saudi government promulgates the religious views of the fundamentalist Wahhabi sect of Sunni Islam, the Saudi government also serves to check radical Islamist groups like the Islamic State and is a regional counterbalance to Iran.

Threats to the Commons

The United States has critical interests at stake in the Middle Eastern commons: sea, air, space, and cyber. The U.S. has long provided the security backbone in these areas, which in turn has supported the region's economic development and political stability.

Maritime. Maintaining the security of the sea lines of communication in the Persian Gulf, Arabian Sea, Red Sea, and Mediterranean Sea is a high priority for strategic, economic, and energy security purposes. The Persian Gulf region contains approximately 50 percent of the world's oil reserves and is a crucial source of oil and gas for energy-importing states, particularly China, India, Japan, South Korea, and many European countries. The flow of that oil could be interrupted by interstate conflict or terrorist attacks.

MAP 7

Middle East Oil Transit Choke Points

SUEZ CANAL
In 2013, 915.5 million tons of cargo transited the canal, averaging 45.5 ships transiting each day. The 120–mile canal is an important transit route for European oil imports from the Persian Gulf.

3.2

BAB EL-MANDEB STRAIT
This strait, 18 miles wide at its narrowest point, is an important transit route for Persian Gulf oil exports to Europe. The vast majority of southbound traffic through the Suez Canal must also pass through Bab el-Mandeb.

3.8

STRAIT OF HORMUZ
Almost 20 percent of the world's traded oil passes through this strait, making it the busiest passageway for oil tankers in the world.

17

Millions of barrels of oil moved per day in 2013 ▶

SOURCE: Heritage Foundation research and analysis provided elsewhere in this *Index* and U.S. Department of Energy, Energy Information Administration, "World Oil Transit Chokepoints," December 2014, Table 1, http://www.eia.gov/beta/international/regions-topics.cfm?RegionTopicID=WOTC (accessed August 17, 2015).

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Bottlenecks such as the Strait of Hormuz, the Suez Canal, and the Bab el-Mandeb Strait are potential choke points for restricting the flow of oil, international trade, and the deployment of U.S. Navy warships. The chief potential threat to the free passage of ships through the Strait of Hormuz, one of the world's most important maritime choke points, is Iran. Approximately 17 million barrels of oil a day—roughly 30 percent of the seaborne oil traded worldwide—flowed through the strait in 2013.[57]

Iran has trumpeted the threat it could pose to the free flow of oil exports from the Gulf if

it is attacked or threatened with a cutoff of its own oil exports. Iran's leaders have threatened to close the Strait of Hormuz, the jugular vein through which most Gulf oil exports flow to Asia and Europe. Although the United States has greatly reduced its dependence on oil exports from the Gulf, it still would sustain economic damage in the event of a spike in world oil prices, and many of its European and Asian allies and trading partners import a substantial portion of their oil needs from the region. Iran's Supreme Leader, Ayatollah Ali Khamenei, has repeatedly played up Iran's threat to international energy security, proclaiming in 2006 that "[i]f the Americans make a wrong move toward Iran, the shipment of energy will definitely face danger, and the Americans would not be able to protect energy supply in the region."[58]

Iran has established a precedent for attacking oil shipments in the Gulf. During the Iran–Iraq war, each side targeted the other's oil facilities, ports, and oil exports. Iran escalated attacks to include neutral Kuwaiti oil tankers and terminals and clandestinely laid mines in Persian Gulf shipping lanes while its ally Libya clandestinely laid mines in the Red Sea. The United States defeated Iran's tactics by reflagging Kuwaiti oil tankers, clearing the mines, and escorting ships through the Persian Gulf, but a large number of commercial vessels were damaged during the "Tanker War" from 1984 to 1987.

Iran's demonstrated willingness to disrupt oil traffic through the Persian Gulf in the past to place economic pressure on Iraq is a red flag to U.S. military planners. During the 1980s Tanker War, Iran's ability to strike at Gulf shipping was limited by its aging and outdated weapons systems and the U.S. arms embargo imposed after the 1979 revolution. However, since the 1990s, Iran has been upgrading its military with new weapons from North Korea, China, and Russia, as well as with weapons manufactured domestically.

Today, Iran boasts an arsenal of Iranian-built missiles based on Russian and Chinese designs that pose significant threats to oil tankers as well as warships. Iran is well stocked with Chinese-designed anti-ship cruise missiles, including the older HY-2 Seersucker and the more modern CSS-N-4 Sardine and CSS-N-8 Saccade models. Iran also has reverse engineered Chinese missiles to produce its own anti-ship cruise missiles, the Ra'ad and Noor.[59] Shore-based missiles deployed along Iran's coast would be augmented by aircraft-delivered laser-guided bombs and missiles, as well as by television-guided bombs.

Iran has a large supply of anti-ship mines, including modern mines that are far superior to the simple World War I–style contact mines that Iran used in the 1980s. They include the Chinese-designed EM-52 "rocket" mine, which remains stationary on the sea floor and fires a homing rocket when a ship passes overhead. In addition, Iran can deploy mines or torpedoes from its three *Kilo*-class submarines, which would be effectively immune to detection for brief periods when running silent and remaining stationary on a shallow bottom just outside the Strait of Hormuz,[60] and also could deploy mines by mini-submarines, helicopters, or small boats disguised as fishing vessels.

Iran's Revolutionary Guard naval forces have developed swarming tactics using fast attack boats and also could deploy naval commandos trained to attack using small boats, mini-submarines, and even jet skis. The Revolutionary Guards also have underwater demolition teams that could attack offshore oil platforms and other facilities.

On April 28, 2015, the Revolutionary Guard naval force seized the *Maersk Tigris*, a container ship registered in the Marshall Islands, near the Strait of Hormuz. Tehran claimed that it seized the ship because of a previous court ruling ordering the Maersk Line, which charters the ship, to make a payment to settle a dispute with a private Iranian company. The ship was later released after being held for more than a week.[61] An oil tanker flagged in Singapore, the *Alpine Eternity*, was surrounded and attacked by Revolutionary Guard gunboats in the strait on May 14,

2015, when it refused to be boarded. Iranian authorities alleged that it had damaged an Iranian oil platform in March, although the ship's owners maintained that it had hit an uncharted submerged structure.[62] The Revolutionary Guard's aggressive tactics in using commercial disputes as pretexts for the illegal seizures of transiting vessels prompted the U.S. Navy to escort American and British-flagged ships through the Strait of Hormuz for several weeks in May before tensions eased.

The July 2015 nuclear agreement has not altered the confrontational tactics of the Revolutionary Guards in the gulf.[63] IRGC naval forces challenged U.S. naval forces in a series of incidents in 2015 and 2016. IRGC missile boats launched rockets within 1,500 yards of the carrier *Harry S. Truman* near the Strait of Hormuz in late December 2015, flew drones over U.S. warships, and detained and humiliated 10 American sailors in a provocative January 12, 2016, incident. Despite the fact that the two U.S. Navy boats carrying the sailors had drifted inadvertently into Iranian territorial waters, the vessels had the right of innocent passage, and their crews should not have been subjected to being disarmed, forced onto their knees, filmed, and exploited in propaganda videos.

Finally, Tehran could use its extensive terrorist network in the region to sabotage oil pipelines and other infrastructure or to strike oil tankers in port or at sea.

Terrorists pose a potential threat to oil tankers and other ships. Al-Qaeda strategist Abu Mus'ab al-Suri identified four strategic choke points that should be targeted for disruption: the Strait of Hormuz, the Suez Canal, the Bab el-Mandeb Strait, and the Strait of Gibraltar.[64] In 2002, al-Qaeda terrorists attacked and damaged the French oil tanker *Limbourg* off the coast of Yemen. Al-Qaeda also almost sank the USS *Cole*, a guided-missile destroyer, in the port of Aden, killing 17 American sailors with a suicide boat bomb in 2000. An Egyptian patrol boat was attacked in November 2014 by the crews of small boats suspected of smuggling arms to Islamist terrorists in Gaza. In July 2015, the Islamic State–Sinai Province claimed responsibility for a missile attack on an Egyptian coast-guard vessel.

Terrorists also have targeted the Suez Canal. In two incidents on July 29 and August 31, 2013, ships in the waterway were attacked with rocket-propelled grenades. The attacks were claimed by a shadowy Islamist extremist group called the Furqan Brigades, which operated in Egypt's Sinai Peninsula.[65] The vessels reportedly escaped major damage. More important, the canal was not forced to close, which would have disrupted global shipping operations, ratcheted up oil prices, and complicated the deployment of U.S. and NATO naval vessels responding to potential crises in the Middle East, Persian Gulf, and Horn of Africa.

Over the past decade, piracy off the coast of Somalia has threatened shipping near the Bab el-Mandeb Strait and the Gulf of Aden. Recently, however, the frequency of pirate attacks in the region has dropped. In 2013, according to the U.S. Navy, hijackings of major shipments off the coast of Somalia plummeted to zero.[66] By early 2015, it appeared that piracy off the coast of Somalia had abated, at least temporarily, due to security precautions such as the deployment of armed guards on board cargo ships.[67] Pirate activity, however, continues to threaten international trade and the safety of the international commons, particularly off the coasts of West Africa and Southeast Asia. A resurgence in the waters around the Middle East cannot be discounted.

WWTA: The WWTA does not reference maritime threats in the Middle East region.

Summary: Iran poses the chief potential threat to shipping in the Strait of Hormuz, while various terrorist groups pose the chief threats to shipping in the Suez Canal and the Bab el-Mandeb Strait. Although pirate attacks off the coast of Somalia have declined steeply in recent years, the potential for their return remains.

Airspace. The Middle East is particularly vulnerable to attacks on civilian aircraft.

Large quantities of arms, including man-portable air defense systems (MANPADS), were looted from Libyan arms depots after the fall of Muammar Qadhafi's regime in 2011. Although Libya is estimated to have had up to 20,000 MANPADS, mostly old Soviet models, only about 10,000 have been accounted for, and an unknown number may have been smuggled out of Libya, which is a hotbed of Islamist radicalism.[68]

U.S. intelligence sources estimated that at least 800 MANPADS fell into the hands of foreign insurgent groups after being moved out of Libya.[69] Libyan MANPADS have turned up in the hands of AQIM, the Nigerian Boko Haram terrorist group, and Hamas in Gaza. At some point, one or more could be used in a terrorist attack against a civilian airliner. Insurgents or terrorists also could use anti-aircraft missile systems captured from regime forces in Iraq and Syria. In January 2015, a commercial airliner landing at Baghdad International Airport was hit by gunfire that injured a passenger and prompted a temporary suspension of flights to Baghdad.

Al-Qaeda also has used MANPADS in several terrorist attacks. In 2002, it launched two SA-7 MANPADS in a failed attempt to bring down an Israeli civilian aircraft in Kenya. In 2007, the al-Qaeda affiliate al-Shabaab shot down a Belarusian cargo plane in Somalia, killing 11 people.[70] Al-Qaeda's al-Nusra Front and the Islamic State have acquired substantial numbers of MANPADS from government arms depots in Iraq and Syria. Although such weapons may pose only a limited threat to modern warplanes equipped with countermeasures, they pose a growing threat to civilian aircraft in the Middle East and could be smuggled into the United States and Europe to threaten aircraft there.

The Islamic State–Sinai Province claimed responsibility for a bomb that destroyed Metrojet Flight 9268, a Russian passenger jet en route from Sharm el-Sheikh, Egypt, to Saint Petersburg, Russia, on October 31, 2015. The incident claimed the lives of 224 people on the plane, one of the biggest death tolls in a terrorist attack in recent years. The May 19, 2016, crash of EgyptAir flight MS804, which killed 66 people flying from Paris, France, to Cairo, Egypt, has been attributed to a fire, but the cause of that onboard fire has not yet been determined.

WWTA: The WWTA makes no mention of the terrorist threat to airspace in the Middle East.

Summary: Al-Qaeda, the Islamic State, and other terrorists have seized substantial numbers of anti-aircraft missiles from military bases in Iraq, Libya, and Syria that pose potential threats to safe transit of airspace in the Middle East, North Africa, and elsewhere.

Space. Iran has launched satellites into orbit, but there is no evidence that it has an offensive space capability. Tehran successfully launched three satellites in February 2009, June 2011, and February 2012 using the Safir space launch vehicle, which uses a modified Ghadr-1 missile for its first stage and has a second stage that is based on an obsolete Soviet submarine-launched ballistic missile, the R-27.[71] The technology probably was transferred by North Korea, which built its BM-25 missiles using the R-27 as a model.[72] Safir technology could be used as a basis to develop long-range ballistic missiles.

Iran claimed to have launched a monkey into space and returned it safely to Earth twice in 2013.[73] Tehran also announced in June 2013 that it had established its first space tracking center to monitor objects in "very remote space" and to help manage the "activities of satellites."[74]

WWTA: The WWTA does not reference Iranian space capabilities.

Summary: Though Iran has launched satellites into orbit successfully, there is no evidence that it has developed an offensive space capability that could deny others the use of space or exploit space as a base for offensive weaponry.

Cyber Threats. Iranian cyber capabilities present a significant threat to the U.S. and its allies. Iran has developed offensive cyber capabilities as a tool of espionage and sabotage.

Tehran claims to have the world's fourth largest cyber force, "a broad network of quasi-official elements, as well as regime-aligned 'hacktivists,' who engage in cyber activities broadly consistent with the Islamic Republic's interests and views."[75]

The creation of the "Iranian Cyber Army" in 2009 marked the beginning of a cyber offensive against those whom the Iranian government regards as enemies. A hacking group dubbed the Ajax Security Team, believed to be operating out of Iran, has used malware-based attacks to target U.S. defense organizations and has successfully breached the Navy Marine Corps Intranet. In addition, the group has have targeted dissidents within Iran, seeding versions of anti-censorship tools with malware and gathering information about users of those programs.[76] Iran has invested heavily in cyber capabilities, with an annual budget reported to be almost $1 billion in 2012.[77]

Hostile Iranian cyber activity has increased significantly since the beginning of 2014 and could threaten U.S. critical infrastructure, according to an April 2015 report released by the American Enterprise Institute. The Islamic Revolutionary Guard Corps and Sharif University of Technology are two Iranian institutions that investigators have linked to efforts to infiltrate U.S. computer networks, according to the report.[78]

Iran allegedly has used cyber weapons to engage in economic warfare, most notably the sophisticated and debilitating denial-of-service attacks against a number of U.S. financial institutions, including the Bank of America, JPMorgan Chase, and Citigroup.[79] In February 2014, Iran launched a crippling cyber attack against the Sands Casino in Las Vegas, owned by Sheldon Adelson, a leading supporter of Israel who is known to be critical of the Iranian regime.[80] In 2012, Tehran was suspected of launching the "Shamoon" virus attack on Saudi Aramco, the national oil company that produces approximately 10 percent of the world's oil, which destroyed around 30,000 computers, as well as an attack on Qatari natural gas company Rasgas's computer networks.[81]

U.S. officials warned of a surge of sophisticated computer espionage by Iran in the fall of 2015 that included a series of cyber attacks against State Department officials.[82] In March 2016, the Justice Department indicted seven Iranian hackers for penetrating the computer system that controlled a dam in the State of New York.[83]

The sophistication of these and other Iranian cyber attacks, together with Iran's willingness to use these weapons, has led various experts to name Iran as one of America's most cyber-capable opponents. Iranian cyber forces have even gone so far as to create fake online personas in order to extract information from U.S. officials through accounts such as LinkedIn, YouTube, Facebook, and Twitter.[84]

WWTA: The 2015 WWTA assessed that "Iran very likely values its cyber program as one of many tools for carrying out asymmetric but proportional retaliation against political foes, as well as a sophisticated means of collecting intelligence." In addition, "Iranian actors have been implicated in the 2012–13 DDOS attacks against US financial institutions and in the February 2014 cyber attack on the Las Vegas Sands casino company."[85]

Summary: Iranian cyber capabilities present significant espionage and sabotage threats to the U.S. and its allies, and Tehran has shown willingness and skill in using them.

Threat Scores

Iran. Iran represents by far the most significant security challenge to the United States, its allies, and its interests in the greater Middle East. Its open hostility to the United States and Israel, sponsorship of terrorist groups like Hezbollah, and history of threatening the commons underscore the problem it could pose. Today, Iran's provocations are mostly a concern for the region and America's allies, friends, and assets there. Iran relies heavily on irregular (to include political) warfare against others in the region and fields

more ballistic missiles than any of its neighbors. The development of its ballistic missiles and potential nuclear capability also mean that it poses a long-term threat to the security of the U.S. homeland.

According to the International Institute for Strategic Studies' *Military Balance 2016*, among the key weapons in Iran's inventory are 22-plus MRBMs, 18-plus SRBMs, 1,663 main battle tanks, 21 tactical submarines, seven corvettes, 13 amphibious landing ships, and 334 combat-capable aircraft. There are 523,000 personnel in the armed forces, including 350,000 in the Army, 125,000 in the Islamic Revolutionary Guard Corps, and 18,000 in the Navy. With regard to these capabilities, the IISS assesses that:

> Iran continues to rely on a mix of ageing combat equipment, reasonably well-trained regular and Islamic Revolutionary Guard Corps (IRGC) forces, and its ballistic-missile inventory to underpin the security of the state. The IRGC, including senior military leaders, has been increasingly involved in the civil war in Syria, supporting President Bashar al-Assad's regular and irregular forces; it was first deployed to Syria in an "advisory" role in 2012....
>
> The military continues to struggle with an ageing inventory of primary combat equipment that ingenuity and asymmetric warfare techniques can only partially offset....
>
> The nuclear agreement with the P5+1 and the European Union also begins to open the way for Iran to revamp its equipment inventory, with China and Russia potentially major suppliers, though sales of conventional systems remain embargoed for five years.[86]

This *Index* assesses the overall threat from Iran, considering the range of contingencies, as "aggressive" and "gathering." Iran's capability score has increased over the 2016 *Index* due to a combination of Tehran's continued weapons developments and ability to develop its nuclear program.

Threats: Iran

	HOSTILE	AGGRESSIVE	TESTING	ASSERTIVE	BENIGN
Behavior		✓			

	FORMIDABLE	GATHERING	CAPABLE	ASPIRATIONAL	MARGINAL
Capability		✓			

Greater Middle East–Based Terrorism

Collectively, the varied non-state actors in the Middle East that are vocally and actively opposed to the United States are the closest to being rated "hostile" with regard to the degree of provocation they exhibit. These groups, from the Islamic State to al-Qaeda and its affiliates, Hezbollah, and the range of Palestinian terrorist organizations in the region, are primarily a threat to America's allies, friends, and interests in the Middle East. Their impact on the American homeland is mostly a concern for American domestic security agencies. However, they pose a challenge to the stability of the region that could result in the emergence of more dangerous threats to the United States.

The IISS *Military Balance* addresses only the military capabilities of states. Consequently, it does not provide any accounting of such entities as Hezbollah, Hamas, al-Qaeda, or the Islamic State.

This *Index* assesses the overall threat from greater Middle East–based terrorism,

considering the range of contingencies, as "hostile" and "capable."[87] Both of these scores represent a more threatening assessment by one level than the 2016 *Index*, indicating the breadth of advances made across the globe by ISIS and the terrorist group's ability to spread its message and gain followers worldwide.

Threats: Middle East Terrorism

	HOSTILE	AGGRESSIVE	TESTING	ASSERTIVE	BENIGN
Behavior	✔				

	FORMIDABLE	GATHERING	CAPABLE	ASPIRATIONAL	MARGINAL
Capability			✔		

Endnotes:

1. James Phillips, "The Yemen Bombing: Another Wake-up Call in the Terrorist Shadow War," Heritage Foundation *Executive Memorandum* No. 773, October 25, 2000, http://www.heritage.org/Research/MiddleEast/EM703.cfm.
2. Stephen F. Hayes and Thomas Joscelyn, "Connecting the Dots," *The Weekly Standard*, November 23, 2009, http://www.weeklystandard.com/Content/Public/Articles/000/000/017/225edzea.asp (accessed September 17, 2014).
3. Peter Finn, "Al-Awlaki Directed Christmas 'Underwear Bomber' Plot, Justice Department Memo Says," *The Washington Post*, February 10, 2012, http://www.washingtonpost.com/world/national-security/al-awlaki-directed-christmas-underwear-bomber-plot-justice-department-memo-says/2012/02/10/gIQArDOt4Q_story.html (accessed September 17, 2014).
4. U.S. Department of State, Bureau of Counterterrorism, "Foreign Terrorist Organizations," Chapter 6 in *Country Reports on Terrorism 2015*, June 2016, http://www.state.gov/j/ct/rls/crt/2015/257523.htm (accessed August 8, 2016).
5. Eric Schmitt, "Al Qaeda Turns to Syria, With a Plan to Challenge ISIS," *The New York Times*, May 15, 2016, http://www.nytimes.com/2016/05/16/world/middleeast/al-qaeda-turns-to-syria-with-a-plan-to-challenge-isis.html?_r=0 (accessed August 8, 2016).
6. Lisa Curtis, ed., "Combatting the ISIS Foreign Fighter Pipeline: A Global Approach," Heritage Foundation *Special Report* No. 180, January 6, 2016, p. 3, http://thf-reports.s3.amazonaws.com/2015/SR180.pdf (accessed August 8, 2016).
7. Eric Schmitt, "U.S. Says Its Strikes Are Hitting More Significant ISIS Targets," *The New York Times*, May 25, 2016, http://www.nytimes.com/2016/05/26/us/politics/us-strikes-isis-targets.html?_r=0 (accessed August n8, 2016).
8. Curtis, ed., "Combatting the ISIS Foreign Fighter Pipeline," p. 5.
9. Brian Bennett, "Al-Qaeda in Iraq Threatens Attacks in U.S.," *Los Angeles Times*, July 25, 2012, http://articles.latimes.com/2012/jul/25/nation/la-na-qaeda-us-20120726 (accessed September 17, 2014).
10. James Phillips and Cassandra Lucaccioni, "Al-Qaeda Recruits Americans in Syria," The Daily Signal, January 10, 2014, http://dailysignal.com/2014/01/10/al-qaeda-seeks-american-recruits-syria/ (accessed September 17, 2014).
11. Schmitt, "Al Qaeda Turns to Syria."
12. U.S. Department of State, Bureau of Counterterrorism, "Foreign Terrorist Organizations," Chapter 6 in *Country Reports on Terrorism 2012*, May 2013, http://www.state.gov/j/ct/rls/crt/2012/209989.htm (accessed September 17, 2014).
13. Associated Press, "ISIL Says It Faces War with Nusra in Syria," Al Jazeera, last updated March 8, 2014, http://www.aljazeera.com/news/middleeast/2014/03/isil-says-it-faces-war-with-nusra-syria-2014371948499174O.html (accessed September 17, 2014).
14. James Phillips, "The Rise of Al-Qaeda's Khorasan Group: What It Means for U.S. National Security," Heritage Foundation *Issue Brief* No. 4281, October 6, 2014, at: http://www.heritage.org/research/reports/2014/10/the-rise-of-al-qaedas-khorasan-group-what-it-means-for-us-national-security.
15. Adam Goldman, Greg Miller, and Nicole Rodriquez, "American Who Killed Himself in Syria Suicide Attack Was from South Florida," *The Washington Post*, May 31, 2014, http://www.washingtonpost.com/world/national-security/american-who-killed-himself-in-syria-suicide-attack-was-from-south-florida-official-says/2014/05/30/03869b6e-e7f4-11e3-a86b-362fd5443d19_story.html (accessed September 17, 2014).
16. Adam Goldman, "Ohio Man Who Trained with Jabhat al-Nusra Is Indicted on Terrorism Charges," *The Washington Post*, April 16, 2015, http://www.washingtonpost.com/world/national-security/ohio-man-who-trained-with-jabhat-al-nusra-is-indicted-on-terrorism-charges/2015/04/16/8e8ded08-e455-11e4-b510-962fcfabc310_story.html (accessed June 26, 2015).
17. Evan Perez and Tom LoBianco, "FBI Head: Khorasan Group Diminished; ISIS Bigger Threat than al Qaeda," CNN, July 23, 2015, http://www.cnn.com/2015/07/22/politics/fbi-james-comey-isis-khorasan-group/ (accessed August 8, 2016).
18. Eric Schmitt and Ben Hubbard, "Suicide Bomber in Syria Was U.S. Citizen, Officials Say," *The New York Times*, May 28, 2014, http://www.nytimes.com/2014/05/29/world/middleeast/us-citizen-in-suicide-act-in-syria-officials-say.html (accessed September 17, 2014).
19. Sari Horwitz, "Eric Holder Urges European Countries to Help Stop Flow of Radicals to Syria," *The Washington Post*, July 8, 2014, http://www.washingtonpost.com/world/national-security/eric-holder-urges-european-states-to-help-stop-flow-of-radicals-to-syria/2014/07/08/b50d01ae-0692-11e4-8a6a-19355c7e870a_story.html (accessed September 17, 2014).
20. U.S. Department of State, *Country Reports on Terrorism 2015*.
21. William Maclean, "Local Wars Blur al-Qaeda's Threat to West," Reuters, July 5, 2012, http://uk.reuters.com/article/2012/07/05/uk-security-qaeda-idUKBRE86408B20120705 (accessed September 17, 2014).

22. James R. Clapper, Director of National Intelligence, "Statement for the Record: Worldwide Threat Assessment of the US Intelligence Community, Senate Armed Services Committee," February 9, 2016, p. 4, https://www.dni.gov/files/documents/SASC_Unclassified_2016_ATA_SFR_FINAL.pdf (accessed August 8, 2016). Cited hereafter as 2016 WWTA.
23. Rebecca Leung, "Hezbollah: 'A-Team of Terrorists,'" CBS News, April 18, 2003, http://www.cbsnews.com/news/hezbollah-a-team-of-terrorists/ (accessed November 10, 2014).
24. Suzanne Kelly, "Experts: Hezbollah Positioned for Attack in U.S.," CNN, March 21, 2012, http://security.blogs.cnn.com/2012/03/21/house-panel-hears-testimony-on-hezbollah-in-u-s/ (accessed September 17, 2014).
25. 2016 WWTA, p. 6.
26. National Air and Space Intelligence Center, "Ballistic and Cruise Missile Threat," July 11, 2013, p. 3, http://www.afisr.af.mil/shared/media/document/AFD-130710-054.pdf (accessed September 17, 2014).
27. U.S. Department of Defense, unclassified "Annual Report on Military Power of Iran: Executive Summary," January 2014, http://freebeacon.com/wp-content/uploads/2014/07/Iranmilitary.pdf (accessed August 8, 2016).
28. 2016 WWTA, p. 8.
29. Saeed Ghasseminejad, "Iran Doubles Down on Its Military Budget," Foundation for Defense of Democracies *Policy Brief*, June 3, 2016, http://www.defenddemocracy.org/media-hit/saeed-ghasseminejad-iran-doubles-down-on-its-military-budget/ (accessed August 8, 2016).
30. Reuters, "Iran Says Russia Delivers First Part of S-300 Defense System," April 11, 2016, http://www.reuters.com/article/us-russia-iran-arms-idUSKCN0X80MM?elqTrackId=e02d5aca6d48418984d902ced0c33d77&elq=39fecef381094e0cbc6de535feb74a3c&elqaid=17334&elqat=1&elqCampaignId=10743 (accessed August 8, 2016).
31. Farzin Nadimi, "Iran and Russia's Growing Defense Ties," Washington Institute for Near East Policy, *PolicyWatch* No. 2563, February 18, 2016, http://www.washingtoninstitute.org/policy-analysis/view/iran-and-russias-growing-defense-ties (accessed August 8, 2016).
32. Sam Dagher and Asa Fitch, "Iran Expands Role in Syria in Conjunction with Russia's Airstrikes," *The Wall Street Journal*, October 2, 2015, http://www.wsj.com/articles/iran-expands-role-in-syria-in-conjunction-with-russias-airstrikes-1443811030 (accessed August 8, 2016).
33. Nuclear Threat Initiative, Country Profiles, "Iran: Missile," last updated July 2014, http://www.nti.org/country-profiles/iran/delivery-systems/ (accessed September 17, 2014).
34. Ibid.
35. Lieutenant General Michael T. Flynn, Director, Defense Intelligence Agency, "Annual Threat Assessment: Statement Before the Senate Armed Services Committee," February 11, 2014, p. 20, http://www.dia.mil/Portals/27/Documents/News/2014_DIA_SFR_SASC_ATA_FINAL.pdf (accessed September 17, 2014).
36. Tim Hume and Alireza Hajihosseini, "Iran Fires Ballistic Missiles a Day After Test; U.S. Officials Hint at Violation," CNN, March 9, 2016, http://www.cnn.com/2016/03/09/middleeast/iran-missile-test/ (accessed August 8, 2016).
37. See James Phillips, "Iran's Nuclear Program: What Is Known and Unknown," Heritage Foundation *Backgrounder* No. 2393, March 26, 2010, http://www.heritage.org/research/reports/2010/03/iran-s-nuclear-program-what-is-known-and-unknown.
38. Valerie Lincy and Gary Milhollin, "Iran's Nuclear Timetable," Wisconsin Project for Nuclear Arms Control, *Iran Watch*, June 17, 2015, http://www.iranwatch.org/our-publications/articles-reports/irans-nuclear-timetable (accessed September 17, 2014).
39. News release, "Statement by the President on Iran," The White House, July 14, 2015, https://www.whitehouse.gov/the-press-office/2015/07/14/statement-president-iran (accessed September 21, 2014).
40. Christopher M. Blanchard, "Saudi Arabia: Background and U.S. Relations," Congressional Research Service *Report for Members and Committees of Congress*, April 22, 2016, p. 20, https://www.fas.org/sgp/crs/mideast/RL33533.pdf (accessed August 8, 2016).
41. Kenneth Katzman, "Iran, Gulf Security, and U.S. Policy," Congressional Research Service *Report for Members and Committees of Congress*, March 30, 2016, p. 24, https://www.fas.org/sgp/crs/mideast/RL32048.pdf (accessed August 8, 2016).
42. 2016 WWTA, p. 24.
43. Ibid., p. 8.
44. Avi Issacharoff, "Israel Raises Hezbollah Rocket Estimate to 150,000," *The Times of Israel*, November 12, 2015, http://www.timesofisrael.com/israel-raises-hezbollah-rocket-estimate-to-150000/ (accessed August 8, 2016).
45. Israel Defense Forces, "Rocket Attacks on Israel from Gaza," IDF Blog, http://www.idfblog.com/facts-figures/rocket-attacks-toward-israel/ (accessed September 17, 2014).

46. Matthew Levitt, "Hezbollah Finances: Funding the Party of God," Washington Institute for Near East Policy, February 2005, p. 3, http://www.washingtoninstitute.org/policy-analysis/view/hezbollah-finances-funding-the-party-of-god (accessed September 17, 2014).
47. James Phillips, "Hezbollah's Terrorist Threat to the European Union," testimony before the Subcommittee on Europe, Committee on Foreign Affairs, U.S. House of Representatives, June 20, 2007, http://www.heritage.org/research/testimony/hezbollahs-terrorist-threat-to-the-european-union.
48. Matthew Levitt, "Inside Hezbollah's European Plots," Washington Institute for Near East Policy, July 20, 2015, https://www.washingtoninstitute.org/policy-analysis/view/inside-hezbollahs-european-plots (accessed September 22, 2015).
49. 2016 WWTA, p. 6.
50. "Address at the Lord Mayor's Annual Defence and Security Lecture by the Director General of the Security Service, Jonathan Evans," London, MI5 Security Service, June 25, 2012, https://www.mi5.gov.uk/home/about-us/who-we-are/staff-and-management/director-general/speeches-by-the-director-general/the-olympics-and-beyond.html (accessed September 17, 2014).
51. 2016 WWTA, p. 4.
52. James Phillips, "Zarqawi's Amman Bombings: Jordan's 9/11," Heritage Foundation *WebMemo* No. 919, November 18, 2005, http://www.heritage.org/research/reports/2005/11/zarqawis-amman-bombings-jordans-9-11.
53. 2016 WWTA, p. 25.
54. Middle East Media Research Institute, "Former IRGC General Close to Supreme Leader Khamenei: 'Bahrain Is a Province of Iran That Should Be Annexed to [It],'" Special Dispatch No. 6358, March 23, 2016, http://www.memri.org/report/en/0/0/0/0/0/0/9090.htm (accessed August 8, 2016).
55. Maayan Groisman, "Iranian Commander Threatens to Make Bahrain's Royal Family 'Disappear'," *The Jerusalem Post*, June 21, 2016, http://www.jpost.com/Middle-East/Iran-News/Iranian-Quds-Force-commander-threatens-to-make-Bahrains-royal-family-disappear-457354 (accessed August 8, 2016).
56. 2016 WWTA, p. 24.
57. U.S. Department of Energy, Energy Information Administration, "World Oil Transit Chokepoints," last updated November 10, 2014, http://www.eia.gov/beta/international/analysis_includes/special_topics/World_Oil_Transit_Chokepoints/wotc.pdf (accessed August 8, 2016).
58. Thom Shanker, "Rice Dismisses Iranian Cleric's Warning on Oil," *The New York Times*, June 5, 2006, http://www.nytimes.com/2006/06/05/world/middleeast/05diplo.html?_r=0 (accessed September 17, 2014).
59. Robert Hewson, "Iran Ready to Field Maritime Cruise Missile," *Jane's Defence Weekly*, February 24, 2004, p. 13.
60. Michael Knights, *Troubled Waters: Future U.S. Security Assistance in the Persian Gulf* (Washington: Washington Institute for Near East Policy, 2006), p. 71, http://www.washingtoninstitute.org/uploads/Documents/pubs/TroubledWaters.pdf.pdf (accessed August 8, 2016).
61. Asa Fitch, "Iranian Authorities Release Maersk Tigris," *The Wall Street Journal*, May 7, 2015, http://www.wsj.com/articles/iranian-authorities-release-maersk-tigris-1430991500 (accessed June 26, 2015).
62. ASC Staff, "Iran Attack: Alpine Eternity Moved to Dubai Drydocks," Arabian Supply Chain.com, May 26, 2015, http://www.arabiansupplychain.com/article-11359-iran-attack-alpine-eternity-moved-to-dubai-drydocks/ (accessed June 26, 2015).
63. James Phillips, "The Dangerous Regional Implications of the Iran Nuclear Agreement," Heritage Foundation *Backgrounder* No. 3124, May 9, 2016, http://www.heritage.org/research/reports/2016/05/the-dangerous-regional-implications-of-the-iran-nuclear-agreement.
64. Niklas Anziger, "Jihad at Sea—Al Qaeda's Maritime Front in Yemen," Center for International Maritime Security, February 25, 2014, http://cimsec.org/jihad-sea-yemen-al-qaedas-new-frontier (accessed September 17, 2014).
65. Steven Starr, "Attacks in the Suez: Security of the Canal at Risk?" Combating Terrorism Center at West Point, *CTC Sentinel*, Vol. 7, Issue 1 (January 15, 2014), https://www.ctc.usma.edu/posts/attacks-in-the-suez-security-of-the-canal-at-risk (accessed August 8, 2016).
66. Noah Rayman, "Did 2013 Mark the End of Somali Piracy?" *Time*, January 6, 2014, http://world.time.com/2014/01/06/did-2013-mark-the-end-of-somali-piracy/ (accessed September 17, 2014).
67. Thomas Bennett, "Maritime Security at a Crossroads," *The Maritime Executive*, April 26, 2015, http://www.maritime-executive.com/features/maritime-security-at-a-crossroads (accessed May 28, 2015).
68. Scott Stewart, "The Continuing Threat of Libyan Missiles," Stratfor Global Intelligence, *Security Weekly*, May 3, 2012, http://www.stratfor.com/weekly/continuing-threat-libyan-missiles#axzz39ABWqV00 (accessed September 17, 2014).

69. David Ignatius, "Libyan Missiles on the Loose," *The Washington Post*, May 8, 2012, http://www.washingtonpost.com/opinions/libyan-missiles-on-the-loose/2012/05/08/gIQA1FCUBU_story.html (accessed September 17, 2014).
70. Matt Schroeder, "New Information on Somali MANPADS," Federation of American Scientists, July 27, 2007, http://fas.org/2007/07/new-information-on-somali-manpads/ (accessed September 17, 2014).
71. Nuclear Threat Initiative, "Iran: Missile," p. 4.
72. Viola Gienger and Tony Capaccio, "Iran May Have Missiles from North Korea, Cables Posted by Wikileaks Show," Bloomberg, November 29, 2010, http://www.bloomberg.com/news/2010-11-29/iran-may-have-missiles-from-north-korea-cables-posted-by-wikileaks-show.html (accessed September 17, 2014).
73. Lateef Mungin, "Iran Claims 2nd Launch of Monkey into Space and Back," CNN, December 14, 2013, http://www.cnn.com/2013/12/14/world/meast/iran-monkey-space/ (accessed September 17, 2014).
74. Nasser Karimi, "Iran Says It Sets up Space Monitoring Center," Associated Press, June 9, 2013, http://news.yahoo.com/iran-says-sets-space-monitoring-center-072742942.html (accessed September 17, 2014).
75. Ilan Berman, "The Iranian Cyber Threat, Revisited," Statement before the Subcommittee on Cybersecurity, Infrastructure Protection, and Security Technologies, Committee on Homeland Security, U.S. House of Representatives, March 20, 2013, http://docs.house.gov/meetings/HM/HM08/20130320/100523/HHRG-113-HM08-Wstate-BermanI-20130320.pdf (accessed September 17, 2014).
76. Nart Villeneuve, Ned Moran, Thoufique Haq, and Mike Scott, "Operation Saffron Rose 2013," FireEye *Special Report*, 2014, http://www.fireeye.com/resources/pdfs/fireeye-operation-saffron-rose.pdf (accessed September 17, 2014).
77. Siobhan Gorman and Julian E. Barnes, "Iran Blamed for Cyberattacks," *The Wall Street Journal*, October 12, 2012, http://online.wsj.com/news/articles/SB10000872396390444657804578052931555576700?mg=reno64-wsj (accessed September 17, 2014).
78. Frederick W. Kagan and Tommy Stiansen, *The Growing Cyberthreat from Iran: The Initial Report of Project Pistachio Harvest*, American Enterprise Institute Critical Threats Project and Norse Corporation, April 17, 2015, https://www.aei.org/publication/growing-cyberthreat-from-iran/ (accessed May 28, 2015).
79. Berman, "The Iranian Cyber Threat, Revisited," p. 3.
80. Anthony Capaccio, David Lerman, and Chris Strohm, "Iran Behind Cyber-Attack on Adelson's Sands Corp., Clapper Says," Bloomberg Business, February 26, 2015, http://www.bloomberg.com/news/articles/2015-02-26/iran-behind-cyber-attack-on-adelson-s-sands-corp-clapper-says (accessed June 26, 2015).
81. Christopher Bronk and Eneken Tikk-Ringas, "The Cyber Attack on Saudi Aramco," International Institute for Strategic Studies, *Survival: Global Politics and Strategy*, Vol. 55, No. 2 (April/May 2013), pp. 81–96, http://www.iiss.org/en/publications/survival/sections/2013-94b0/survival--global-politics-and-strategy-april-may-2013-b2cc/55-2-08-bronk-and-tikk-ringas-e272 (accessed June 19, 2014); Saudi Aramco, "Our Company," http://www.saudiaramco.com/content/www/en/home.html#our-company%257C%252Fen%252Fhome%252Four-company%252Fat-a-glance.baseajax.html (accessed June 19, 2014).
82. David E. Sanger and Nicole Perlroth, "Iranian Hackers Attack State Dept. via Social Media Accounts," *The New York Times*, November 24, 2015, http://www.nytimes.com/2015/11/25/world/middleeast/iran-hackers-cyberespionage-state-department-social-media.html?_r=0 (accessed August 8, 2016).
83. Ellen Nakashima and Matt Zapotosky, "U.S. Charges Iran-Linked Hackers with Targeting Banks, N.Y. Dam," *The Washington Post*, March 24, 2016, https://www.washingtonpost.com/world/national-security/justice-department-to-unseal-indictment-against-hackers-linked-to-iranian-goverment/2016/03/24/9b3797d2-f17b-11e5-a61f-e9c95c06edca_story.html (accessed August 8, 2016).
84. David E. Sanger, "Iran Hackers Dangle a Familiar Name to Fish for Data," *The New York Times*, May 30, 2014, http://www.nytimes.com/2014/05/31/world/middleeast/iran-hackers-dangle-a-familiar-name-to-fish-for-data.html?_r=2 (accessed September 17, 2014).
85. James R. Clapper, Director of National Intelligence, "Statement for the Record: Worldwide Threat Assessment of the US Intelligence Community, Senate Armed Services Committee," February 26, 2015, p. 3, http://www.armed-services.senate.gov/imo/media/doc/Clapper_02-26-15.pdf (accessed August 8, 2016).

86. International Institute for Strategic Studies, *The Military Balance 2016: The Annual Assessment of Global Military Capabilities and Defence Economics* (London: Routledge, 2016), pp. 327–331.

87. This *Index* scores threat capability as it relates to the vital national interests of the U.S. and the role and utility of U.S. military forces. Terrorist groups clearly have the ability to conduct attacks using improvised explosives, firearms, and even hijacked airplanes. The bombing of the Boston Marathon in April 2013, an attempted car bomb attack in New York City's Times Square in May 2010, and al-Qaeda's attacks on September 11, 2001, are stark examples. Often, the U.S. has handled terrorism as a law enforcement and intelligence collection matter, especially within the United States and when it presents a threat to particular U.S. interests in other countries. Compared to the types of threats posed by states such as China or Russia, terrorism is a lesser sort of threat to the security and viability of the U.S. as a global power. This *Index* does not dismiss the deaths, injuries, and damage that terrorists can inflict on Americans at home and abroad; it places the threat posed by terrorism in context with substantial threats to the U.S. homeland, the potential for major regional conflict, and the potential to deny U.S. access to the global commons. With this in mind, terrorist groups seldom have the physical ability either to accomplish the extreme objectives they state or to present a physical threat that rises to a level that threatens U.S. vital security interests. Of course, terrorist organizations can commit acts of war on a continuing basis, as reflected in their conduct in the war against al-Qaeda and its associates in which the United States has been engaged for more than a decade.

Asia

Threats to the Homeland

Threats to the homeland include both terrorist threats from non-state actors resident in ungoverned areas of South Asia and an active, developing ballistic missile threat from North Korea and credible Chinese nuclear missile capability to support other elements of China's national power.

Terrorism Originating from Afghanistan and Pakistan (AfPak). Terrorist groups operating from Pakistan and Afghanistan continue to pose a direct threat to the U.S. homeland. Pakistan is home to a host of terrorist groups that keep the region unstable and contribute to the spread of global terrorism. The killing of Osama bin Laden at his hideout in Abbottabad, Pakistan, in May 2011 and an intensive drone campaign in Pakistan's tribal areas bordering Afghanistan from 2010–2012 have helped to degrade the al-Qaeda threat. However, the presence of a major al-Qaeda training camp in southern Afghanistan that the U.S. and Afghan forces destroyed last October demonstrates that the international terrorist organization has the ability to regenerate, particularly in areas where the Taliban is influential. A joint U.S.–Afghan military operation involving 200 U.S. Special Operations Forces destroyed the al-Qaeda camp located in Kandahar province, killing 160 terrorists.[1]

In addition to al-Qaeda, several other like-minded terrorist groups still thrive along the Afghanistan–Pakistan border, carry out regular attacks in Pakistan and Afghanistan, and target U.S. interests in the region and beyond. The Afghan Taliban and its allies, headquartered in Pakistan, have stepped up attacks against the Afghan National Security Forces (ANSF) over the past year and are making a push to regain territory in Afghanistan as international forces depart. As of April 2016, around 13,200 U.S. and NATO troops were in Afghanistan as part of Operation Resolute Support to train and advise the Afghan forces.

The Afghan Taliban control more territory now than at any other time in the past 14 years, and the group was able to capture the northern city of Kunduz temporarily last October. A Taliban resurgence in Afghanistan could allow al-Qaeda to regain ground in the region and pave the way for terrorist groups of all stripes to reestablish bases there.[2] Shortly after the fall of Kunduz, President Barack Obama reversed his earlier pledge to withdraw nearly all troops by the end of his term and said that the U.S. instead would keep a force level of 5,500 U.S. troops in the country when he departs office in January 2017. He later revised this further to say that he would keep 8,400 troops in place, with any further reductions up to his successor.[3]

ISIS also is seeking to make inroads into Pakistan and Afghanistan, but its efforts so far have met with only limited success. This is most likely due to al-Qaeda's well-established roots in the region, ability to maintain the loyalty of the various South Asian terrorist groups, and careful nurturing of its relationship with the Afghan Taliban. The Afghan Taliban view ISIS as a direct competitor, vying for financial resources, recruits, and ideological influence. This competition was evident in a letter sent by the Taliban to ISIS leader al-Baghdadi in June of 2015, urging the group

not to take actions that could lead to "division of the Mujahideen's command." There also have been reports of clashes between ISIS militants and the Taliban in eastern and southern Afghanistan.

A spokesman for the U.S.-led coalition in Afghanistan said in April 2016 that ISIS has the potential to be an "enormous" threat in Afghanistan, but its presence has declined since the beginning of 2016.[4] According to the U.S. official, the U.S. carried out between 70 and 80 air strikes against ISIS targets in Afghanistan from January–March 2016. He also attributed ISIS's waning footprint to Taliban attacks, local uprisings, and Afghan security force operations.

Pakistan's continued support for terrorist groups that have links to al-Qaeda undermines U.S. counterterrorism goals in the region. Pakistan's military and intelligence leaders maintain a short-term tactical approach of fighting some terrorist groups that are deemed to be a threat to the state while supporting others that are aligned with Pakistan's goal of extending its influence and curbing India's.

A terrorist attack on a school in Peshawar on December 16, 2014, that killed over 150 people, mostly children, shocked the Pakistani public and prompted the government led by Prime Minister Nawaz Sharif to introduce a National Action Plan (NAP) to reinvigorate the country's fight against terrorism. The action plan includes steps like lifting the moratorium on the death penalty for terrorists, establishing special military courts to try terrorists, curbing the spread of extremist literature and propaganda on social media, freezing the assets of terrorist organizations, and forming special committees, comprised of army and political leaders, in the provinces to implement the NAP.

Implementation of the NAP and the Pakistani military's operations against TTP hideouts in North Waziristan have helped to reduce Pakistan's internal terrorist threat to some degree. A Pakistani think tank reported earlier this year that terrorist attacks were down by 48 percent in 2015 from the previous year.[5] Nevertheless, the first few months of 2016 have seen major attacks in Pakistan. On January 20, militants stormed a university in the city of Charsadda in the northwest part of the country, killing at least 20 students and teachers. On March 27, Jamaat-ul-Ahrar, a splinter faction of the Pakistani Taliban, carried a suicide attack at a popular park in Lahore. The attack was targeted at Christian families celebrating the Easter holiday, but most of the victims were Muslim, and about half of the 72 killed were children.

There are few signs that Pakistan's crackdown on terrorism extends to groups that target India, such as the Lashkar-e-Taiba (LeT), which was responsible for the 2008 Mumbai attacks, and the Jaish-e-Mohammed (JeM), which carried out an attack on the Indian airbase at Pathankot on January 2, 2016. In early April 2015, Pakistan released on bail the mastermind of the Mumbai attacks, Zakiur Rehman Lakhvi, who had been in Pakistani custody since 2009. The day before Lakhvi's release, the U.S. Department of State had announced approval of nearly $1 billion in U.S. military sales to Pakistan.

In April 2012, the U.S. issued a $10 million reward for information leading to the arrest or conviction of LeT founder Hafez Muhammad Saeed. The LeT has engaged in recruitment and fundraising activities in the U.S. In September 2011, for instance, U.S. authorities arrested Jubair Ahmad, an American permanent resident born in Pakistan, for providing material support to the LeT by producing LeT propaganda and uploading it to the Internet. Ahmad reportedly attended an LeT training camp in Pakistan before moving to the U.S. in 2007.[6]

The U.S. trial of Pakistani American David Coleman Headley, who was arrested in Chicago in 2009 for his involvement in the 2008 Mumbai attacks, led to striking revelations about the LeT's international reach and close connections to Pakistani intelligence. Headley had traveled frequently to Pakistan, where he received terrorist training from the LeT,

and to India, where he scouted the sites of the Mumbai attacks. In four days of testimony and cross-examination, Headley provided details about his meetings with a Pakistani intelligence officer, a former army major, and a navy frogman who were among the key players in orchestrating the Mumbai assault.[7]

The possibility that terrorists could gain effective access to Pakistani nuclear weapons is contingent on a complex chain of circumstances. In terms of consequence, however, it is the most dangerous regional threat scenario. Concern about the safety and security of Pakistan's nuclear weapons increases when Indo–Pakistani tensions increase. For example, during the 1999 Kargil crisis, U.S. intelligence indicated that Pakistan had made "nuclear preparations," which spurred greater U.S. diplomatic involvement in defusing the crisis.[8]

If Pakistan were to move around its nuclear assets or, worse, take steps to mate weapons with delivery systems, the chances for terrorist theft or infiltration would increase. Increased reliance on tactical nuclear weapons (TNWs) is of particular concern because launch authorities for TNWs are typically delegated to lower-tier field commanders far from the central authority in Islamabad. Another concern is the possibility for miscalculations leading to regional nuclear war if top Indian leaders were to lose confidence that nuclear weapons in Pakistan are under government control or, conversely, assume they were under Pakistani government control after they ceased to be.

There is concern that Islamist extremist groups with links to the Pakistan security establishment could exploit those links to gain access to nuclear weapons technology, facilities, and/or materials. The realization that Osama bin Laden stayed for six years within a half-mile of Pakistan's premier defense academy has fueled concern that al-Qaeda can operate relatively freely in parts of Pakistan and might eventually gain access to Pakistan's nuclear arsenal. A Harvard University Belfer Center for Science and International Affairs study noted in 2010 that Pakistan's stockpile "faces a greater threat from Islamic extremists seeking nuclear weapons than any other stockpile on earth."[9]

There is the additional, though less likely, scenario of extremists gaining access through a collapse of the state. While Pakistan remains unstable because of its weak economy, regular terrorist attacks, sectarian violence, civil–military tensions, and the growing influence of religious extremist groups, it is unlikely that the Pakistani state will collapse altogether. The country's most powerful institution, the 550,000-strong army, which has ruled Pakistan for almost half of its existence, would almost certainly intervene and take charge once again if the political situation began to unravel.[10] The potential breakup of the Pakistani state would have to be preceded by the disintegration of the army, which currently is not plausible.[11]

WWTA: Although the WWTA assesses that "fighting in 2016 will be more intense than 2015" and will "continue to threaten US personnel, our Allies, and international partners—including Afghans—particularly in Kabul and other urban population centers," it does not reference any threat to the homeland from AfPak-based terrorism. It does note, however, that despite the degradation of al-Qaeda's leadership in Afghanistan and Pakistan, al-Qaeda "nodes" there are "dedicating resources to planning attacks." It also says that the Khorasan branch of ISIS in South Asia "will probably remain a low-level threat to Afghan stability as well as to US and Western interests in the region in 2016."[12]

Summary: The threat to the American homeland emanating from Afghanistan and Pakistan is diverse, complex, and mostly indirect and largely involves non-state actors. The intentions of non-state terrorist groups like the TTP, al-Qaeda, and ISIS toward the U.S. are demonstrably hostile. Despite the broad and deep U.S. relationships with Pakistan's governing elites and military, however, it is likely that the political–military interplay in Pakistan and instability in Afghanistan will

SOURCES: Missilethreat.com, "Ballistic Missiles;" Reuters, "North Korea Missiles Could Reach US, Says South," NBC News, December 23, 2012; and John Schilling, "Where's That North Korean ICBM Everyone Was Talking About?" 38 North, March 12, 2015, http://38north.org/2015/03/jschilling031215/ (accessed August 24, 2015).

continue to result in an active threat to the American homeland.

Missile Threat: North Korea and China. The two sources of the ballistic missile threat to the U.S. are very different in terms of their sophistication and integration into broader strategies for achieving national goals. The threats from North Korea and China are therefore very different in nature.

North Korea. In December 2012 and February 2016, North Korea successfully put a satellite into orbit. The same technology that launches satellites can be used to build intercontinental ballistic missiles (ICBMs). North Korea conducted its third and fourth nuclear tests in 2013 and 2016. These events clearly signaled that new leader Kim Jong-un had no intention either of resuming North Korea's Six-Party Talks pledge to denuclearize or of abiding by U.N. resolutions that require a cessation of Pyongyang's nuclear and missile programs. Instead, Kim Jong-un would continue North Korea's decades-long quest to develop nuclear weapons and the means to deliver them.

North Korea has declared that it already has a full nuclear strike capability, even altering its constitution to enshrine itself as a nuclear-armed state.[13] Among North Korea's many direct verbal threats to the U.S., the regime warned in March 2016 that it would "reduce all bases and strongholds of the U.S. and south Korean warmongers for provocation and aggression into ashes in a moment, without giving them any breathing spell."[14]

The United States and South Korea have revised their estimates and now see a more dire North Korean threat. After recovering components of the ICBM launched by North Korea in December 2012, South Korea assessed that it had "a range of more than 10,000 kilometers."[15] U.S. Vice Chairman of the Joint Chiefs of Staff Admiral James A. Winnefeld, Jr., attested to the North Korean missile threat in March 2013 when he stated, "We believe the KN-08 [North Korean long-range missile] probably does have the range to reach the United States."[16]

In April 2015, General Curtis Scaparrotti, commander of U.S. Forces Korea, testified that he believes the North Koreans "have had time and capability to miniaturize a nuclear warhead. They have stated that they had had intercontinental missiles and they had a nuclear capability, and they paraded it. As a commander, I think, we must assume that they have that capability."[17] Admiral Bill Gortney, commander of the North American Aerospace Defense Command, similarly told reporters that the KN-08 road-mobile ICBM "is operational today. Our assessment is that they have the ability to put a nuclear weapon on a KN-08 and shoot it at the [U.S.] homeland."[18] North Korea has also had some very limited success with tests of submarine-launched ballistic missiles (SLBMs), of which there have been at least five since May 2015, including successful ejection and, most recently, sending a missile 30 kilometers down range.[19]

According to press reports, U.S. experts concluded that the recovered North Korean missile provided "tangible proof that North Korea was building the missile's cone at dimensions for a nuclear warhead, durable enough to be placed on a long-range missile that could re-enter the earth's atmosphere from space."[20]

China. Chinese nuclear forces are the responsibility of the People's Liberation Army (PLA) Rocket Forces (PLARF), one of the three new services created on December 31, 2015. China's nuclear ballistic missile forces include land-based missiles with a range of 13,000 kilometers that can reach the U.S. (CSS-4) and submarine-based missiles that can reach the U.S. when the submarine is deployed within missile range.

The PRC became a nuclear power in 1964 when it exploded its first atomic bomb as part of its "two bombs, one satellite" effort. In quick succession, China then exploded its first thermonuclear bomb in 1967 and orbited its first satellite in 1970, demonstrating the capability to build a delivery system that can reach the ends of the Earth. China chose to

rely primarily on a land-based nuclear deterrent rather than developing two or three different basing systems as the United States did.

Furthermore, unlike the United States or the Soviet Union, China chose to pursue only a minimal nuclear deterrent. The PRC fielded only a small number of nuclear weapons, with estimates of about 100–150 weapons on medium-range ballistic missiles and about 60 ICBMs. Its only ballistic missile submarine (SSBN) conducted relatively few deterrence patrols (perhaps none),[21] and its first-generation SLBM, the JL-1 (if it ever attained full operational capability), had limited reach. The JL-1's 1,700-kilometer range makes it comparable to the first-generation Polaris A1 missile the U.S. fielded in the 1960s.

While China's nuclear force remained stable for several decades, it has been part of the modernization effort of the past 20 years. The result has been modernization and some expansion of the Chinese nuclear deterrent. The core of China's ICBM force is the DF-31 series, a solid-fueled, road-mobile system, along with a growing number of longer-range DF-41 missiles (also rail mobile) that may be in the PLA operational inventory. The DF-41 may be deployed with multiple independently targetable reentry vehicles (MIRVs). China's medium-range nuclear forces have similarly shifted to mobile, solid-rocket systems so that they are both more survivable and more easily maintained.

Notably, the Chinese are expanding their ballistic missile submarine fleet. Replacing the one Type 092 Xia-class SSBN are several Type 094 Jin-class SSBNs, four of which are already operational. These are expected to be equipped with the new, longer-range JL-2 SLBM. Such a system would provide the PRC with a "secure second-strike" capability, substantially enhancing China's nuclear deterrent. There is also some possibility that the Chinese nuclear arsenal now contains land-attack cruise missiles. The CJ-20, a long-range, air-launched cruise missile carried on China's H-6 bomber, may be nuclear tipped, although there is not much evidence that China has pursued such a capability at this time. China is also believed to be working on a cruise missile submarine, which, if equipped with nuclear cruise missiles, would further expand the range of nuclear attack options.[22]

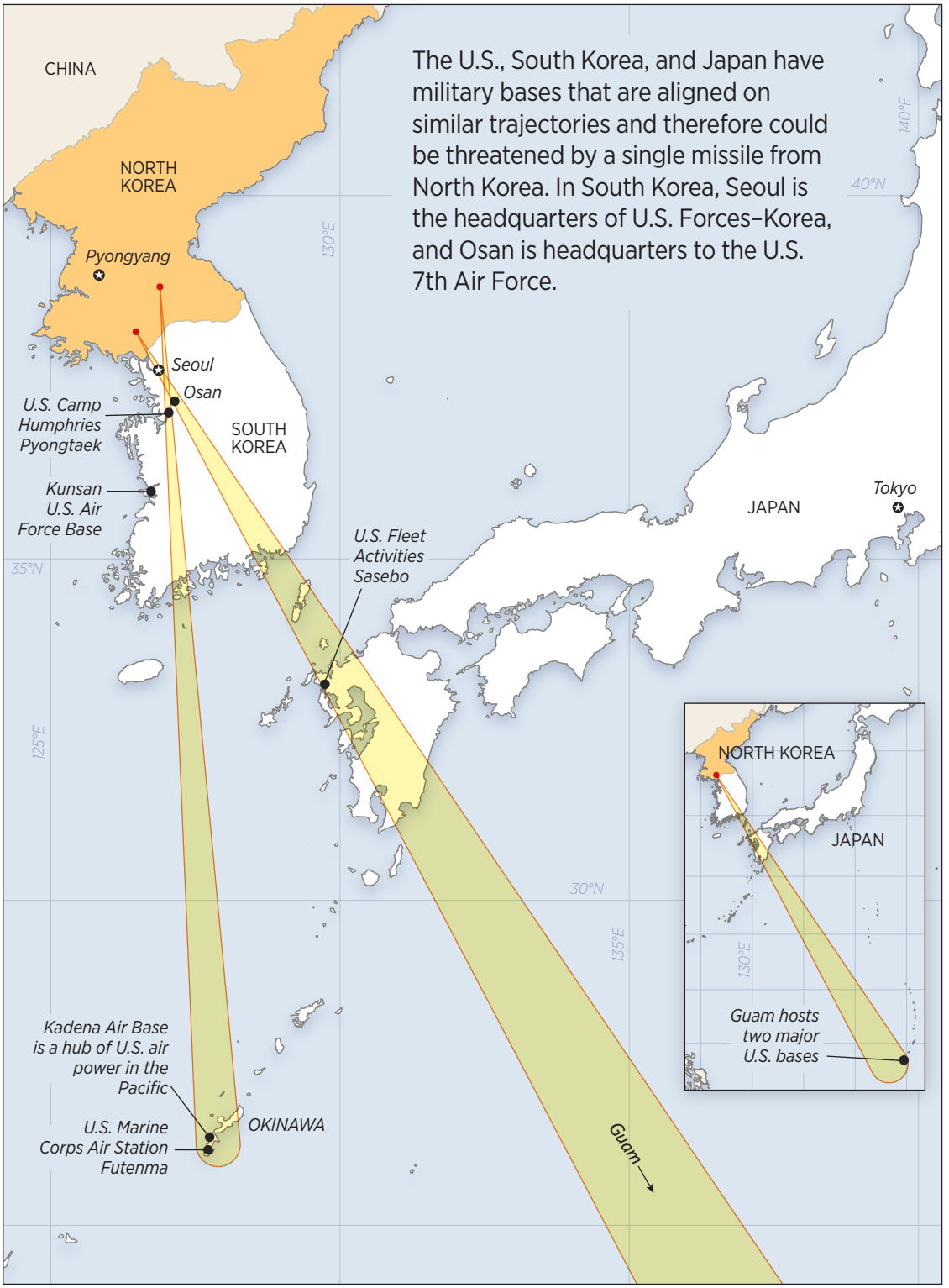
As a result of its modernization efforts, China's nuclear forces appear to be shifting from a minimal deterrent posture (one suited only to responding to an attack, and even then with only limited numbers) to a more robust but still limited deterrent posture. While the PRC will still likely field fewer nuclear weapons than either the United States or Russia, it will field a more modern and diverse set of capabilities than India or Pakistan (or North Korea), its nuclear-armed neighbors. If there are corresponding changes in doctrine, modernization will enable China to engage in limited nuclear options in the event of a conflict.

WWTA: The WWTA assesses that China "continues to modernize its nuclear missile force by adding more survivable road-mobile systems and enhancing its silo-based systems. This new generation of missiles is intended to ensure the viability of China's strategic deterrent by providing a second-strike capability."[23] The 2015 WWTA noted that China was likely to begin seaborne nuclear deterrence patrols in the near future but offered no judgment on the degree of threat that it poses to the U.S. The 2016 edition does not make this observation.

The WWTA classifies North Korea's nuclear weapons and missile programs as a "serious threat to US interests and to the security environment in East Asia." It also reports that North Korea is "committed to developing a long-range, nuclear-armed missile that is capable of posing a direct threat to the United States" and has "publicly displayed its KN08 road-mobile ICBM on multiple occasions. We assess that North Korea has already taken initial steps toward fielding this system, although the system has not been flight-tested." The WWTA further states the Director of National Intelligence's long-held assessment that North Korea's "nuclear capabilities are

MAP 9

U.S. and Allied Military Bases Align Geographically



SOURCE: Heritage Foundation research.

heritage.org

intended for deterrence, international prestige, and coercive diplomacy."[24]

Summary: The respective missile threats to the American homeland from North Korea and China are very different. China has many more nuclear weapons, multiple demonstrated and tested means of delivery, and more mature systems, but it is a more stable actor with a variety of interests, including relations with the United States and the international system. North Korea has fewer weapons and questionable means of delivery, but it is less stable and less predictable, with a vastly lower stake in the international system. There is also a widely acknowledged difference in intentions: China seeks a stable second-strike capability and, unlike North Korea, is not actively and directly threatening the United States.

Threat of Regional War

America's forward-deployed military at bases throughout the Western Pacific, five treaty allies, security partners in Taiwan and Singapore, and growing security partnership with India are keys to the U.S. strategic footprint in Asia. One of its critical allies, South Korea, is under active threat of invasion from the North. Taiwan is under a long-standing, well-equipped, and purposely positioned military threat from China. Japan and the Philippines, by virtue of maritime territorial disputes, are under growing paramilitary, military, and political pressure from China.

In South Asia, India is geographically positioned between two major security threats: Pakistan to its west and China to its northeast. From Pakistan, India faces the additional threat of terrorism, whether state-enabled or carried out without state knowledge or control.

North Korean Attack on American Bases/Allies. North Korea's conventional and nuclear missile forces threaten U.S. bases in South Korea, Japan, and Guam.

Beyond its nuclear weapons programs, North Korea poses additional risks to its neighbors. North Korea has an extensive ballistic missile force. Pyongyang has deployed approximately 800 Scud short-range tactical ballistic missiles, 300 No-dong medium-range missiles, and 50 Musudan intermediate-range ballistic missiles. The Scud missiles threaten South Korea, the No-dong can target all of Japan and South Korea, and the Musudan can hit U.S. bases on Okinawa and Guam. Pyongyang continues its development of the Taepo-dong series of ICBMs and the KN-08, which have a range sufficient to hit the continental U.S.[25]

North Korea has approximately 1 million people in its military, with reserves numbering several million more. Pyongyang has forward-deployed 70 percent of its ground forces within 90 miles of the Demilitarized Zone (DMZ), making it possible to attack with little or no warning, which is of particular concern because South Korea's capital, Seoul, is only 30 miles south of the DMZ.[26] In addition to three conventional corps alongside the DMZ, Pyongyang has deployed two mechanized corps, an armor corps, and an artillery corps.[27]

South Korea remains North Korea's principal target. In 2005, South Korea initiated a comprehensive defense reform strategy to transform its military into a smaller but more capable force to deal with the North Korean threat. Overall, South Korean military manpower would be reduced approximately 25 percent, from 681,000 to 500,000. The army would face the largest cuts, disbanding four corps and 23 divisions and cutting troops from 560,000 in 2004 to 370,000 in 2020. Seoul planned to compensate for decreased troop levels by procuring advanced fighter and surveillance aircraft, naval platforms, and ground combat vehicles.[28]

That North Korea's conventional forces are a very real threat to South Korea was clearly demonstrated by two deadly attacks on South Korea in 2010. In March, a North Korean submarine sank the South Korean naval corvette *Cheonan* in South Korean waters, killing 46 sailors. In November, North Korean artillery shelled Yeonpyeong Island, killing four South Koreans.

MAP 10

U.S. Forces Operate in Chinese Missile Envelope

NOTE: Although not shown, China also has the ability to strike targets within the continental United States with its inventory of intercontinental ballistic missiles (ICBMs) equipped with nuclear warheads. The CSS-3/DF-4, with a range of 5,400 km, can reach Alaska, while the DF-31A (11,000 km) and DF-5 (13,000 km) ICBMs can reach the entire U.S.
SOURCE: U.S. Department of Defense, Office of the Secretary of Defense, *Military and Security Developments Involving the People's Republic of China 2014*, April 24, 2014, p. 85, http://www.defense.gov/Portals/1/Documents/pubs/2014_DoD_China_Report.pdf (accessed January 13, 2015).

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Since the North Korean military is predominantly equipped with older ground force equipment, Pyongyang has prioritized deployment of strong asymmetric capabilities, including special operations forces, long-range artillery, and missiles. As noted, North Korea has deployed hundreds of Scud short-range ballistic missiles that can target all of South Korea with explosive, chemical, and biological warheads. The land and sea borders between North and South Korea remain unsettled, heavily armed, and actively subject to occasional, limited armed conflict.

Many experts have assessed that North Korea has developed several nuclear devices but does not yet have the ability to miniaturize a warhead or deliver it by missile. More recently, however, several studies have concluded that the North Korean nuclear threat is much greater than previously thought. For example, Dr. Siegfried Hecker, former director of the Los Alamos Nuclear Laboratory, concluded that North Korea could have 20 nuclear weapons by 2016.[29] A study published by the Korea Institute at Johns Hopkins University's Nitze School of Advanced International Studies predicted a worst-case scenario of Pyongyang's having 100 nuclear weapons by 2020.[30]

In any event, enough information is available to conclude that North Korea has likely already achieved the ability to deliver nuclear weapons by means of its No-dong medium-range missile.[31] Factors for such an assessment include the decades-long duration of North Korea's nuclear and missile programs; the technology, expertise, and components acquired from collaborative involvement with Pakistan, the A. Q. Khan network, and Iran; repeated instances of experts underestimating North Korean nuclear and missile capabilities; North Korea's declarations of its ability to hit the U.S. and its allies with nuclear weapons; and U.S. and South Korean government assessments of North Korean breakthroughs.

Press reports indicate that the CIA assessed that Pyongyang received a nuclear package from Pakistan, including detailed, step-by-step instructions to produce a Chinese-designed nuclear warhead that could be delivered by North Korea's No-dong missile.[32] Pakistani nuclear scientist A. Q. Khan reportedly stated that North Korea's nuclear weapons were "the perfect nuclear weapons, technologically more advanced than ours."[33] Khan described how, in return for Pakistani assistance to Pyongyang's centrifuge program, "North Korea would help Pakistan in fitting the nuclear warhead into the Ghauri missile."[34]

In March 2016, the National Defense Commission declared that it has a "military operation plan...to liberate south Korea and strike the U.S. mainland" and that "offensive means have been deployed to put major strike targets in the operation theaters of south Korea within the firing range and the powerful nuclear strike targeting the U.S. imperialist aggressor forces bases in the Asia-Pacific region and the U.S. mainland...."[35] In April 2013, U.S. officials told reporters that North Korea "can put a nuclear weapon on a missile, that they have missile-deliverable nuclear weapons, but not ones that can go more than 1,000 miles [1,609 kilometers]."[36]

WWTA: The WWTA calls North Korea's nuclear weapons and missile programs "a serious threat to...the security environment in East Asia." It also references North Korea's export of ballistic missiles and associated materials to several countries and assistance to Syria's construction of a nuclear reactor as illustrating "its willingness to proliferate dangerous technologies."[37] The WWTA warns that "despite efforts at diplomatic outreach, Kim continues to challenge the international community with provocative and threatening behavior in pursuit of his goals...."[38]

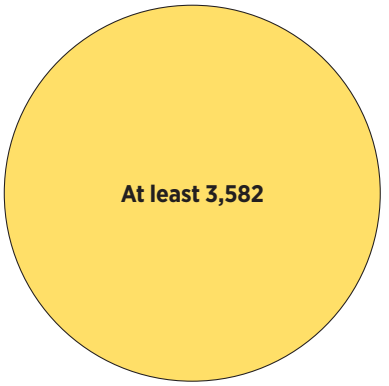
Summary: North Korean forces arrayed against American allies in South Korea and Japan are substantial, and North Korea's history of provocation is a consistent indicator of its intent to achieve its political objectives by threat of force.

Chinese Threat to Taiwan. China's long-standing threat to end de facto independence

FIGURE 1

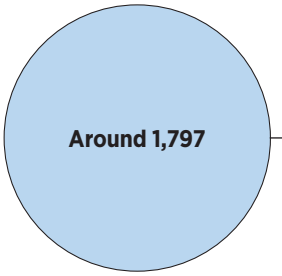
The World's Nuclear Arsenals

Figures are approximate numbers of nuclear warheads.

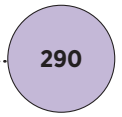


RUSSIA
Active arsenal is an estimated 1,582 actively deployed strategic warheads and several thousand more short-range nuclear weapons. Russia considers NATO a principal adversary and is willing to use its nuclear weapons to counter conventional threats.

UNITED STATES
Maintains 1,597 actively deployed strategic warheads and about 200 short-range nuclear warheads in Europe. This arsenal protects 1.09 billion people living in 30 countries.



FRANCE
Began nuclear program in late-1950s. Nuclear arsenal is primarily sub-based.



CHINA
Delivery systems include long-range missiles, bombers, and submarines.

UNITED KINGDOM

PAKISTAN

INDIA

ISRAEL

NORTH KOREA 8

Nations Protected by the U.S. Nuclear Arsenal, with Populations in Millions

U.S.	316.4
Japan	127.3
Germany	80.8
Turkey	76.5
U.K.	64.1
France	63.7
Italy	59.7
South Korea	50.2
Spain	46.6
Poland	38.5
Canada	35.1
Romania	21.3
Ned.	16.8
Belgium	11.2
Greece	11.1
Portugal	10.6
Czech Republic	10.5
Hungary	9.9
Bulgaria	7.2
Denmark	5.6
Slovakia	5.4
Norway	5.1
Croatia	4.3
Lithuania	3.0
Albania	2.8
Slovenia	2.1
Latvia	2.0
Estonia	1.3
Luxembourg	0.5
Iceland	0.3
TOTAL	**1,089.9**

SOURCES: U.S. Department of State, "New START Treaty Aggregate Numbers of Strategic Offensive Arms," July 1, 2015, http://www.state.gov/t/avc/rls/240062.htm (accessed September 3, 2015); Amy F. Woolf, "Nonstrategic Nuclear Weapons," Congressional Research Service, February 23, 2015, https://www.fas.org/sgp/crs/nuke/RL32572.pdf (accessed September 3, 2015); Arms Control Association, "Nuclear Weapons: Who Has What at a Glance," August 2015, http://www.armscontrol.org/factsheets/Nuclearweaponswhohaswhat (accessed September 3, 2015); and Terry Miller and Anthony B. Kim, *2015 Index of Economic Freedom* (Washington, DC: The Heritage Foundation and Dow Jones & Company, Inc., 2015), http://www.heritage.org/index.

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of Taiwan and ultimately to bring it under the authority of Beijing—if necessary, by force—is both a threat to a major American security partner and a threat to the American interest in peace and stability in the Western Pacific.

Tensions across the Taiwan Strait have cooled significantly over the past eight years. Regardless of the state of the relationship at any given time, however, Chinese leaders from Deng Xiaoping and Mao Zedong to Xi Jinping have consistently emphasized the importance of ultimately reclaiming Taiwan. The island—along with Tibet—is the clearest example of a geographical "core interest" in Chinese policy. China has never renounced the use of force, and it continues to employ political warfare against Taiwan's political and military leadership. The 2016 election of Tsai Ing-wen of the pro-independence Democratic Progressive Party (DPP) is likely to mark a revival in cross-Strait tensions.

For the Chinese leadership, the failure to effect unification, whether peacefully or through the use of force, would reflect fundamental political weakness in the PRC. For this reason, there is no realistic means by which any Chinese leadership can back away from the stance of having to unify the island with the mainland. As a result, the island remains an essential part of the PLA's "new historic missions," shaping PLA acquisitions and military planning.

Two decades of double-digit increases in China's announced defense budget have produced a significantly more modern PLA, much of which remains focused on a Taiwan contingency. This modernized force includes more than 1,000 ballistic missiles, a modernized air force, and growing numbers of modern surface combatants and diesel-electric submarines capable of mounting a blockade. As the 1995–1996 Taiwan Strait crisis demonstrated, Beijing is prepared to use at least open displays of force—and might have been willing to go further in the absence of a strong American presence.

It is widely posited that China's anti-access/area-denial (A2/AD) strategy—the deployment of an array of overlapping capabilities, including anti-ship ballistic missiles (ASBMs), submarines, and long-range cruise missiles, satellites, and cyber weapons—is aimed largely at forestalling American intervention in support of friends and allies in the Western Pacific, including Taiwan. By holding at risk key American platforms and systems (e.g., aircraft carriers), the Chinese seek to delay or even deter American intervention in support of key friends and allies, allowing the PRC to achieve a fait accompli. The growth of China's military capabilities is specifically oriented toward countering America's ability to assist in the defense of Taiwan.

Chinese efforts to reclaim Taiwan are not limited to overt military means. The "three warfares" highlight Chinese political warfare methods, including legal warfare/lawfare, public opinion warfare, and psychological warfare. The PRC employs such approaches to undermine both Taiwan's will to resist and America's willingness to support Taiwan. The Chinese goal would be to "win without fighting," to take Taiwan without firing a shot or with only minimal resistance before the United States could organize an effective response.

WWTA: The WWTA does not reference the threat that China poses to Taiwan.

Summary: The Chinese threat to Taiwan is long-standing. Although recently obscured by positive political relations, the military threat is ever present and can be expected to resurface with any increase in tensions across the Strait that may be occasioned by the change in governments in Taipei. China's ability to execute a military action against Taiwan, albeit at high economic and political cost, is improving. Its intent to unify Taiwan with the mainland under the full authority of the PRC central government and to end the island's de facto independence has been consistent over time.

Major Pakistan-backed Terrorist Attack on India Leading to Open Warfare Between India and Pakistan. An Indo–Pakistani conflict would jeopardize multiple U.S. interests in the region and increase the threat

of global terrorism. Pakistan would rely on militant non-state actors to help it fight India and thus create a more permissive environment in which various terrorist groups could operate freely. The threat of conflict going nuclear would force U.S. businesses to exit the region and disrupt investment and trade flows, mainly between the U.S. and India, whose bilateral trade currently totals around $100 billion. An actual nuclear exchange would be devastating, both in human lives lost and in long-term economic damage.

India and Pakistan are engaged in a nuclear arms race that threatens stability throughout the Subcontinent. Both countries tested nuclear weapons in 1998, establishing themselves as overtly nuclear weapons states. Both countries also are developing naval nuclear weapons and already possess ballistic missile and aircraft-delivery platforms.[39]

Pakistan has the fastest-growing nuclear weapons arsenal in the world today. Islamabad currently has an estimated 100 nuclear weapons and is developing war plans that include the use of tactical nuclear weapons in the event of conflict with India. Pakistan's development of a mobile dual-use battlefield ballistic missile with a range of only 60 kilometers is of particular concern,[40] especially given such weapons' impact on India's nuclear use threshold.

The broader military and strategic dynamic between India and Pakistan is essentially unstable. As noted, Pakistan continues to harbor terrorist groups like Lashkar-e-Taiba and Jaish-e-Mohammed, which carried out the recent attack on the Indian airbase at Pathankot. JeM had been less visible for several years, but JeM leader Masood Azhar resurfaced in 2014 in Pakistan to address a large public rally where he called on suicide attackers to resume jihad against India. Media reports indicate that some JeM leaders were detained in Pakistan following the January 2 Pathankot attack, but no charges have been filed.

Hafez Muhammed Saeed, LeT's founder and leader of its front organization, JuD, also continues to operate freely in Pakistan, often holding press conferences and inciting violence against India during large-scale public rallies. In December 2014, Saeed held a two-day conclave in Lahore that received support from the Pakistani government, including security from 4,000 police officers and government assistance in transporting attendees to the gathering of more than 400,000. India condemned the Pakistani government's support for the gathering as "blatant disregard" of global norms against terrorism.[41]

The possibility of armed conflict between India and Pakistan seemed to heighten slightly following the May 2014 election of Bharatiya Janata Party (BJP) leader Narendra Modi as India's Prime Minister. While Modi initially sought to reach out to Pakistan by inviting Pakistani Prime Minister Nawaz Sharif to his swearing-in ceremony, he subsequently called off foreign secretary–level talks that were scheduled for August 2014 to express anger over a Pakistani official's meeting with Kashmiri separatist leaders. Modi's cancellation of the talks signaled that his government is likely to take a harder line toward Islamabad than the one taken by his predecessor, Manmohan Singh, and tie progress in dialogue to Pakistani steps to crack down on anti-India terrorists. Before it took power last year, the BJP often criticized Singh for being too soft on Pakistan. Another obstacle to improved Indo–Pakistani ties is the political weakness of Pakistani Prime Minister Sharif, whose government barely survived month-long street protests led by the opposition in August 2014.

Adding to the tension has been an increase in cross-border firing between the Indian and Pakistani militaries, raising questions about whether a cease-fire that has been in place since 2003 may be breaking down. In August 2014, the two sides engaged in intense firing and shelling along their international border (called the working boundary) and across the Line of Control (LoC) that divides Kashmir. India's Border Security Force Director noted that the firing across the international

border was the worst it had been since India and Pakistan fought a war in 1971.[42] Tensions were defused following a phone call between the Directors General of Military Operations in which they mutually agreed to stop the firing. A similar escalation in border tensions occurred again in December 2014 when a series of firing incidents over a one-week period resulted in the deaths of at least five Pakistani soldiers and one Indian soldier.

On December 25, 2015, Prime Minister Modi made an impromptu visit to Lahore to meet with Nawaz Sharif. The visit created enormous good will between the two countries and raised hope that official dialogue would soon resume. However, six days later, JeM militants attacked the Indian airbase at Pathankot, killing seven Indian security personnel. India has provided information on the attackers to Pakistan and demanded action against JeM. Official Indo–Pakistani dialogue thus remains deadlocked, even though the two sides are reportedly communicating quietly through their foreign secretaries and national security advisors.

There is some concern about the impact on Indo–Pakistani relations of the international troop drawdown in Afghanistan. The vacuum created by the departing international forces will allow the Taliban and other extremists to strengthen their grip in the region, potentially reinvigorating the insurgency in Kashmir and raising the chances of a major terrorist attack against India. Afghan security forces successfully thwarted an attack on the Indian consulate in Herat, Afghanistan, in May 2014. A successful future attack on Indian interests in Afghanistan along the lines of the bombing of the Indian embassy in Kabul in 2008 would sharpen tensions between New Delhi and Islamabad.

With terrorist groups operating relatively freely in Pakistan and maintaining links to the country's military and intelligence services, there is a moderate risk of the two countries climbing the military escalation ladder and eventually engaging in all-out conflict. Pakistan's nuclear weapons capability appears to have acted as a deterrent against Indian military escalation both during the 2001–2002 military crisis and following the 2008 Mumbai attacks, but the Indian government would be under great pressure to react strongly in the face of a terrorist provocation. Pakistan's recent focus on incorporating tactical nuclear weapons into its war-fighting doctrine has also raised concern that if conflict does break out, there is now a higher risk of nuclear exchange.[43]

WWTA: The WWTA does not reference the threat to American interests from a Pakistani attack on India and potential escalation. Unlike the 2015 assessment, however, it does specifically reference tense relations between the two countries. It also references "Islamabad's willingness to take action against those in Pakistan linked to the [Pathankot] attack" as key to resuming engagement.[44]

Summary: Indian military retaliation against a Pakistan-backed terrorist strike against India could include targeted air strikes on terrorist training camps inside Pakistan. This would likely lead to broader military conflict with some prospect of escalating to a nuclear exchange. Neither side desires another general war. Both countries have limited objectives and have demonstrated their intent to avoid escalation, but this is a delicate calculation.

Major Chinese Border Incursion into India. The possibility of armed conflict between India and China, while currently remote, poses an indirect threat to U.S. interests because it could disrupt the territorial status quo and raise nuclear tensions in the region. A border conflict between India and China could also prompt Pakistan to try to take advantage of the situation, further contributing to regional instability.

Long-standing border disputes that led to a Sino–Indian War in 1962 have been heating up again in recent years. In April 2013, the most serious border incident between India and China in over two decades occurred when Chinese troops settled for three weeks several miles inside northern Indian territory on the Depsang Plains in Ladakh. A visit to India by

MAP 11

Areas of Dispute Along the India-China Border

SOURCE: Alyssa Ayres, "China's Mixed Messages to India," Council on Foreign Relations, September 17, 2014, http://blogs.cfr.org/asia/2014/09/17/chinas-mixed-messages-to-india/ (accessed January 5, 2014).

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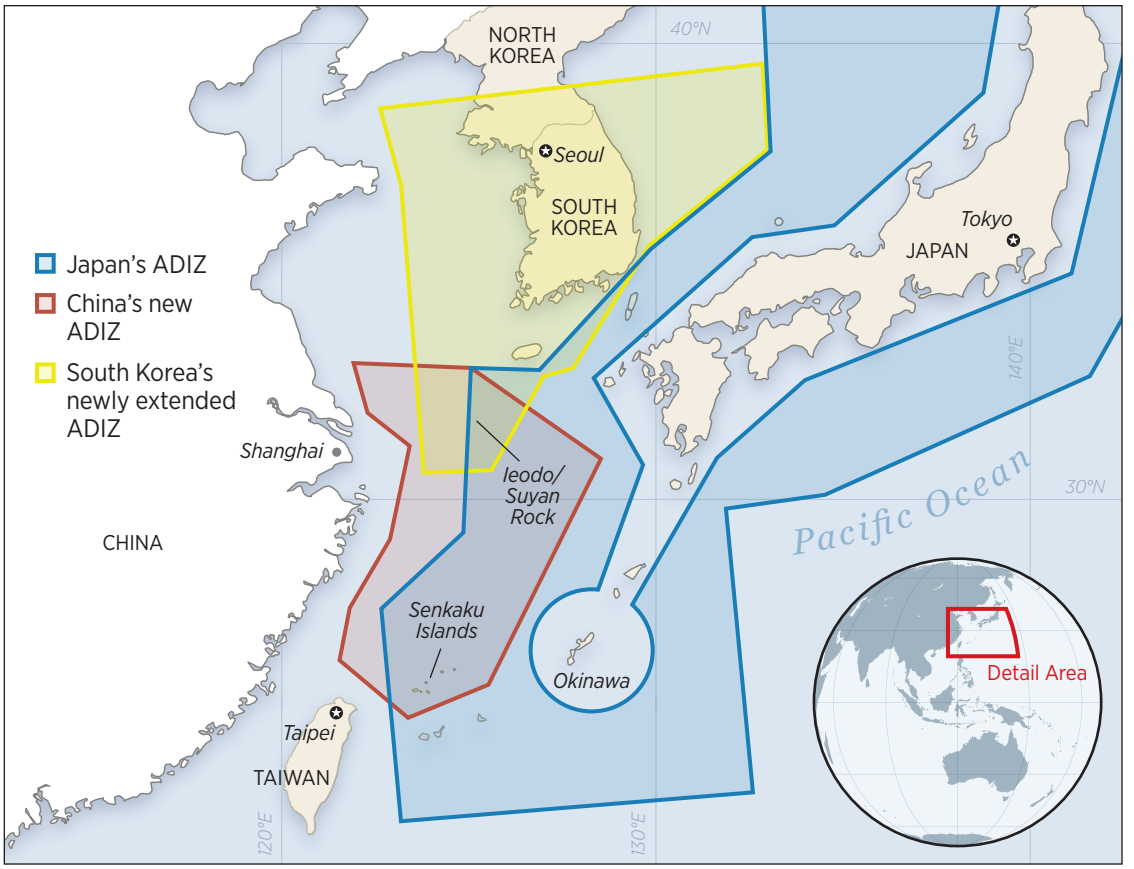
Chinese President Xi Jinping in September 2014 was overshadowed by another flare-up in border tensions when hundreds of Chinese PLA forces reportedly set up camps in the mountainous regions of Ladakh, prompting Indian forces to deploy to forward positions in the region. The border standoff lasted three weeks and was defused when both sides agreed to pull back their troops to previous positions. India claims that China occupies more than 14,000 square miles of Indian territory in the Aksai Chin along its northern border in Kashmir, and China lays claim to more than 34,000 square miles of India's northeastern state of Arunachal Pradesh. The issue is also closely related to China's concern for its control of Tibet and the presence in India of the Tibetan government in exile and Tibet's spiritual leader, the Dalai Lama.

The Chinese are building up military infrastructure and expanding a network of road, rail, and air links in the border areas. To meet these challenges, the BJP government has also committed to expanding infrastructure development along India's disputed border with China, especially in the Indian states of Arunachal Pradesh and Sikkim. While China currently holds a decisive military edge over India, New Delhi is engaged in an ambitious military modernization program.

The Border Defense and Cooperation Agreement (BDCA) signed during then-Prime

MAP 12

Overlapping Air Defense Identification Zones



SOURCE: Mark J. Valencia, "Troubled Skies: China's New Air Zone and the East China Sea Disputes," *Global Asia*, Vol. 8, No. 4 (Winter 2013), http://www.globalasia.org/article/troubled-skies-chinas-new-air-zone-and-the-east-china-sea-disputes/ (accessed January 5, 2015).

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Minister Singh's visit to China in October 2013 is unlikely to reduce border tensions significantly or lead to a broader settlement in the near future. The accord is aimed at putting into place institutional mechanisms for maintaining peace along the border, but several Indian analysts worry that it is part of China's effort to keep in place the status quo, which favors the Chinese. Some have even contended that the Chinese intend to buy time on their border disputes with India through the BDCA while focusing on other territorial claims in the Asia–Pacific.[45]

The BDCA affirms that neither side will use its military capability against the other and proposes opening a hotline between the two countries' military headquarters, instituting meetings between border personnel in all sectors, and ensuring that neither side tails the other's patrols along the Line of Actual Control (LAC).[46] The agreement also includes language stipulating that in the event the two sides come face-to-face, they "shall exercise maximum self-restraint, refrain from any provocative actions, not use force or threaten to use force against the other side, treat each

other with courtesy, and prevent exchange of armed conflict."[47]

WWTA: Unlike its 2015 assessment, which referenced both the likely pursuit of better economic relations and tensions along the border,[48] the 2016 WWTA is silent on India–China relations.

Summary: American interest in India's security is substantial and expanding. The threat to this interest from China is active, albeit part of a broader, multifaceted bilateral relationship that includes many cooperative dimensions. Both India and China apparently want to avoid allowing minor incidents to escalate into a more general war. The Chinese seem to use border tensions for limited diplomatic and political gain vis-à-vis India, and India responds in ways intended to contain minor incursions and maximize reputational damage to China. Despite limited aims, however, the unsettled situation and gamesmanship along the border could result in miscalculation, accidents, or overreaction.

Threats to the Commons

The U.S. has critical direct interests at stake in the East and South Asia commons that include sea, air, space, and cyber interests. These interests include an economic interest in the free flow of commerce and the military use of the commons to safeguard America's own security and contribute to the security of its allies and partners.

Washington has long provided the security backbone in these areas, which in turn has supported the region's remarkable economic development. However, China is taking increasingly assertive steps to secure its own interests in these areas independent of U.S. efforts to maintain freedom of the commons for all in the region. It cannot be assumed that China shares a common conception of international space with the United States or interest in perpetuating American predominance in securing the commons.

Maritime and Airspace Commons. The aggressiveness of the Chinese navy, maritime law enforcement forces, and air forces in and over the waters of the East and South China Sea, coupled with ambiguous, extralegal territorial claims and assertion of control there, poses an incipient threat to American and overlapping allied interests. Chinese military writings emphasize the importance of establishing dominance of the air and maritime domains in any future conflict.

East China Sea. Since 2010, China has intensified its efforts to assert claims of sovereignty over the Senkaku Islands of Japan in the East China Sea. Beijing asserts not only exclusive economic rights within the disputed waters, but also recognition of "historic" rights to dominate and control those areas as part of its territory.

Chinese and Japanese maritime law enforcement and coast guard vessels regularly operate in waters surrounding the Senkakus that are administered by Japan, raising the potential for miscalculation and escalation into a military clash. In the summer of 2016, China began to deploy naval units into the area, justifying its action as "freedom of navigation" operations.

In November 2013, China declared an air defense identification zone (ADIZ) in the East China Sea that largely aligned with its claimed maritime exclusive economic zone (EEZ). The People's Liberation Army declared that it would "take defense emergency measures to respond to aircraft that do not cooperate in identification or refuse to follow orders."[49] The announcement was a provocative act and another Chinese attempt to change the status quo unilaterally. The ADIZ declaration is part of a broader Chinese pattern of using intimidation and coercion to assert expansive extralegal claims of sovereignty and/or control incrementally. In June 2016, a Chinese fighter made an "unsafe" pass near a U.S. RC-135 reconnaissance aircraft in the East China Sea area.

South China Sea. Roughly half of global trade in goods, a third of trade in oil, and over half of global liquefied natural gas shipments pass through the South China Sea, which also accounts for approximately 10 percent

of global fish catch and may contain massive potential reserves of oil and natural gas. It is hotly contested by six countries, including Taiwan and the Philippines, an American security treaty ally.

Incidents between Chinese law enforcement vessels and other claimants' fishing boats occur on a regular basis in the South China Sea, as do other Chinese assertions of administrative authority. The U.S. presence also has become an object of Chinese attention, from confrontations with the ocean surveillance ship USNS *Impeccable* and the destroyer USS *John McCain* in 2009 to the confrontation with the guided-missile cruiser USS *Cowpens* in December 2013 and a dangerous intercept of a U.S. Navy P-8 aircraft in August 2014.

The most serious inter-regional incidents in the South China Sea have occurred between China and the Republic of the Philippines. In 2012, a Philippine naval ship operating on behalf of the country's coast guard challenged private Chinese poachers in waters around Scarborough Shoal. The resulting escalation left Chinese government ships in control of the shoal. In 2016, there have been reports that the Chinese intend to consolidate their gains in the area by reclaiming the sea around the shoal.[50] Chinese government ships also have occasionally attempted to prevent the rotation of troops on and replenishment of Philippines-held Second Thomas Shoal.

The most significant development in the South China Sea over the past two years has been Chinese reclamation and militarization of seven artificial islands or outposts. In July 2016, an award issued by an arbitral panel constituted under the United Nations Convention on the Law of the Sea (UNCLOS) invalidated China's sweeping claims to waters in the South China Sea and found its "island" reclamation to be in violation of Beijing's commitments under UNCLOS. Speculation now centers on how Beijing will respond to this ruling. There is the possibility that it will declare an ADIZ above the South China Sea. There are also concerns that it will take action against vulnerable targets like Philippines-occupied Second Thomas Shoal, which the panel determined are part of the Philippines EEZ and continental shelf, or proceed with the reclamation at Scarborough. The latter development in particular would facilitate the physical assertion of its claims and enforcement of an ADIZ, regardless of the UNCLOS award.

Airpower. Although China is not yet in a position to enforce an ADIZ consistently in either area, the steady two-decade improvement of the PLA Air Force (PLAAF) and naval aviation will one day provide the necessary capabilities. Chinese observations of recent conflicts, including wars in the Persian Gulf, the Balkans, and Afghanistan, have emphasized the growing role of airpower and missiles in conducting "non-contact, non-linear, non-symmetrical" warfare.

China also seems to have made a point of publicizing its air force modernization, unveiling new aircraft prototypes, including two new stealthy fighters, on the eve of visits by American Secretaries of Defense. (Secretary Chuck Hagel's visit in 2014 was preceded by the unveiling of the J-15 naval fighter.) Those aircraft have been flown much more aggressively, with Chinese fighters flying very close to Japanese aircraft in China's East China Sea ADIZ and conducting armed combat air patrols in the skies over Tibet.[51]

The PLA has shed most of its 1960s-era aircraft, replacing them with much more modern systems. Today's PLAAF is dominated by fourth- and 4.5th- generation fighter aircraft. These include the domestically designed and produced J-10, as well as the Su-27/Su-30/J-11 system, comparable to the F-15 or F-18, that dominates both the fighter and strike missions.[52] Older airframes such as the J-7 are being steadily retired from the fighter inventory. China is also believed to be preparing to field two stealthy fifth-generation fighter designs. The J-20 is the larger aircraft, resembling the American F-22 fighter. The J-31 appears to resemble the F-35 but with two engines rather than one. The production of advanced combat

aircraft engines remains one of the greatest challenges to Chinese fighter design.

China fields some long-range strike aircraft, largely the H-6 bomber based on the Soviet-era Tu-16 Badger. While this aircraft has little prospect of penetrating advanced air defenses, it is suitable as a cruise missile carrier. China also has used the H-6 as the basis for initial efforts to develop an aerial tanker fleet and seems to be examining other options as well. As China deploys more tankers, this will extend the range and loiter time of its fighter aircraft. China will then be better equipped to enforce its newly declared East China Sea Air Defense Identification Zone and any possible future South China Sea ADIZ.

A variety of modern support aircraft have also entered the PLAAF inventory, including airborne early warning (AEW), command and control (C2), and electronic warfare (EW) aircraft. At the Zhuhai Air Show, Chinese companies have displayed a variety of unmanned aerial vehicles (UAVs), reflecting substantial investments and research and development efforts. The surveillance and armed UAV systems include the Xianglong (Soaring Dragon) and Sky Saber systems. The 2014 DOD report on Chinese capabilities also reports that China has tested a stealthy flying-wing UAV, the Lijian.[53]

China's air defenses, which are under the control of the PLAAF, have also been steadily modernizing. China has acquired the advanced S-300 surface-to-air missile (SAM) system (SA-10B/SA-20), which is roughly analogous to the American Patriot SAM system, and is developing its own advanced SAM (the HQ-9), which is deployed both on land and at sea. In early 2014, Russia announced that it would sell China the S-400 SAM system. This would mark a substantial improvement in PLAAF air defense capabilities, as the S-400 has anti-aircraft and anti-missile capabilities.[54] China has deployed these SAM systems in a dense, overlapping belt along its coast, protecting the nation's economic center of gravity. Key industrial and military centers such as Beijing are also heavily defended by SAM systems. Some of these systems have reportedly been deployed to the Paracel islands in the South China Sea.

A third component of the PLAAF is China's airborne forces. The 15th Airborne Army is part of the PLAAF, with three divisions of 10,000–15,000 personnel each. These are not believed to be assigned to any of the Chinese military regions but are instead a strategic reserve as well as a rapid reaction force. In 2009, in the military review associated with the 60th anniversary of the founding of the PRC, Chinese airborne units paraded through Tiananmen Square with ZBD-03 mechanized airborne combat vehicles. These vehicles provide Chinese airborne forces with tactical mobility as well as some degree of protected fire support from their 30mm autocannon and HJ-73 anti-tank missile (a domestic version of the AT-3 Sagger)—something American airborne forces continue to lack.

One shortcoming of the Chinese airborne forces is the lack of military transport aircraft, although the PLAAF can undoubtedly call upon China's substantial civilian fleet of airliners in time of crisis or war.

Sea power. As the world's foremost trading state, China depends on the seas for its economic well-being. China's factories are increasingly powered by imported oil, and Chinese diets contain a growing percentage of imported food. Chinese products rely on the seas to be moved to markets. At the same time, because China's economic center of gravity is now in the coastal region, it has had to emphasize maritime power to defend key assets and areas. Consequently, China has steadily expanded its maritime power, including its merchant marine and maritime law enforcement capabilities, but especially the People's Liberation Army Navy (PLAN).

The PLAN is no longer an unsophisticated coastal defense force. Instead, since the end of the Cold War, China's navy has moved away from a reliance on mass toward incorporating advanced platforms and weapons. Most notably, the Chinese navy is the first in East Asia to deploy its own aircraft carrier since

World War II. The Liaoning carries a mixed air group of J-15 fighters (based on the naval-ized Su-27) and helicopters and is believed to be fully operational.

Meanwhile, many obsolete vessels have been decommissioned, including scores of older, missile-armed, fast attack craft. In their place, China has produced a range of more capable combatants and is building each class in significant numbers. These range from the Type 022 Houbei missile-armed catamaran, armed with sea-skimming supersonic anti-ship cruise missiles, to the Type-052C *Luyang-II* destroyer, equipped with a phased-array radar for its HQ-9 SAM system. The HQ-9 is believed to be comparable to early model Patriot missiles, with its ability to combat most air-breathing systems and a limited anti–ballistic missile capability. Although these new ships are not replacing older Chinese surface combatants on a one-for-one basis, the overall capability of the PLAN surface force is steadily improving.

Similarly, the PLAN has been modernizing its submarine force. Since 2000, the PLAN has consistently fielded between 50 and 60 diesel-electric submarines, but the age and capability of the force has been improving as older boats, especially 1950s-vintage *Romeo*-class boats, are replaced with newer designs. These include a dozen *Kilo*-class submarines purchased from Russia and domestically designed and manufactured *Song* and *Yuan* classes. All of these are believed to be capable of firing not only torpedoes, but also anti-ship cruise missiles. The Chinese have also developed variants of the *Yuan*, with an air-independent propulsion (AIP) system that reduces the boats' vulnerability by removing the need to use noisy diesel engines to recharge batteries.

The PLAN also has been augmenting its aerial maritime strike capability. In addition to more modern versions of the H-6 twin-engine bombers (a version of the Soviet/Russian Tu-16 Badger), the PLAN's Naval Aviation force has introduced a range of other strike aircraft into the inventory. These include the JH-7/FBC-1 Flying Leopard, which can carry between two and four YJ-82 anti-ship cruise missiles, and the Su-30 strike fighter. Within Chinese littoral waters, the PLAN Air Force can bring a significant amount of firepower to bear.

The PLAN also has been working to improve its "fleet train." The 2010 PRC defense white paper notes the accelerated construction of "large support vessels." It also specifically notes that the navy is exploring "new methods of logistics support for sustaining long-time maritime missions."[55]

As with other aspects of PLA modernization, even as the PLAN is upgrading its weapons, it is also improving its doctrine and training, including increased emphasis on joint operations and the incorporation of electronic warfare into its training regimen. Such improvements suggest that PLA Air Force assets, space and cyber operations, and even PLA Rocket Force units might support naval aviation strikes. The new anti-ship ballistic missile forces, centered on the DF-21D anti-ship ballistic missile (now reportedly at initial operational capability), should be seen as part of joint Chinese efforts to control the seas, complementing PLAAF and PLAN air, surface, and sub-surface forces.

WWTA: The WWTA does not address threats to the maritime and airspace commons. It does, however, say that China "seek[s] greater influence over" the region and "wants the United States to refrain from actions [it] perceive[s] as interfering with [its] interests—which will perpetuate the ongoing geopolitical and security competition around the peripher[y] of...China, to include the major sea lanes." It further notes that the Chinese "will almost certainly eschew direct military conflict with the United States in favor of contests at lower levels of competition...that intentionally blur the distinction between peace and wartime operations."[56]

Summary: In the absence of U.S. forces, China is increasingly capable of dominating the airspace across the East Asian littoral. Neither Taiwan nor any Southeast Asian

nation can match the PLAAF's number of high-performance aircraft. China's military and party leaders appear to be intent on establishing a dominant position in regional air and maritime commons. There is a very similar dynamic in the maritime domain. In both domains, China is ever more capable of challenging American dominance, especially along its littoral.

Escalation of Territorial Disputes or Accidental Incidents at Sea. Because the PRC and other countries in the region see active disputes over the East and South China Seas not as differences regarding the administration of the commons, but rather as matters of territorial sovereignty, there exists the threat of armed conflict between China and American allies that are also claimants, particularly Japan and the Philippines.

Beijing prefers to accomplish its objectives quietly and through non-military means. In both the East and South China Seas, China has sought successfully to exploit "gray zones," gaining control incrementally and deterring others without resort to lethal use of force. It uses military and economic threats, bombastic language, and enforcement through military bullying. Chinese paramilitary-implemented, military-backed encroachment in support of expansive extralegal claims could lead to an unplanned armed clash.

Rising nationalism is exacerbating tensions, making geostrategic relations in Asia increasingly complex and volatile. In the face of persistent economic challenges, nationalist themes are becoming an increasingly strong undercurrent, affecting policymaking. Although the nationalist phenomenon is not new, it is gaining force and complicating efforts to maintain regional stability.

Governments may choose to exploit nationalism for domestic political purposes, but they also run the risk of being unable to control the genie that they have released. Nationalist rhetoric is mutually reinforcing, which makes countries less likely to back down than in the past. The increasing power that the Internet and social media provide to the populace, largely outside of government control, adds an element of unpredictability to future clashes.

In case of armed conflict between China and the Philippines or between China and Japan, either by intention or as a result of an accidental incident at sea, the U.S. could be required to exercise its treaty commitments.[57] Escalation of a direct U.S.–China incident is itself not unthinkable. Even keeping an inadvertent incident from escalating into a broader military confrontation would be difficult. This is particularly true in the East and South China Seas, where naval as well as civilian law enforcement vessels from both China and the U.S. operate in what the U.S. considers to be international waters.

WWTA: The WWTA states that "China will continue to pursue an active foreign policy" in the region, "highlighted by [among other things] a firm stance on competing territorial claims in the East and South China Seas." It also predicts continuing regional tensions "as China pursues construction at its expanded outposts in the South China Sea."[58] It offers no judgment either on the threat that this poses to American interests or on the prospect for large-scale conventional conflict in the region.

Summary: The Chinese have a growing capacity to disrupt the freedom of the commons that benefits the entire region. Both territorial disputes related to what the U.S. considers the commons and accidental incidents could draw the U.S. into conflict. China likely does not intend to engage in armed conflict with its neighbors, particularly American treaty allies, or the U.S. itself. However, it will continue to press its territorial claims at sea in ways that, even if inadvertently, cause incidents that could escalate into more belligerent action.

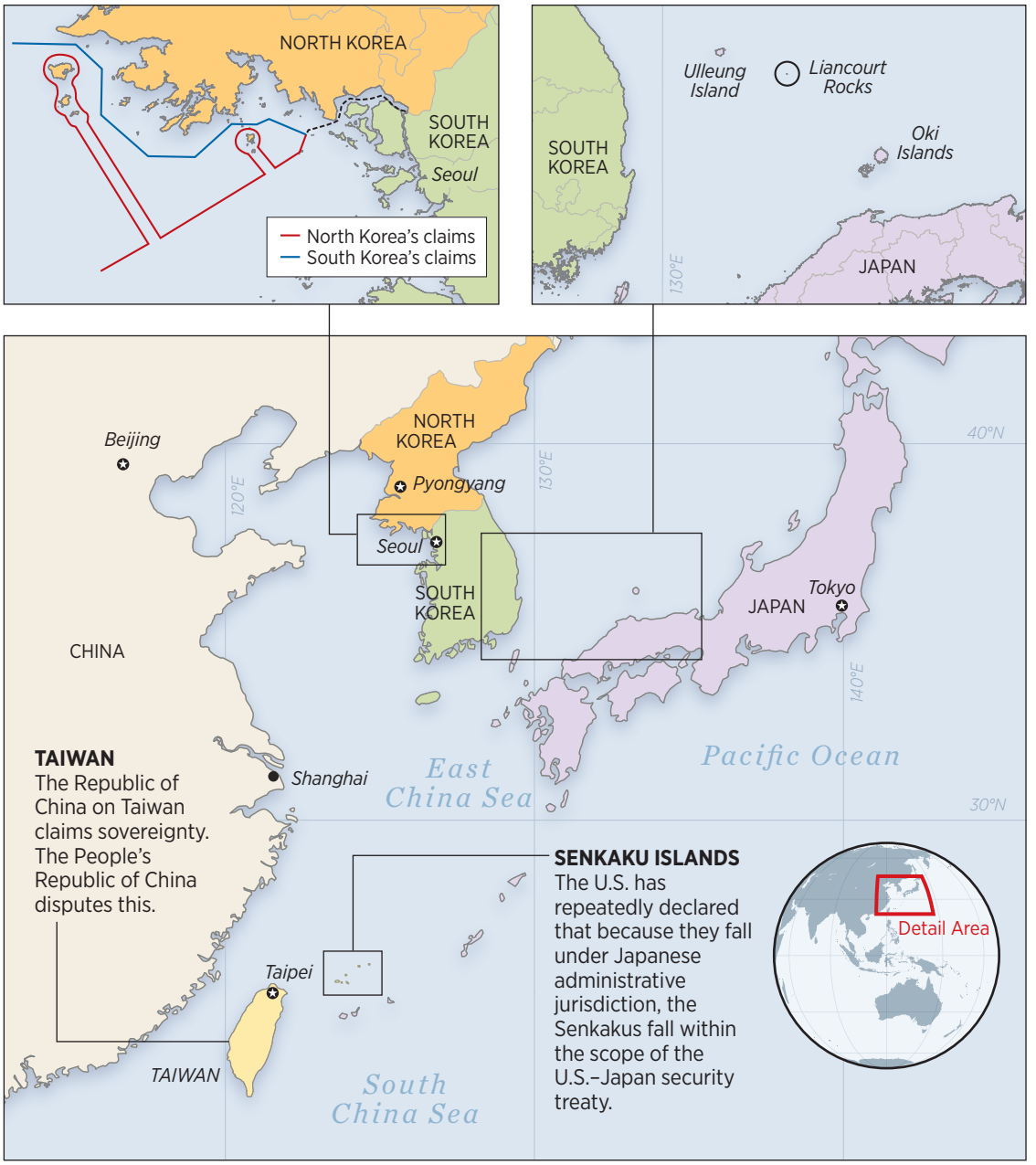
Space. One of the key force multipliers for the United States is its extensive array of space-based assets. Through its various satellite constellations, the U.S. military can track opponents, coordinate friendly forces, engage in precision strikes against enemy forces, and conduct battle-damage assessments so that its munitions are expended efficiently.

MAP 13

Areas of Dispute in the East China Sea

KOREAN MARITIME BOUNDARIES
South Korea's claim constitutes the Northern Limit Line, which serves as an operational maritime border between North and South. However, sovereignty over the area is in dispute.

LIANCOURT ROCKS
Known as "Dokdo" in South Korea and "Takeshima" in Japan, the two disputed islands—better measured in acres than in square kilometers—evoke considerable emotion.



SOURCE: Heritage Foundation research. Korean maritime boundaries are from Political Geography Now, "What Is North Korea?" April 11, 2013, http://www.polgeonow.com/2013/04/what-is-north-korea.html (accessed January 5, 2015).

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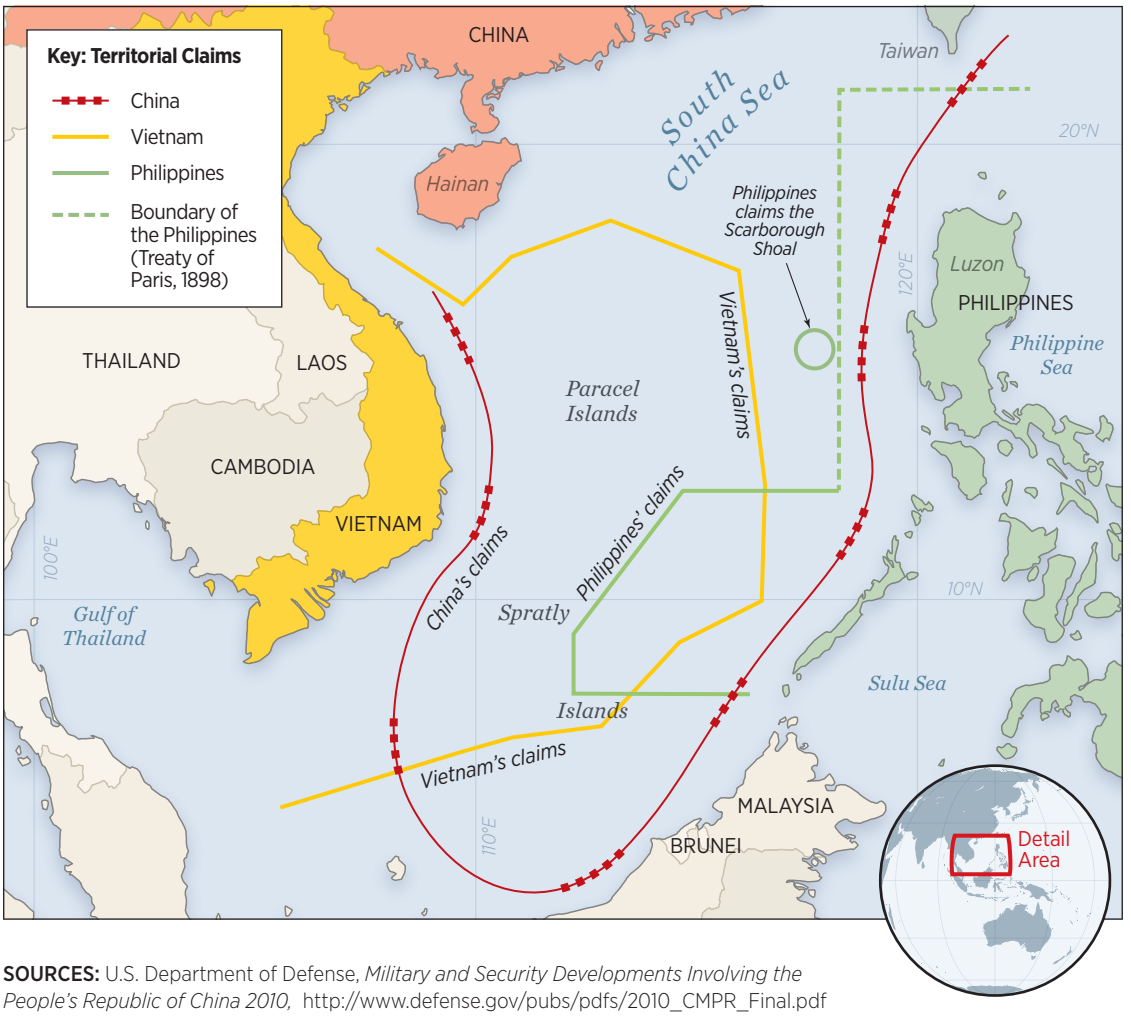
MAP 14

Areas of Dispute in the South China Sea



SOURCES: U.S. Department of Defense, *Military and Security Developments Involving the People's Republic of China 2010,* http://www.defense.gov/pubs/pdfs/2010_CMPR_Final.pdf (accessed February 27, 2012); Martin Stuart-Fox, *A Short History of China and Southeast Asia* (Sydney: Allen & Unwin, 2003), p. 217; and Heritage Foundation research.

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The American military is more reliant than many others on space-based systems because it is also an expeditionary military (i.e., its wars are conducted far distant from the homeland). Consequently, it requires global rather than regional reconnaissance, communications and data transmission, and meteorological information and support. At this point, only space-based systems can provide this sort of information on a real-time basis. The U.S. can leverage space in ways that no other country can, and this is a major advantage, but this heavy reliance on space systems is also a key American vulnerability.

China fields an array of space capabilities, including its own navigation and timing satellites, the Beidou/Compass system, and has claimed a capacity to refuel satellites.[59] It has three satellite launch centers, and a fourth is under construction. China's interest in space dominance includes not only accessing space, but also denying opponents the ability to do the same. As one Chinese assessment notes, space capabilities provided 70 percent of

battlefield communications, over 80 percent of battlefield reconnaissance and surveillance, and 100 percent of meteorological information for American operations in Kosovo. Moreover, 98 percent of precision munitions relied on space for guidance information. In fact, "It may be said that America's victory in the Kosovo War could not be achieved without fully exploiting space."[60]

To this end, the PLA has been developing a range of anti-satellite capabilities. These include both hard-kill and soft-kill systems. The former include direct-ascent kinetic-kill vehicles (DA-KKV), such as the system tested in 2007, but also more advanced systems that are believed capable of reaching targets in mid-Earth orbit and even geosynchronous orbit.[61] The latter include anti-satellite lasers for either dazzling or blinding purposes.[62] This is consistent with PLA doctrinal writings, which emphasize the need to control space in future conflicts. "Securing space dominance has already become the prerequisite for establishing information, air, and maritime dominance," says one Chinese teaching manual, "and will directly affect the course and outcome of wars."[63]

Soft-kill attacks need not come only from dedicated weapons, however. The case of Galaxy-15, a communications satellite owned by Intelsat Corporation, showed how a satellite could effectively disrupt communications simply by being in "switched on" mode all of the time.[64] Before it was finally brought under control, it had drifted through a portion of the geosynchronous belt, forcing other satellite owners to move their assets and juggle frequencies. A deliberate such attempt by China (or any other country) could prove far harder to handle, especially if conducted in conjunction with attacks by kinetic systems or directed-energy weapons.

China has now created a single service, the PLA Strategic Support Force (PLASSF), with authority over China's space, electronic warfare, and network warfare capabilities. In essence, this is a service that is focused on fighting in the information domain, striving to secure what the PLA terms "information dominance" for themselves while denying it to others. This service will probably combine electronic warfare, cyber warfare, and physical attacks against adversary space and information systems in order to deny them the ability to gather, transmit, and exploit information.

WWTA: The WWTA references an increase in threats to American "use of military, civil, and commercial space systems...as...China progress[es] in developing counterspace weapon systems to deny, degrade, or disrupt US space systems." It further states that "China continue[s] to pursue weapons systems capable of destroying satellites on orbit, placing US satellites at greater risk in the next few years," and cites probable Chinese "progress on the antisatellite missile system that it tested in July 2014."[65]

Summary: The PRC poses a challenge to the United States that is qualitatively different from the challenge posed by any other potential adversary in the post–Cold War environment. It is the first nation to be capable of accessing space on its own while also jeopardizing America's ability to do the same. This appears to be its intent.

Cyber. Threats in this area derive primarily from China and North Korea, and both are serious.

China. In 2013, the Verizon Risk Center identified China as the "top external actor from which [computer] breaches emanated, representing 30 percent of cases where country-of-origin could be determined."[66] Given the difficulties of attribution, country of origin should not necessarily be conflated with the perpetrator, but forensic efforts have identified at least one Chinese military unit with cyber intrusions.[67] Similarly, the Verizon report concluded that China was the source of 95 percent of state-sponsored cyber-espionage attacks. Since the 2015 Xi–Obama summit where the two sides reached an understanding to reduce cyber economic espionage, Chinese cyber actions have shifted. While the overall level of activity appears to

be unabated, the Chinese do appear to have moved toward more focused attacks mounted from new sites.

China's cyber-espionage efforts are often aimed at economic targets, reflecting the much more holistic Chinese view of both security and information. Rather than creating an artificial dividing line between military security and civilian security, much less information, the PLA plays a role in supporting both aspects and seeks to obtain economic intellectual property as well as military electronic information.

This is not to suggest, however, that the PLA has not emphasized the military importance of cyber warfare. Chinese military writings since the 1990s have emphasized a fundamental transformation in global military affairs (*shijie junshi gaige*). Future wars will be conducted through joint operations involving multiple services rather than through combined operations focused on multiple branches within a single service. These future wars will span not only the traditional land, sea, and air domains, but also outer space and cyberspace. The latter two arenas will be of special importance, because warfare has shifted from an effort to establish material dominance (characteristic of Industrial Age warfare) to establishing information dominance (*zhi xinxi quan*). This is due to the rise of the Information Age and the resulting introduction of information technology into all areas of military operations.

Consequently, according to PLA analysis, future wars will most likely be "local wars under informationized conditions." That is, they will be wars in which information and information technology not only will be widely applied, but also will be a key basis of victory. The ability to gather, transmit, analyze, manage, and exploit information will be central to winning such wars: The side that is able to do these things more accurately and more quickly will be the side that wins. This means that future conflicts will no longer be determined by platform-versus-platform performance and not even by system against system (*xitong*). Rather, conflicts are now clashes between rival arrays of systems of systems (*tixi*).[68]

Chinese military writings suggest that a great deal of attention has been focused on developing an integrated computer network and electronic warfare (INEW) capability. This would allow the PLA to reconnoiter a potential adversary's computer systems in peacetime, influence opponent decision-makers by threatening those same systems in times of crisis, and disrupt or destroy information networks and systems by cyber and electronic warfare means in the event of conflict. INEW capabilities would complement psychological warfare and physical attack efforts to secure "information dominance," which Chinese military writings emphasize as essential for fighting and winning future wars.

Attacks on computer networks in particular have the potential to be extremely disruptive. The recent indictment of five serving PLA officers on the grounds of cyber espionage highlights how active the Chinese military is in this realm.[69]

It is essential to recognize, however, that the PLA views computer network operations as part of information operations (*xinxi zuozhan*), or information combat. Information operations are specific operational activities that are associated with striving to establish information dominance. They are conducted in both peacetime and wartime, with the peacetime focus on collecting information, improving its flow and application, influencing opposing decision-making, and effecting information deterrence.

Information operations involve four mission areas:

- **Command and Control Missions.** An essential part of information operations is the ability of commanders to exercise control over joint operations by disparate forces. Thus, command, control, communications, computers, intelligence, surveillance, and reconnaissance structures are a key part of information operations, providing the means for collecting, transmitting, and managing information.

- **Offensive Information Missions.** These are intended to disrupt the enemy's battlefield command and control systems and communications networks, as well as to strike the enemy's psychological defenses.

- **Defensive Information Missions.** Such missions are aimed at ensuring the survival and continued operation of information systems. They include deterring an opponent from attacking one's own information systems, concealing information, and combating attacks when they do occur.

- **Information Support and Information-Safeguarding Missions.** The ability to provide the myriad types of information necessary to support extensive joint operations and to do so on a continuous basis is essential to their success.[70]

Computer network operations are integral to all four of these overall mission areas. They can include both strategic and battlefield network operations and can incorporate both offensive and defensive measures. They also include protection not only of data, but also of information hardware and operating software.

Computer network operations will not stand alone, however, but will be integrated with electronic warfare operations, as reflected in the phrase "network and electronics unified [*wangdian yiti*]." Electronic warfare operations are aimed at weakening or destroying enemy electronic facilities and systems while defending one's own.[71] The combination of electronic and computer network attacks will produce synergies that affect everything from finding and assessing the adversary to locating one's own forces to weapons guidance to logistical support and command and control. The creation of the PLASSF is intended to integrate these forces and make them more complementary and effective in future "local wars under informationized conditions."

North Korea. In 2014, North Korea conducted a cyber attack on Sony Pictures in retaliation for the studio's release of a satirical film depicting the assassination of Kim Jong-un. The cyber attack was accompanied by physical threats against U.S. theaters and citizens. Contrary to the perception of North Korea as a technologically backward nation, the regime has an active cyber warfare capability. In 2009, North Korea declared that it was "fully ready for any form of high-tech war."[72] According to South Korea's National Intelligence Service, North Korean leader Kim Jong-un declared that cyber warfare was "a magic weapon" that empowered Pyongyang to launch "ruthless strikes" against South Korea.[73]

The Reconnaissance General Bureau, North Korea's intelligence agency, oversees Unit 121 with almost 6,000 "cyber-warriors" dedicated to attacking Pyongyang's enemies, up from 3,000 just two years ago. Defectors from the unit have told South Korean intelligence officials that hackers are sent to other countries for training as well as to conduct undercover operations. The unit's hackers never operate primarily within North Korea because the country's limited computer network would make it too easy to identify the source of the attack.[74]

Seoul concluded that North Korea was behind cyber attacks using viruses or distributed denial-of-service tactics against South Korean government agencies, businesses, banks, and media organizations in 2009, 2011, 2012, and 2013. The most devastating attack in 2013 against South Korean banks and media outlets deleted the essential Master Boot Record from 48,000 computers.[75] North Korea also jammed GPS signals in 2012, posing a risk to hundreds of airplanes transiting Seoul's Incheon airport. Lieutenant General Bae Deag-sig, head of South Korea's Defense Security Command, stated that "North Korea is attempting to use hackers to infiltrate our military's information system to steal military secrets and to incapacitate the defense information system."[76] In 2016, the threat to banks, in particular, became global with an attack on the SWIFT banking system.[77]

WWTA: The WWTA cites China's continued "success in cyber espionage against the US Government, our allies, and US companies." It also references Beijing's selective use of cyberattacks against "targets it believes threaten Chinese domestic stability or regime legitimacy."[78] With regard to North Korea, the WWTA cites its probable responsibility for an attack on a South Korean nuclear plant and says that "North Korea probably remains capable and willing to launch disruptive or destructive cyberattacks to support its political objectives."[79]

Summary: With obvious implications for the U.S., the PLA emphasizes the need to suppress and destroy an enemy's information systems while preserving one's own, as well as the importance of computer and electronic warfare in both the offensive and defensive roles. Methods to secure information dominance would include establishing an information blockade; deception (including through electronic means); information contamination; and information paralysis.[80] China sees cyber as part of an integrated capability for achieving strategic dominance in the Western Pacific region. For North Korea, cybersecurity is an area in which even its limited resources can directly support discrete political objectives.

Threat Scores

AfPak-Based Terrorism. There is a great deal of uncertainty surrounding the threat from AfPak. For the U.S., Pakistan is both a security partner and a security challenge. Pakistan provides a home and support to terrorist groups that are hostile to the U.S., other U.S. partners in South Asia like India, and the fledgling government of Afghanistan. Afghanistan is particularly vulnerable to destabilization efforts. Both Pakistan and Afghanistan are already among the world's most unstable states. The instability of the former, given its nuclear arsenal, has a direct bearing on U.S. security.

The IISS *Military Balance* largely addresses the military capabilities of states. Its limited references to capabilities of non-state actors do not include those in the AfPak region. The 2016 edition contains no reference to the possibility of Pakistani nuclear weapons falling into hands that would threaten the American homeland or interests more broadly. The 2014 edition stated that Pakistan's "nuclear weapons are currently believed to be well-secured against terrorist attack."[81] Pakistan's Army Strategic Forces Command has 30 medium-range ballistic missiles, 30 short-range ballistic missiles, and land-attack cruise missiles.[82] Previous editions of the *Military Balance* have also cited development of "likely nuclear capable" artillery. Pakistan also has "1–2 squadrons of F-16A/B or Mirage 5 attack aircraft that may be assigned a nuclear strike role."[83]

This *Index* assesses the overall threat from AfPak-based terrorists, considering the range of contingencies, as "testing" for level of provocation of behavior and "gathering" for level of capability. This is notable because the 2016 *Index* assessed the level of provocative behavior emanating from this threat as "aggressive," one level higher on the scale used.

Threats: Af-Pak Terrorism

	HOSTILE	AGGRESSIVE	TESTING	ASSERTIVE	BENIGN
Behavior			✓		

	FORMIDABLE	GATHERING	CAPABLE	ASPIRATIONAL	MARGINAL
Capability		✓			

China. China presents the United States with the most comprehensive security challenge in the region. It poses various threat contingencies across all three areas of vital American national interests: homeland; regional war (extending from attacks on overseas U.S. bases or against allies and friends); and the global commons. China's provocative behavior is well documented. It is challenging the U.S. and its allies, like Japan, at sea and in cyberspace. It has raised concerns on its border with India and is a standing threat to Taiwan. While there may be a lack of official transparency, publicly available sources shed considerable light on its fast-growing military capabilities.

According to the IISS *Military Balance*, among the key weapons in China's inventory are 62 Chinese ICBMs; 405 shorter-range ballistic missiles;[84] four SSBNs; 77 satellites; 6,540 main battle tanks (300 fewer than 2014); 57 tactical submarines; 74 principal surface combatants (including one aircraft carrier and 19 destroyers); and 2,306 combat-capable aircraft in its air force. There are 1,600,000 members of the People's Liberation Army.[85]

With regard to these capabilities, the 2014 *Military Balance* stated that "a lack of war-fighting experience, questions over training and morale, and key capability weaknesses in areas such as C4ISTAR and ASW, mean that [the PLA] remains qualitatively inferior, in some respects, to more technologically advanced armed forces in the region—such as South Korea and Japan—and it lags far behind the U.S.[86] The IISS also points out that China's aircraft carrier has "yet to demonstrate the capabilities that would enable carrier battle group operations" and limitations with regard to its capacity for "sustained conflict within the region" and deployment beyond the region.[87] Neither the 2016 nor the 2015 edition of the *Military Balance* contains either of these caveats. The 2016 edition, however, does state that "without evidence from active operations...the actual extent of improvements...remain difficult to assess."[88]

This *Index* assesses the overall threat from China, considering the range of contingencies, as "aggressive" for level of provocation of behavior and "gathering" for level of capability. These are the same levels as the 2016 *Index*.

Threats: China

	HOSTILE	AGGRESSIVE	TESTING	ASSERTIVE	BENIGN
Behavior		✓			

	FORMIDABLE	GATHERING	CAPABLE	ASPIRATIONAL	MARGINAL
Capability		✓			

North Korea. In the first instance, North Korea poses the most acute security challenge for American allies and bases in South Korea. However, it is also a significant challenge to U.S. allies in Japan and American bases there and in Guam.

North Korean authorities are very actively and vocally provocative toward the United States. While North Korea has used its missile and nuclear tests to enhance its prestige and importance—domestically, regionally, and globally—and to extract various concessions from the United States in negotiations over its nuclear program and various aid packages, such developments also improve North Korea's military posture. North Korea likely

has already achieved warhead miniaturization, the ability to place nuclear weapons on its medium-range missiles, and an ability to reach the continental United States with a missile.

According to the IISS *Military Balance*, key weapons in North Korea's inventory include 3,500-plus main battle tanks, 560-plus light tanks, and 21,100 pieces of artillery. The navy has 73 tactical submarines, three frigates, and 383 patrol and coastal combatants.[89] The air force has 545 combat-capable aircraft (58 fewer than 2014), including 80 H-5 bombers. The IISS counts 1,020,000 members of the North Korean army. Regarding the missile threat in particular, the 2016 *Military Balance* states that "U.S. officials now view the so-far-untested Hwasong-13 (KN-08) road-mobile ICBM as operational"[90] and cites "the lack of a full flight test of the SLBM prototype." More generally, the 2014 *Military Balance* carries a caveat that military "[e]quipment is mainly in a poor state, and training, morale and operational readiness all remain questionable."[91]

This *Index* assesses the overall threat from North Korea, considering the range of contingencies, as "aggressive" for level of provocation of behavior and "gathering" for level of capability. It is noted that the provocation score for North Korea has dropped from "hostile" in the 2016 *Index*, but only because this score fell just below the numerical level assigned to that score and remains just short of "aggressive" and "hostile." If the nation engages in further provocative actions toward U.S. interests, the level of provocation could return to the highest threat level.

Threats: North Korea

	HOSTILE	AGGRESSIVE	TESTING	ASSERTIVE	BENIGN
Behavior		✓			

	FORMIDABLE	GATHERING	CAPABLE	ASPIRATIONAL	MARGINAL
Capability		✓			

Endnotes:

1. Dan Lamothe, "'Probably the Largest' al-Qaeda Training Camp Ever Destroyed in Afghanistan," *The Washington Post*, October 30, 2015, https://www.washingtonpost.com/news/checkpoint/wp/2015/10/30/probably-the-largest-al-qaeda-training-camp-ever-destroyed-in-afghanistan/ (accessed August 4, 2016).
2. James R. Clapper, Director of National Intelligence, "Statement for the Record: Worldwide Threat Assessment of the US Intelligence Community, Senate Armed Services Committee," February 11, 2014, http://www.dni.gov/files/documents/2014%20WWTA%20SFR_SASC_11_Feb.pdf (accessed September 17, 2014).
3. Mark Landler, "Obama Says He Will Keep More Troops in Afghanistan Than Planned," The New York Times, July 6, 2016, http://www.nytimes.com/2016/07/07/world/asia/obama-afghanistan-troops.html (accessed August 4, 2016).
4. Rebecca Kheel, "General: ISIS in Afghanistan Potentially an 'Enormous' Threat," *The Hill*, April 14, 2016, http://thehill.com/policy/defense/276325-general-isis-in-afghanistan-potentially-enormous-threat (accessed August 4, 2016).
5. "Terrorist Attacks Kill 1,079 People in Year 2015: PIPS Report," *The News*, January 5, 2016, http://www.thenews.com.pk/latest/86585-Terrorist-attacks-kill-1079-people-in-year-2015-PIPS-report (accessed August 4, 2016).
6. Reuters, "Pakistani Man Arrested on U.S. Terrorism Charges," September 2, 2011, http://www.reuters.com/article/2011/09/02/us-pakistan-usa-arrest-idUSTRE7815M920110902 (accessed September 17, 2014).
7. Abha Shankar, "Trial's First Week Reinforces Pakistani Intelligence Suspicions," Investigative Project on Terrorism, *IPT News*, May 27, 2011, http://www.investigativeproject.org/2919/trial-first-week-reinforces-pakistani (accessed September 17, 2014).
8. Peter R. Lavoy, ed., *Asymmetric Warfare in South Asia: The Causes and Consequences of the Kargil Conflict* (Cambridge: Cambridge University Press, 2009), p. 10.
9. Matthew Bunn, *Securing the Bomb 2010: Securing All Nuclear Materials in Four Years* (Cambridge, MA, and Washington, DC: Project on Managing the Atom, Belfer Center for Science and International Affairs, Harvard Kennedy School, and Nuclear Threat Initiative, April 2010), http://belfercenter.ksg.harvard.edu/publication/20068/securing_the_bomb_2010.html (accessed June 6, 2013).
10. "Pakistan's Future: Resilient Mess," *The Economist*, February 11, 2012, http://www.economist.com/node/21547231 (accessed September 17, 2014).
11. Stephen P. Cohen, "The Future of Pakistan," The Brookings Institution, January 2011, https://www.brookings.edu/wp-content/uploads/2016/06/01_pakistan_cohen.pdf (accessed August 9, 2016).
12. James R. Clapper, Director of National Intelligence, "Statement for the Record: Worldwide Threat Assessment of the US Intelligence Community, Senate Armed Services Committee," February 9, 2016, pp. 26–27, https://www.armed-services.senate.gov/imo/media/doc/Clapper_02-09-16.pdf (accessed August 4, 2016). Cited hereafter as 2016 WWTA.
13. Yonhap News Agency, "N.K. Calls Itself 'Nuclear-armed State' in Revised Constitution," May 30, 2012, http://english.yonhapnews.co.kr/northkorea/2012/05/30/76/0401000000AEN20120530005200315F.HTML (accessed August 4, 2016).
14. Anna Fifield, "North Korea's Making a Lot of Threats These Days. How Worried Should We Be?," *The Washington Post*, March 11, 2016, https://www.washingtonpost.com/news/worldviews/wp/2016/03/11/north-koreas-making-a-lot-of-threats-these-days-how-worried-should-we-be/ (accessed August 4, 2016).
15. Voice of America, "S. Korea Says Debris Reveals North's ICBM Technology," December 23, 2012, http://www.voanews.com/content/north-korea-missile/1570703.html (accessed September 17, 2014).
16. U.S. Department of Defense, "DOD News Briefing on Missile Defense from the Pentagon," March 15, 2013, http://archive.defense.gov/Transcripts/Transcript.aspx?TranscriptID=5205 (accessed December 23, 2014).
17. General Curtis Scaparrotti, United States Army, Commander, United Nations Command/Combined Forces Command/U.S. Forces Korea, testimony in "Transcript: Senate Armed Services Committee Hearing on the U.S. Pacific Command & US Forces Korea," April 17, 2015, http://www.pacom.mil/Media/SpeechesTestimony/tabid/6706/Article/585392/transcript-senate-armed-services-committee-hearing-on-the-us-pacific-command-us.aspx (accessed June 5, 2015).
18. U.S. Department of Defense, "Department of Defense Press Briefing by Admiral Gortney in the Pentagon Briefing Room," April 7, 2015, http://www.defense.gov/Transcripts/Transcript.aspx?TranscriptID=5612 (accessed June 5, 2015).
19. John Schilling, "A New Submarine-Launched Ballistic Missile for North Korea," Johns Hopkins University, Paul H. Nitze School of Advanced International Studies, U.S.–Korea Institute, 38 North, April 25, 2016, http://38north.org/2016/04/jschilling042516/ (accessed August 4, 2016).
20. Bruce Klingner, "Allies Should Confront Imminent North Korean Nuclear Threat," Heritage Foundation *Backgrounder* No. 2913, June 3, 2014, http://www.heritage.org/research/reports/2014/06/allies-should-confront-imminent-north-korean-nuclear-threat.

21. Andrew S. Erickson and Michael S. Chase, "China's SSBN Forces: Transitioning to the Next Generation," *China Brief*, Vol. 9, Issue 12 (June 12, 2009), http://www.jamestown.org/single/?no_cache=1&tx_ttnews[tt_news]=35120#.U5G0OSjb5NQ (accessed September 17, 2014).
22. For more information on China's cruise missile program, see Dennis M. Gormley, Andrew S. Erickson, and Jongdong Yuan, *A Low-Visibility Force Multiplier: Assessing China's Cruise Missile Ambitions* (Washington: National Defense University Press, 2014), http://ndupress.ndu.edu/Portals/68/Documents/Books/force-multiplier.pdf (accessed August 4, 2016).
23. 2016 WWTA, p. 7.
24. 2016 WWTA, pp. 6–7.
25. International Crisis Group, "North Korea's Nuclear and Missile Programs," *Asia Report* No. 168, June 18, 2009, http://www.crisisgroup.org/~/media/Files/asia/north-east-asia/north-korea/168_north_koreas_nuclear_and_missile_programs.ashx (accessed October 10, 2014).
26. U.S. Department of Defense, Office of the Secretary of Defense, *Military and Security Developments Involving the Democratic People's Republic of Korea 2013*, Annual Report to Congress, 2014, http://www.defense.gov/Portals/1/Documents/pubs/North_Korea_Military_Power_Report_2013-2014.pdf (accessed August 5, 2016).
27. Bruce E. Bechtol, Jr., "Understanding the North Korean Military Threat to the Security of the Korean Peninsula and Northeast Asia: Declined or Evolved?" *Korea Observer*, Vol. 40, No. 1 (Spring 2009), pp. 115–154.
28. Bruce W. Bennett, "A Brief Analysis of the Republic of Korea's Defense Reform Plan," RAND Corporation *Occasional Paper* No. OP-165-OSD, December 2005, http://www.rand.org/content/dam/rand/pubs/occasional_papers/2006/RAND_OP165.pdf (accessed September 18, 2014).
29. Yonhap News Agency, "N. Korea to Have 20 Nuke Bombs by 2016: U.S. Expert," December 10, 2014, http://english.yonhapnews.co.kr/national/2014/12/10/13/0301000000AEN20141210010100315F.html (accessed August 4, 2016).
30. Joel S. Wit and Sun Young Ahn, "North Korea's Nuclear Futures: Technology and Strategy," Johns Hopkins University, Paul H. Nitze School of Advanced International Studies, U.S.–Korea Institute, North Korea's Nuclear Futures Series, February 2015, http://38north.org/wp-content/uploads/2015/02/NKNF-NK-Nuclear-Futures-Wit-0215.pdf (accessed August 5, 2016).
31. Bruce Klingner, "Allies Should Confront Imminent North Korean Nuclear Threat," Heritage Foundation *Backgrounder* No. 2913, June 3, 2014, http://www.heritage.org/research/reports/2014/06/allies-should-confront-imminent-north-korean-nuclear-threat#_ftn30.
32. Joby Warrick and Peter Slevin, "Libyan Arms Designs Traced Back to China," *The Washington Post*, February 15, 2004, http://www1.udel.edu/globalagenda/2004/student/readings/libya-chinaconnection.html (accessed August 5, 2016); David E. Sanger, "U.S. Sees More Arms Ties Between Pakistan and Korea," *The New York Times*, March 14, 2014, http://www.nytimes.com/2004/03/14/international/asia/14KORE.html (accessed October 10, 2014).
33. David Albright, "North Korean Miniaturization," Johns Hopkins University, Paul H. Nitze School of Advanced International Studies, U.S.–Korea Institute, 38 North, February 13, 2013, http://38north.org/2013/02/albright021313/ (accessed September 17, 2014).
34. R. Jeffrey Smith and Joby Warrick, "Pakistani Scientist Depicts More Advanced Nuclear Program in North Korea," *The Washington Post*, December 28, 2009, http://www.washingtonpost.com/wp-dyn/content/article/2009/12/27/AR2009122701205.html (accessed October 10, 2014); Pervez Musharraf, *In the Line of Fire: A Memoir* (New York: Free Press, 2006), p. 296.
35. North Korea Leadership Watch, "National Defense Commission, Foreign Ministry Issues Statements on Foal Eagle, Key Resolve," March 6, 2016, https://nkleadershipwatch.wordpress.com/2016/03/06/national-defense-commission-foreign-ministry-issues-statements-on-foal-eagle-key-resolve/ (accessed August 5, 2016).
36. Richard Engel, "Will North Korea Follow Through on Nuclear Threats?" NBC News, April 3, 2013, http://www.nbcnews.com/video/nightly-news/51421978 (accessed September 17, 2014).
37. 2016 WWTA, pp. 6–7.
38. Ibid., p. 17.
39. International Institute for Strategic Studies, *Strategic Survey 2013: The Annual Review of World Affairs* (London: Routledge, 2013), p. 32.
40. Ibid, p. 31; David J. Karl, "Nuclear South Asia Is More Stable Than You Think," *Foreign Policy*, South Asia Channel, May 28, 2014, http://southasia.foreignpolicy.com/posts/2014/05/28/nuclear_south_asia_is_more_stable_than_you_think (accessed September 17, 2014).
41. "India Condemns Pak Support to Hafiz Saeed's Rally in Lahore," *India Today*, December 14, 2014, http://indiatoday.intoday.in/story/hafiz-saeed-pakistan-lahore-rally-26-11-mumbai-attacks-jud-al-qaeda/1/405036.html (accessed August 5, 2016).

42. "Spate of Violations: DGMOs to Reduce Cross-border, LoC Tensions," *Express Tribune*, August 27, 2014, http://tribune.com.pk/story/754176/spate-of-violations-dgmos-to-reduce-cross-border-loc-tensions/ (accessed August 5, 2016).
43. International Institute for Strategic Studies, *Strategic Survey 2013*, p. 31.
44. 2016 WWTA, p. 27.
45. Major General P.J.S. Sandhu (Retd), "Border Defence Cooperation Agreement—What Next?" United Service Institution of India, October 28, 2013, http://www.usiofindia.org/Article/?pub=Strategic%20Perspective&pubno=38&ano=2003 (accessed September 17, 2014).
46. N.C. Bipindra, "India, China Skid on Visa, Ink Border Pact," *New Indian Express*, October 24, 2013, http://newindianexpress.com/nation/India-China-skid-on-visa-ink-border-pact/2013/10/24/article1852361.ece (accessed October 10, 2014).
47. Nirupama Subramanian, "India, China Not to Use Force in Case of Face-offs," *The Hindu*, October 24, 2013, http://www.thehindu.com/todays-paper/india-china-not-to-use-force-in-case-of-faceoffs/article5266608.ece (accessed September 18, 2014).
48. James R. Clapper, Director of National Intelligence, "Statement for the Record: Worldwide Threat Assessment of the US Intelligence Community, Senate Armed Services Committee," February 26, 2015, p. 22, http://www.armed-services.senate.gov/imo/media/doc/Clapper_02-26-15.pdf (accessed August 5, 2016).
49. Madison Park, "Why China's New Air Zone Incensed Japan, U.S.," CNN, November 27, 2013, http://www.cnn.com/2013/11/25/world/asia/china-japan-island-explainer/ (accessed September 17, 2014).
50. David Brunnstrom and Andrea Shalal, "Exclusive: U.S. Sees New Chinese Activity Around South China Sea Shoal," Reuters, March 19, 2016, http://www.reuters.com/article/us-southchinasea-china-scarborough-exclu-idUSKCN0WK01B (accessed August 5, 2016).
51. Tim Hume, "Close Call as China Scrambles Fighter Jets on Japanese Aircraft in Disputed Territory," CNN World, updated May 26, 2014, http://www.cnn.com/2014/05/26/world/asia/china-japan-jets-scramble/ (accessed November 12, 2014).
52. International Institute for Strategic Studies, *The Military Balance 2014: The Annual Assessment of Global Military Capabilities and Defence Economics* (London: Routledge, 2014), p. 292.
53. U.S. Department of Defense, Office of the Secretary of Defense, *Military and Security Developments Involving the People's Republic of China 2014*, Annual Report to Congress, 2014, p. 33, http://www.defense.gov/Portals/1/Documents/pubs/2014_DoD_China_Report.pdf (accessed August 5, 2016).
54. Zachary Keck, "Putin Approves Sale of S-400 to China," *The Diplomat*, April 11, 2014, http://thediplomat.com/2014/04/putin-approves-sale-of-s-400-to-china/ (accessed September 17, 2014).
55. Xinhua, "Full Text: China's National Defense in 2010," March 31, 2011, http://news.xinhuanet.com/english2010/china/2011-03/31/c_13806851.htm (accessed November 12, 2014).
56. 2016 WWTA, p. 16.
57. While it has long been a matter of U.S. policy that Philippine territorial claims in the South China Sea lie outside the scope of American treaty commitments, the treaty does apply in the event of an attack on Philippine "armed forces, public vessels or aircraft in the Pacific." Mutual Defense Treaty Between the United States and the Republic of the Philippines, August 30, 1951, Article V, http://avalon.law.yale.edu/20th_century/phil001.asp (accessed August 5, 2016). In any event, Article IV of the Treaty obligates the U.S. in case of such an attack to "meet the common dangers in accordance with its constitutional processes." Regardless of formal treaty obligations, however, enduring U.S. interests in the region and perceptions of U.S. effectiveness and reliability as a check on growing Chinese ambitions would likely spur the U.S. to become involved.
58. 2016 WWTA, p. 16.
59. Xinhua, "China Announces Success in Technology to Refuel Satellites in Orbit," June 30, 2016, http://news.xinhuanet.com/english/2016-06/30/c_135479061.htm (accessed August 5, 2016).
60. Mei Lianju, *Space Operations Teaching Materials* (Beijing, PRC: Academy of Military Sciences Publishing House, 2013), p. 65.
61. Brian Weeden, "Through a Glass Darkly: Chinese, American, and Russian Anti-Satellite Testing in Space," *The Space Review*, March 17, 2014, http://www.thespacereview.com/article/2473/1 (accessed September 17, 2014).
62. Ian Easton, *The Great Game in Space: China's Evolving ASAT Weapons Programs and Their Implications for Future U.S. Strategy*, Project 2049 Institute, 2009, pp. 4–5.
63. Mei Lianju, *Space Operations Teaching Materials*, p. 69.

64. Peter B. de Selding, "Runaway Zombie Satellite Galaxy 15 Continues to Pose Interference Threat," Space.com, October 15, 2010, http://www.space.com/9340-runaway-zombie-satellite-galaxy-15-continues-pose-interference-threat.html (accessed September 17, 2014).
65. 2016 WWTA, pp. 9–10.
66. Stephanie Henry, "Verizon Report Describes Trends in International Data Breaches, China-Based Espionage," US–China Business Council, http://www.uschina.org/washington-update/verizon-report-describes-trends-international-data-breaches-china-based-espionage (accessed August 5, 2016); Lucian Constantin, "Verizon: One in Five Data Breaches Are the Result of Cyberespionage," *PC World*, April 23, 2013, http://www.pcworld.com/article/2036177/one-in-five-data-breaches-are-the-result-of-cyberespionage-verizon-says.html (accessed September 17, 2014).
67. Dan McWhorter, "Mandiant Exposes APT1—One of China's Cyber Espionage Units and 3,000 Indicators," Mandiant, February 18, 2013, https://www.mandiant.com/blog/mandiant-exposes-apt1-chinas-cyber-espionage-units-releases-3000-indicators/ (accessed October 12, 2014).
68. Bai Bangxi and Jiang Lijun, "Systems of Systems Conflict Is Not the Same as Systems Conflict," *National Defense Newspaper*, January 10, 2008.
69. News release, "U.S. Charges Five Chinese Military Hackers for Cyber Espionage Against U.S. Corporations and a Labor Organization for Commercial Advantage," U.S. Department of Justice, May 19, 2014, http://www.justice.gov/opa/pr/us-charges-five-chinese-military-hackers-cyber-espionage-against-us-corporations-and-labor (accessed November 12, 2014).
70. Guo Ruobing, *Theory of Military Information Security* (Beijing, PRC: National Defense University Publishing House, 2013), pp. 12–21.
71. Tan Rukan, *Building Operational Strength Course Materials* (Beijing, PRC: Academy of Military Sciences Publishing House, 2012), p. 204.
72. "Cyber Attack Retaliation Against Seoul's Move to Join 'Cyber Storm,'" *The Korea Herald*, July 7, 2009, http://www.koreaherald.com/common_prog/newsprint.php?ud=20090710000075&dt=2 (accessed July 23, 2014).
73. "N.Korea Boosting Cyber Warfare Capabilities," *Chosun Ilbo*, November 5, 2013, http://english.chosun.com/site/data/html_dir/2013/11/05/2013110501790.html (accessed July 23, 2014).
74. Yoon Sangwon, "North Korea Recruits Hackers at School," Al Jazeera, June 20, 2011, http://www.aljazeera.com/indepth/features/2011/06/201162081543573839.html (accessed July 23, 2014).
75. Kelly Beaucar Vlahos, "Special Report: The Cyberwar Threat from North Korea," Fox News, February 14, 2014, http://www.foxnews.com/tech/2014/02/14/cyberwar-experts-question-north-korea-cyber-capabilities/ (accessed August 8, 2014).
76. Choi He-suk, "N.K. Third for Cyber War Capabilities," *The Korea Herald*, June 7, 2012, http://www.koreaherald.com/view.php?ud=20120607001276 (accessed August 5, 2016).
77. Nicole Perlroth and Michael Corkery, "North Korea Linked to Digital Attacks on Global Banks," *The New York Times*, May 26, 2016, http://www.nytimes.com/2016/05/27/business/dealbook/north-korea-linked-to-digital-thefts-from-global-banks.html (accessed August 5, 2016).
78. 2016 WWTA, p. 3.
79. Ibid.
80. Yuan Wenxian, *Joint Campaign Information Operations Teaching Materials* (Beijing, PRC: National Defense University Press, 2009), pp. 109–112.
81. International Institute for Strategic Studies, *The Military Balance 2014*, p. 220.
82. International Institute for Strategic Studies, *The Military Balance 2016: The Annual Assessment of Global Military Capabilities and Defence Economics* (London: Routledge, 2016), p. 280.
83. Ibid. and International Institute for Strategic Studies, *The Military Balance 2015: The Annual Assessment of Global Military Capabilities and Defence Economics* (London: Routledge, 2015), pp. 276–277.
84. International Institute for Strategic Studies, *The Military Balance 2016*, p. 240. The Pentagon's annual report to Congress on PRC-related military and security developments, however, contains higher estimates, including 1,200 SRBMs. See U.S. Department of Defense, Office of the Secretary of Defense, *Military and Security Developments Involving the People's Republic of China 2016*, Annual Report to Congress, 2016, p. 109, http://www.defense.gov/Portals/1/Documents/pubs/2016%20China%20Military%20Power%20Report.pdf (accessed August 5, 2016).
85. International Institute for Strategic Studies, *The Military Balance 2016*, pp. 240–242, 245.
86. International Institute for Strategic Studies, *The Military Balance 2014*, p. 231.

87. Ibid.
88. International Institute for Strategic Studies, *The Military Balance 2015*, p. 237.
89. International Institute for Strategic Studies, *The Military Balance 2016*, p. 265.
90. Ibid., p. 264–246.
91. International Institute for Strategic Studies, *The Military Balance 2014*, p. 254.

Conclusion: Global Threat Level

America and its interests face challenges around the world from countries and organizations that have:

- Interests that conflict with those of the U.S.;
- Sometimes hostile intentions toward the U.S.; and
- In some cases, growing military capabilities.

The government of the United States faces the constant challenge of employing the right mix of U.S. diplomatic, economic, public information, intelligence, and military capabilities, sometimes alone but more often with allies, to protect and advance U.S. interests.

In Europe, Russia remains the primary threat to American interests. The *2017 Index* assessed the threat emanating from Russia as a behavior score of "aggressive" and a capability score of "formidable," the highest category on the scale. Russia has increased its support to separatist movements in Ukraine; has engaged in massive pro-Russia propaganda campaigns internal to Ukraine and in other Eastern European countries; and over the past year has performed a series of provocative military exercises and training missions that are viewed as warning signals to neighboring countries, particularly the Baltics. It also has increased its investment in modernizing its military and has gained significant combat experience while supporting the government of Bashar al-Assad in Syria.

In the Middle East, Iran continues to be the state actor most hostile to American interests. The *2017 Index* assessed Iran's behavior as "aggressive," and its capability has increased to "gathering." Since publication of the *2015 Index*, Iran has methodically moved closer to becoming a nuclear power, successfully maneuvering to stabilize its program via the nuclear agreement negotiated with the U.S.; has continued to back Houthi rebels in Yemen in what some consider a proxy war between Iran and its Sunni Arab neighbors; has continued to exert influence in the region through its backing of the Assad regime and Hezbollah; and has further deepened its involvement in the instability of Iraq by providing direct support to Shia militias.

Also in the Middle East, a broad array of terrorist groups, most notably ISIS and the Iran-sponsored Hezbollah, are the most hostile of any of the global threats to America examined in the *Index*. They also, however, are evaluated as among the least capable. In 2016, the threat posed by ISIS increased dramatically through a combination of highly publicized acts of brutality, territorial gains in Iraq and Syria, and aggressive campaigns both for recruiting and for inciting "lone wolf" attacks around the globe. Terrorism in the region reached new "lows" in atrocities as ISIS and other terrorist groups redoubled their efforts to solidify and expand their control of sub-regions.

In Asia, China remained "aggressive" in its provocative behavior. China moved to militarize the islands that it built on reefs in international waters, continuing to claim them. It

also has continued to field new equipment, most notably in naval power, perceived to be most important in its efforts to shape the maritime domain of the western Pacific in line with its interests.

North Korea's level of behavior dropped back to "aggressive" from the "hostile" level noted in the *2016 Index*. The *2017 Index* assesses North Korea's capability level as remaining at "gathering" as Pyongyang continues to develop and refine its missile technology, especially in the area of submarine-launched ballistic missiles.

The terrorist threats emanating from the Afghanistan–Pakistan region subsided somewhat to "testing," a notch down from the *2016 Index's* level of "aggressive." The capability score for the region's terrorist threat remained at "gathering."

Just as there are American interests that are not covered by this *Index*, there may be additional threats to American interests that are not identified here. The *Index* focuses on the more apparent sources of risk and those in which the risk is greater.

Compiling the assessments of these threat sources, the *2017 Index* rates the overall global threat environment as "aggressive" and "gathering" in the areas of threat actor behavior and material ability to harm U.S. security interests, respectively, leading to an aggregated threat score of "high." This score is a full category worse than the *2016 Index* assessment of "elevated," driven by increases in the capability of Russia, Iran, and terrorist actors in the Middle East to harm U.S. national security interests.

Behavior of Threats

	HOSTILE	AGGRESSIVE	TESTING	ASSERTIVE	BENIGN
Russia		✓			
Iran		✓			
Middle East Terrorism	✓				
Af-Pak Terrorism			✓		
China		✓			
North Korea		✓			
OVERALL		✓			

Capability of Threats

	FORMIDABLE	GATHERING	CAPABLE	ASPIRATIONAL	MARGINAL
Russia	✓				
Iran		✓			
Middle East Terrorism			✓		
Af-Pak Terrorism		✓			
China		✓			
North Korea		✓			
OVERALL		✓			

Threats to U.S. Vital Interests

	SEVERE	HIGH	ELEVATED	GUARDED	LOW
Russia		✓			
Iran		✓			
Middle East Terrorism		✓			
Af-Pak Terrorism		✓			
China		✓			
North Korea		✓			
OVERALL		✓			

Our combined score for threats to U.S. vital interests can be summarized thus:

Threats to U.S. Vital Interests

SEVERE	HIGH	ELEVATED	GUARDED	LOW

U.S. Military Power

An Assessment of U.S. Military Power

America is a global power with global interests. Its military is meant first and foremost to defend America from attack. Beyond that, it is meant to protect Americans abroad, allies, and the freedom to use international sea, air, and space while retaining the ability to engage in more than one major contingency at a time. America must be able not only to defend itself and its interests, but also to deter enemies and opportunists from taking action that would challenge U.S. interests, a capability that includes preventing the destabilization of a region and guarding against threats to the peace and security of America's friends

As noted in the two preceding editions of the *Index*, however, the U.S. does not have the right force to meet a two–major regional contingency (two-MRC) requirement and is not ready to carry out its duties effectively. Consequently, as was seen during 2016, the U.S. risks seeing its interests increasingly challenged and the world order it has led since World War II undone.

How to Think About Sizing Military Power

Military power begins with the people and equipment used to conduct war: the weapons, tanks, ships, airplanes, and supporting tools such as communications systems that make it possible either for one group to impose its will on another or to prevent such an outcome from happening.

However, simply counting the number of people, tanks, or combat aircraft that the U.S. possesses would be irrelevant because it would lack context. For example, the U.S. Army might have 100 tanks, but to accomplish a specific military task, 1,000 or more tanks might be needed or none at all. It might be that the terrain on which a battle is fought is especially ill-suited to tanks or that the tanks one has are inferior to the enemy's. The enemy could be quite adept at using tanks, or his tank operations might be integrated into a larger employment concept that leverages the supporting fires of infantry and airpower, whereas one's own tanks are poorly maintained, the crews are ill-prepared, or one's doctrine is irrelevant.

Success in war is partly a function of matching the tools of warfare to a specific task and employing those tools effectively in the conditions of the battle. Get these wrong—tools, objective, competency, or context—and you lose.

Another key element is the military's capacity to conduct operations: how many of the right tools—people, tanks, planes, or ships—it has. One might have the right tools and know how to use them effectively but not have enough to win. Given that one cannot know with certainty beforehand just when, where, against whom, and for what reason a battle might be fought, determining how much capability is needed is an exercise of informed, but not certain, judgment.

Further, two different combatants can use the same set of tools in radically different ways to quite different effects. The concept of employment matters. Concepts are developed to account for numbers, capabilities, material readiness, and all sorts of other factors that enable or constrain one's actions, such as whether one fights alone or alongside allies, on familiar or strange terrain, or with a

large, well-equipped force or a small, poorly equipped force.

All of these factors and a multitude of others bear upon the outcome of any military contest. Military planners attempt to account for them when devising requirements, developing training and exercise plans, formulating war plans, and providing advice to the President in his role as Commander in Chief of U.S. military forces.

Measuring hard combat power in terms of its adequacy in capability, capacity, and readiness to defend U.S. vital interests is hard, especially in such a limited space as this *Index*, but it is not impossible. Regardless of the difficulty of determining the adequacy of one's military forces, the Secretary of Defense and the military services have to make decisions every year when the annual defense budget request is submitted to Congress.

The adequacy of hard power is affected most directly by the resources the nation is willing to invest. While that investment decision is informed to a significant degree by an appreciation of threats to U.S. interests and the ability of a given defense portfolio to protect U.S. interests against such threats, it is not informed solely by such considerations; hence the importance of clarity and honesty in determining just what is needed in hard power and the status of such power from year to year.

Administrations take various approaches in determining the type and amount of military power needed and, by extension, the amount of money and other resources to commit to it. After defining the national interests to be protected, the Department of Defense can use worst-case scenarios to determine the maximum challenges the U.S. military might have to overcome. Another way is to redefine what constitutes a threat. By taking a different view of whether major actors pose a meaningful threat and of the extent to which friends and allies have the ability to assist the U.S. in meeting security objectives, one can arrive at different conclusions about necessary military strength.

For example, one Administration might view China as a rising, belligerent power bent on dominating the Asia–Pacific. Another Administration might view China as an inherently peaceful, rising economic power, with the expansion of its military capabilities a natural occurrence commensurate with its strengthening status. The difference between these views can have a dramatic impact on how one thinks about U.S. defense requirements. So, too, can policymakers amplify or downplay risk to justify defense budget decisions.

There can also be strongly differing views on requirements for operational capacity.

- Does the country need enough for two major combat operations (MCOs) at roughly the same time or just enough for a single major operation plus some number of lesser cases?

- To what extent should "presence" tasks—the use of forces for routine engagement with partner countries or simply to be on hand in a region for crisis response—be additive to or a subset of a military force sized to handle two major regional conflicts?

- How much value should be assigned to advanced technologies as they are incorporated into the force?

Where to Start

There are references that one can use to help sort through the variables and arrive at a starting point for assessing the adequacy of today's military posture: government studies and historical experience. The government occasionally conducts formal reviews meant to inform decisions on capabilities and capacities across the Joint Force relative to the threat environment (current and projected) and evolutions in operating conditions, the advancement of technologies, and aspects of U.S. interests that may call for one type of military response over another.

The 1993 Bottom-Up Review (BUR), conducted by then-Secretary of Defense Les

Aspin, is one such frequently cited example. Secretary Aspin recognized that "the dramatic changes that [had] occurred in the world as a result of the end of the Cold War and the dissolution of the Soviet Union" had "fundamentally altered America's security needs" and were driving an imperative "to reassess all of our defense concepts, plans, and programs from the ground up."[1]

The BUR formally established the requirement that U.S. forces should be able "to achieve decisive victory in two nearly simultaneous major regional conflicts [MRCs] and to conduct combat operations characterized by rapid response and a high probability of success, while minimizing the risk of significant American casualties."[2] Thus was formalized the two-MRC standard.

Dr. Daniel Gouré, in his 2015 *Index* essay "Building the Right Military for a New Era: The Need for an Enduring Analytic Framework," noted that various Administrations have redefined force requirements based on their perceptions of what was necessary to protect U.S. interests.[3] In an attempt to formalize the process, and perhaps to have a mechanism by which to exert influence on the executive branch in such matters,[4] Congress mandated that each incoming Administration must conduct a comprehensive strategic review of the global security environment, articulate a relevant strategy suited to protecting and promoting U.S. security interests, and recommend an associated military force posture.

The Quadrennial Defense Reviews (QDRs) have been conducted since 1997, accompanied in 1997, 2010, and 2014 by independent National Defense Panel (NDP) reports that have reviewed and commented on them. Both sets of documents purport to serve as key assessments, but analysts have come to minimize their value, regarding them as justifications for executive branch policy preferences (the QDR reports) or overly broad, generalized commentaries (the NDP reports) that lack substantive discussion about threats to U.S. interests, a credible strategy for dealing with them, and the actual ability of the U.S. military to meet national security requirements.

Correlation of Forces as a Factor in Force Sizing

During the Cold War, the U.S. used the Soviet threat as its primary reference in determining its hard-power needs. At that time, the correlation of forces—a comparison of one force against another to determine strengths and weaknesses—was highly symmetrical. U.S. planners compared tanks, aircraft, and ships against their direct counterparts in the opposing force. These comparative assessments drove the sizing, characteristics, and capabilities of fleets, armies, and air forces.

The evolution of guided, precision munitions and the rapid technological advancements in surveillance and targeting systems, however, have made comparing combat power more difficult. What was largely a platform v. platform model has shifted somewhat to a munitions v. target model.

The proliferation of precise weaponry increasingly means that each round, bomb, rocket, missile, and even individual bullet (in some instances) can hit its intended target, thus decreasing the number of munitions needed to prosecute an operation. It also means that the lethality of an operating environment increases significantly for the people and platforms involved. We are now at the point where one must consider how many "smart munitions" the enemy has when thinking about how many platforms and people are needed to win a combat engagement instead of focusing primarily on how many ships or airplanes the enemy can bring to bear against one's own force.[5]

In one sense, increased precision and the technological advances now being incorporated into U.S. weapons, platforms, and operating concepts make it possible to do far more with fewer assets than ever before. Platform signature reduction (stealth) makes it harder for the enemy to find and target them, while the increased precision of weapons makes it possible for fewer platforms to hit many more

targets. Additionally, the ability of the U.S. Joint Force to harness computers, modern telecommunications, space-based platforms—such as for surveillance, communications, positioning-navigation-timing (PNT) support from GPS satellites—and networked operations potentially means that smaller forces can have far greater effect in battle than at any other time in history. But these same advances also enable enemy forces, and certain military functions—such as seizing, holding, and occupying territory—may require a certain number of soldiers no matter how state-of-the-art their equipment may be.

With smaller forces, each individual element of the force represents a greater percentage of its combat power. Each casualty or equipment loss takes a larger toll on the ability of the force to sustain high-tempo, high-intensity combat operations over time, especially if the force is dispersed across a wide theater or across multiple theaters of operation.

As advanced technology has become more affordable, it has become more accessible for nearly any actor, whether state or non-state. Consequently, it may be that the outcomes of future wars will depend to a much greater degree on the skill of the forces and their capacity to sustain operations over time than they will on some great disparity in technology. If so, readiness and capacity will take on greater importance than absolute advances in capability.

All of this illustrates the difficulties of and need for exercising judgment in assessing the adequacy of America's military power. Yet without such an assessment, all that we are left with are the quadrennial strategic reviews, which are subject to filtering and manipulation to suit policy interests; annual budget submissions, which typically favor desired military programs at presumed levels of affordability and are therefore necessarily budget-constrained; and leadership posture statements, which often simply align with executive branch policy priorities.

The U.S. Joint Force and the Art of War

This section of the *Index*, on military capabilities, assesses the adequacy of the United States' defense posture as it pertains to a conventional understanding of "hard power," defined as the ability of American military forces to engage and defeat an enemy's forces in battle at a scale commensurate with the vital national interests of the U.S. While some hard truths in military affairs are appropriately addressed by math and science, others are not. Speed, range, probability of detection, and radar cross-section are examples of quantifiable characteristics that can be measured. Specific future instances in which U.S. military power will be needed, the competency of the enemy, the political will to sustain operations in the face of mounting deaths and destruction, and the absolute amount of strength needed to win are matters of judgment and experience, but they nevertheless affect how large and capable a force one might need.

In conducting the assessment, we accounted for both quantitative and qualitative aspects of military forces, informed by an experience-based understanding of military operations and the expertise of external reviewers.

Military effectiveness is as much an art as it is a science. Specific military capabilities represented in weapons, platforms, and military units can be used individually to some effect. Practitioners of war, however, have learned that combining the tools of war in various ways and orchestrating their tactical employment in series or simultaneously can dramatically amplify the effectiveness of the force committed to battle.

Employment concepts are exceedingly hard to measure in any quantitative way, but their value as critical contributors in the conduct of war is undeniable. How they are utilized is very much an art-of-war matter, learned through experience over time.

What Is Not Being Assessed

In assessing the current status of the military forces, this *Index* uses the primary

references used by the military services themselves when they discuss their ability to employ hard combat power. The Army's unit of measure is the brigade combat team (BCT), while the Marine Corps structures itself by battalions. For the Navy, it is the number of ships in its combat fleet, and the most consistent reference for the Air Force is total number of aircraft, sometimes broken down into the two primary sub-types of fighters and bombers.

Obviously, this is not the totality of service capabilities, and it certainly is not everything needed for war, but these measures can be viewed as surrogate measures that subsume or represent the vast number of other things that make these "units of measure" possible and effective in battle. There is an element of proportionality or ratio related to these measures that drives other aspects of force sizing. For example:

- When planning air operations, the Air Force looks at the targets to be serviced and the nature of the general operation to be supported and then accounts for aircraft and munitions needed (type and quantity) and the availability and characteristics of airfields relevant to the operation. From this, they calculate sorties, distances, flight hours, fuel consumption, number of aircraft in a given piece of airspace, and a host of other pieces of information to determine how many aerial refueling tankers will be needed.

- Joint Force detailed planning for operations determines how much equipment, manpower, and supplies need to be moved from one point to another and how much more will be needed to sustain operations: Logistics is a very quantitative business.

- U.S. Transportation Command (TRANSCOM) calculates the amount of lift required in cargo planes, sealift shipping, long-haul road movements, and trains.

- The Marine Corps thinks operationally in terms of Marine Air-Ground Task Forces (MAGTFs) that are composed of command, ground, air, and logistics elements. The size of a MAGTF varies depending on the mission to be accomplished, but the nucleus is normally (though not always) the ground combat element that typically ranges from a battalion to a division. The amount of airpower, logistics support, and transportation (amphibious, sealift, and airlift) required to execute the operation extends from there.

- The Navy thinks in terms of the number of surface combatants, the nature of operations, and proximity to ports to drive planning for all of the combat logistics force vessels that are needed to make it happen.

- The Army provides a host of "common user support" capabilities to the overall force that can include operating ports, theater-wide trucking and rail operations, large-scale fuel and ammunition storage and distribution, engineering and construction services, and general supply support.

- Institutional elements like recruiting are necessary to generate the force in the first place, as well as the multitude of installations at which units are based, training facilities, acquisition workforce, and the military's medical infrastructure.

The point is that the military spear has a great deal of shaft that makes it possible for the tip to locate, close with, and destroy its target, and there is a rough proportionality between shaft and spear tip. Thus, in assessing the basic units of measure for combat power, one can get a sense of what is likely needed in the combat support, combat service support, and supporting establishment echelons. The scope of this *Index* does not extend to analysis of everything that makes hard power possible; it focuses on the status of the hard power itself.

This assessment also does not account for the Reserve and Guard components of the services; it focuses only on the Active component. Again, the element of proportion or ratio figures prominently. Each service determines the balance among its Active, Reserve, and National Guard elements (only the Army and Air Force have Guard elements; the Navy and Marine Corps do not) based on factors that include cost of the respective elements, availability for operational employment, time needed to respond to an emergent crisis, the allocation of roles between the elements, and political considerations.[6] This assessment looks at the baseline requirement for a given amount of combat power that is readily available for use in a major combat operation—something that is usually associated with the Active components of each service.

The Defense Budget and Strategic Guidance

As for the defense budget, ample discussion of budget issues is scattered throughout (mainly as they pertain to acquisition programs), but the budget itself—whether for the military services individually, the Joint Force as a whole, or the totality of the defense establishment—is actually a reflection of the importance that the U.S. places on the modernity, capacity, and readiness of the force rather than a measure of the capability of the force itself. In other words, the budget itself does not tell us much about the posture of the U.S. military.

The baseline budget for defense in fiscal year (FY) 2016 was $548 billion, which paid for the forces (manpower, equipment, training); enabling capabilities (things like transportation, satellites, defense intelligence, and research and development); and institutional support (bases and stations, facilities, recruiting, and the like). The baseline budget does not pay for the cost of major ongoing overseas operations, which is captured in supplemental funding known as OCO (overseas contingency operations).

It is true that absent a significant threat to the survival of the country, the U.S. will always balance expenditures on defense with spending in all of the other areas of government activity that it thinks are necessary or desirable. Some have argued that a defense budget indexed to a percent of gross domestic product (GDP) is a reasonable reference, but a fixed percentage of GDP does not accurately reflect national security requirements *per se* any more than the size of the budget alone correlates to levels of capability. It is possible that a larger defense budget could be associated with less military capability if the money were allocated inappropriately or spent wastefully, and the fact that the economy changes over time does not necessarily mean that defense spending should increase or decrease in lockstep by default.

Ideally, defense requirements are determined by identifying national interests that might need to be protected with military power; assessing the nature of threats to those interests and what would be needed to defeat those threats (and how much that would cost); and then determining what the country can afford (or is willing) to spend. *Any difference between assessed requirements and affordable levels of spending on defense would constitute risk to U.S. security interests.*

This *Index* enthusiastically adopts this latter approach: interests, threats, requirements, resulting force, and associated budget. Spending less than the amount needed to maintain a two-MRC force results in policy debates about where to accept risk: force modernization, the capacity to conduct large-scale or multiple simultaneous operations, or force readiness.

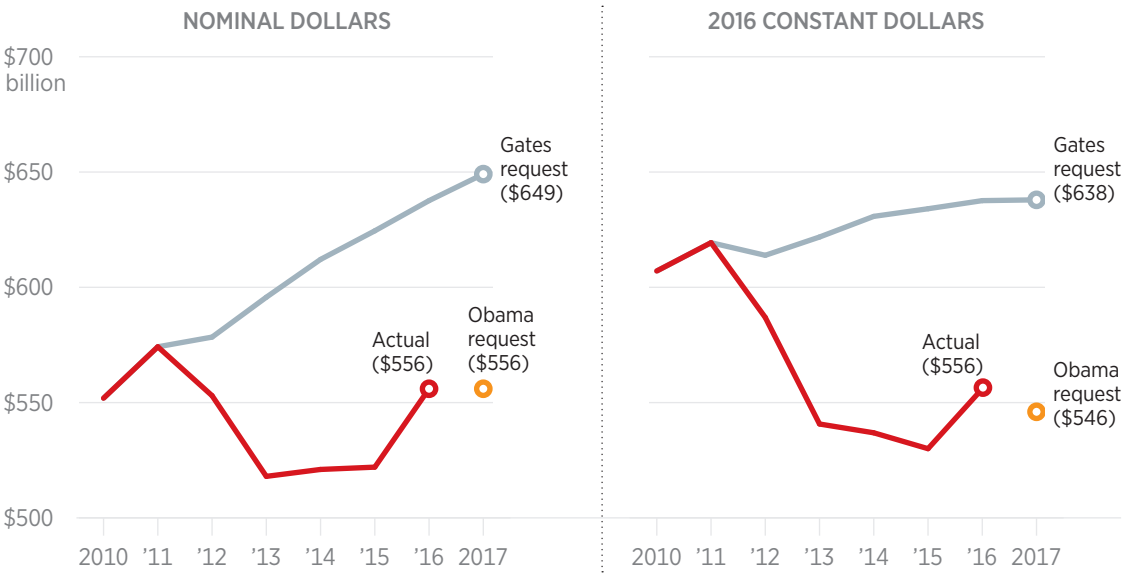
The decision to fund national defense commensurate with interests and prevailing threats is a policy decision that reflects national priorities and acceptance of risk. This *Index* assesses the ability of the nation's military forces to protect vital national security interests within the world *as it is* so that the debate about the level of funding for hard power is better informed.

In FY 2016, the debate about how much funding to allocate to defense was affected once again by a larger political debate that

CHART 2

Defense Spending Far Below Requested Levels

Current defense spending is far below the levels requested by former Secretary of Defense Robert Gates in 2012. After adjusting for inflation, defense spending has declined by $78 billion since 2011.



NOTES: Figures for Gates are from his FY 2012 request. Figures for Obama's request are from the President's FY 2017 budget proposal. Figures are base budget except FY 2016 actual and FY 2017 Obama request, which also include overseas contingency operations funding used for the base budget.

SOURCES: U.S. Office of Management and Budget, *Budget of the United States Government, Fiscal Years 2012–2017: Summary Tables* (Washington, DC: U.S. Government Printing Office, 2011, 2012, 2013, 2014, 2015, and 2016), Tables S-10 and S-11, http://www.gpo.gov/fdsys/browse/collectionGPO.action?collectionCode=BUDGET (accessed August 26, 2016), and Heritage Foundation calculations.

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pitted those who wanted to see an overall reduction in federal spending against those who pushed for higher levels of spending for defense and those who wanted to see any increase in defense spending matched by commensurate increases in domestic spending. In spite of each camp's firmly held views, Congress as a whole, acknowledging problems in military readiness and the growing need to replace aging equipment, voted to modify the spending caps set by the Budget Control Act (BCA) by enacting the Bipartisan Budget Act of 2015 (BBA). The BBA increased the spending cap on the defense budget by $25 billion for FY 2016 and by $15 billion for FY 2017.[7] It also provided an additional $8 billion for the base defense budget through the OCO account, which is not subject to spending caps as the normal defense budget is.[8]

The combined base budget and OCO-for-base budget for FY 2016 was $556 billion. Adjusted for inflation, this was a 5 percent increase over FY 2015 levels but still below the President's FY 2016 budget request of $561 billion. For comparison, President Barack Obama's 2012 defense budget, the last under

former Secretary of Defense Robert Gates, proposed spending $638 billion on defense in FY 2016. A bipartisan consensus, as seen in the National Defense Panel report in 2014, has identified the so-called Gates budget as the minimum the United States should be spending on national defense.[9] As seen in Chart 3, both the FY 2016 enacted budget and the FY 2017 budget proposal are well below this minimum.

The restrictions placed on defense spending by the BCA continue to be a major concern of the military service chiefs, who have consistently testified about the damage these restrictions are causing to readiness, modernization, and capacity for operations. As FY 2016 ended, the budget debates about FY 2017 had not been resolved, but it appears unlikely that any resolution will bring the national defense budget close to even the minimum levels proposed by the Gates budget.

Purpose as a Driver in Force Sizing

The Joint Force is used for a wide range of purposes, only one of which is major combat operations. Fortunately, such events have been rare, averaging roughly 15–20 years between occurrences.[10] In between (and even during) such occurrences, the military is used in support of regional engagement, crisis response, strategic deterrence, and humanitarian assistance, as well as to provide support to civil authorities and U.S. diplomacy.

The U.S. Unified Combatant Commands, or COCOMS (EUCOM, CENTCOM, PACOM, SOUTHCOM, and AFRICOM), all have annual and long-term plans through which they engage with countries in their assigned regions. These engagements range from very small unit training events with the forces of a single partner country to larger bilateral and sometimes multilateral military exercises. In 2015, these engagements included training and assisting Iraqi military forces and participating in joint training exercises with NATO members. Such events help to establish working relationships with other countries, acquire a more detailed understanding of regional political–military dynamics and on-the-ground conditions in areas of interest, and signal U.S. security interests to friends and competitors.

To support such COCOM efforts, the services provide forces that are based permanently in respective regions or that operate in them temporarily on a rotational basis. To make these regional rotations possible, the services must maintain a base force that is sufficiently large to train, deploy, support, receive back, and make ready again a stream of units ideally numerous enough to meet validated COCOM demand.

The ratio between time spent at home and time spent away on deployment for any given unit is known as OPTEMPO (operational tempo), and each service attempts to maintain a ratio that both gives units enough time to educate, train, and prepare their forces and allows the individuals in a unit to maintain some semblance of a healthy home and family life. This ensures that units are fully prepared for the next deployment cycle and that servicemembers do not become "burned out" or suffer adverse consequences in their personal lives because of excessive deployment time.

Experience has shown that a ratio of at least 3:1 is sustainable, meaning three periods of time at home for every period deployed. (If a unit is to be out for six months, it will be home for 18 months before deploying again.) Obviously, a service needs a sufficient number of people, units, ships, and planes to support such a ratio. If peacetime engagement were the primary focus for the Joint Force, the services could size their forces to support these forward-based and forward-deployed demands.

Thus, the size of the total force must necessarily be much larger than any sampling of its use at any point in time.

In contrast, sizing a force for major combat operations is an exercise informed by history—how much force was needed in previous wars—and then shaped and refined by analysis of current threats, a range of plausible scenarios, and expectations about what the

U.S. can do given training, equipment, employment concept, and other factors. The defense establishment must then balance "force sizing" between COCOM requirements for presence and engagement with the amount of military power (typically measured in terms of combat units and major combat platforms, which informs total end strength) thought necessary to win in likely war scenarios.

Inevitably, compromises are made that account for how much military the country is willing to buy. Generally speaking:

- The Army sizes to major warfighting requirements.
- The Marine Corps focuses on crisis response demands and the ability to contribute to one major war.
- The Air Force attempts to strike a balance that accounts for historically based demand across the spectrum because air assets are shifted fairly easily from one theater of operations to another ("easily" being a relative term when compared to the challenge of shifting large land forces), and any peacetime engagement typically requires some level of air support.
- The Navy is driven by global presence requirements. To meet COCOM requirements for a continuous fleet presence at sea, the Navy must have three to four ships in order to have one on station. To illustrate with a simplistic example, a commander who wants one U.S. warship stationed off the coast of a hostile country needs the use of four ships from the fleet: one on station, one that left station and is traveling home, one that just left home and is traveling to station, and one that fills in for one of the other ships when it needs maintenance or training time.

This report focuses on the forces required to win two major wars as the baseline force-sizing metric. The military's effectiveness, both as a deterrent against opportunistic competitor states and as a valued training partner in the eyes of other countries, derives from its effectiveness (proven or presumed) in winning wars.

Our Approach

With this in mind, we assessed the state of military affairs for U.S. forces as it pertains to their ability to deliver hard power against an enemy in three areas:

- Capability,
- Capacity, and
- Readiness.

Capability. Examining the capability of a military force requires consideration of:

- The proper tools (material and conceptual) of sufficient design, performance characteristics, technological advancement, and suitability needed for it to perform its function against an enemy force successfully.
- The sufficiency of armored vehicles, ships, airplanes, and other equipment and weapons to win against the enemy.
- The appropriate variety of options to preclude strategic vulnerabilities in the force and give flexibilities to battlefield commanders.
- The degree to which elements of the force reinforce each other in covering potential vulnerabilities, maximizing strengths, and gaining greater effectiveness through synergies that are not possible in narrowly stovepiped, linear approaches to war.

The capability of the U.S. Joint Force was on ample display in its decisive conventional war victory over Iraq in liberating Kuwait in 1991 and later in the conventional military

operation to liberate Iraq in 2003. Aspects of its capability have also been seen in numerous other operations undertaken since the end of the Cold War. While the conventional combat aspect at the "pointy end of the spear" of power projection has been more moderate in places like Yugoslavia, Somalia, Bosnia and Serbia, and Kosovo, and even against the Taliban in Afghanistan in 2001, the fact that the U.S. military was able to conduct highly complex operations thousands of miles away in austere, hostile environments and sustain those operations as long as required is testament to the ability of U.S. forces to do things that the armed forces of few if any other countries can do.

A modern-day "major combat operation"[11] along the lines of those upon which Pentagon planners base their requirements would feature a major opponent possessing modern integrated air defenses; naval power (surface and subsurface); advanced combat aircraft (to include bombers); a substantial inventory of short-range, medium-range, and long-range missiles; current-generation ground forces (tanks, armored vehicles, artillery, rockets, and anti-armor weaponry); cruise missiles; and (in some cases) nuclear weapons. Such a situation involving an actor capable of threatening vital national interests would present a challenge that is comprehensively different from the challenges that the U.S. Joint Force has faced in past decades.

2016 saw a continued shift in debate within military circles about the extent to which the U.S. military is ready for major conventional warfare, given its focus on counterinsurgency, stability, and advise-and-assist operations over the past decade. The Army in particular has noted the need to reengage in training and exercises that feature larger-scale combined arms maneuver operations, especially to ensure that its higher headquarters elements are up to the task. For example, Secretary of the Army Eric Fanning remarked in 2016 that "we've been fighting a certain way for 15 years" but "are [now] focused in the Army on getting back to full-spectrum training...."[12] This *Index* ascertains the relevance and health of military service capabilities by looking at such factors as average age of equipment, generation of equipment relative to the current state of competitor efforts as reported by the services, and the status of replacement programs meant to introduce more updated systems as older equipment reaches the end of its programmed service life. While some of the information is quite quantitative, other factors could be considered judgment calls made by acknowledged experts in the relevant areas of interest or as addressed by senior service officials when providing testimony to Congress or addressing specific areas in other official statements.

It must be determined whether the services possess capabilities that are relevant to the modern combat environment.

Capacity. The U.S. military must have a sufficient quantity of the right capability or capabilities. There is a troubling but fairly consistent trend that characterizes the path from requirement to fielded capability within U.S. military acquisition. Along the way to acquiring the capability, several linked things happen that result in far less of a presumed "critical capability" than supposedly was required.

- The manufacturing sector attempts to satisfy the requirements articulated by the military.
- "Unexpected" technological hurdles arise that take longer and much more money to solve than anyone envisioned.
- Programs are lengthened, and cost overruns are addressed (usually with more money).
- Then the realization sets in that the country either cannot afford or is unwilling to pay the cost of acquiring the total number of platforms originally advocated. The acquisition goal is adjusted downward (if not canceled), and the military finally fields

fewer platforms (at higher unit cost) than it originally said it needed to be successful in combat.

As deliberations proceed toward a decision on whether to reduce planned procurement, they rarely focus on and quantify the increase in risk that accompanies the decrease in procurement.

Something similar happens with force structure size: the number of units and total number of personnel the services say they need to meet the objectives established by the Commander in Chief and the Secretary of Defense in their strategic guidance. The Marine Corps has stated that it needs 27 infantry battalions to fully satisfy the validated requirements of the regional Combatant Commanders, yet current funding for defense has the Corps at 23 on a path to 21. The Army was on a build toward 48 brigade combat teams, but funding reductions now have the number at 31—less than two-thirds the number that the Army originally thought necessary—if sequestration remains law.

Older equipment can be updated with new components to keep it relevant, and commanders can employ fewer units more expertly for longer periods of time in an operational theater to accomplish an objective. At some point, however, sheer numbers of updated, modern equipment and trained, fully manned units are likely necessary to win in battle against a credible opponent when the crisis is profound enough to threaten a vital interest.

Capacity (numbers) can be viewed in at least three ways: compared to a stated objective for each category by each service, compared to amounts required to complete various types of operations across a wide range of potential missions as measured against a potential adversary, and as measured against a set benchmark for total national capability. This *Index* employs the two-MRC metric as a benchmark.

The two-MRC benchmark for force sizing is the *minimum* standard for U.S. hard-power capacity because one will never be able to employ 100 percent of the force at the same time. Some percentage of the force will always be unavailable because of long-term maintenance overhaul (for Navy ships in particular); unit training cycles; employment in myriad engagement and small-crisis response tasks that continue even during major conflicts; and the need to keep some portion of the force uncommitted to serve as a strategic reserve.

The historical record shows that the U.S. Army commits 21 BCTs on average to a major conflict; thus, a two-MRC standard would require 42 BCTs available for actual use. But an Army built to field only 42 BCTs would also be an Army that could find itself entirely committed to war, leaving nothing back as a strategic reserve, to replace combat losses, or to handle other U.S. security interests. Again, this *Index* assesses only the Active component of the services, though with full awareness that the Army also has Reserve and National Guard components that together account for half of the total Army. The additional capacity needed to meet these "above two-MRC requirements" could be handled by these other components or mobilized to supplement Active-component commitments. In fact, this is how the Army thinks about meeting operational demands and is at the heart of the current debate within the total Army about the roles and contributions of the various Army components. A similar situation exists with the Air Force and Marine Corps.

The balance among Active, Reserve, and Guard elements is beyond the scope of this study. Our focus here is on establishing a minimum benchmark for the capacity needed to handle a two-MRC requirement.

We conducted a review of the major defense studies (1993 BUR, QDR reports, and independent panel critiques) that are publicly available,[13] as well as modern historical instances of major wars (Korea, Vietnam, Gulf War, Operation Iraqi Freedom), to see whether there was any consistent trend in U.S. force allocation. The results of our review are presented in Table 6. To this we added 20

TABLE 1

Historical U.S. Force Allocation

Troop figures are in thousands.

	Korean War	Vietnam War	Persian Gulf War	Operation Iraqi Freedom
ARMY				
Total Troop Deployment During Engagement	206.3	219.3	267.0	99.7
Divisions*	6	7	4	1
Reserve Component Divisions Total for Strategic Documents	n/a	n/a	n/a	n/a
Total Army End Strength During Engagement, During Year of Strategy Document Active	1,313.8	1,113.3	738.0	499.0
Total Active End Strength Recommendations	n/a	n/a	n/a	n/a
NAVY				
Total Fleet During Engagement	904	770	529	297
Aircraft Carriers	6	5	6	5
Carrier Air Wings	6	5	6	5
Large Surface Combatants	37	14	30	23
Small Surface Combatants	16	47	16	9
Attack Submarines	4	0	12	12
Amphibious Vessels	34	26	21	7
Combat Logistics and Support Ships	28	29	45	42
Fighter/Attack Squadrons	21	43	22	24
MARINE CORPS				
Total Troop Deployment During Engagement	33.5	44.7	90.0	66.2
Active Divisions*	1	2	2	1
Reserve Divisions	n/a	n/a	n/a	n/a
Marine Expeditionary Force	1	1	1	2
Air Wings Active/Reserve	1	1	1	1
Total Marine Corps End Strength During Engagement by Year of Strategy Document	187.0	289.0	196.3	178.0
Total Recommended End Strength	n/a	n/a	n/a	n/a
AIR FORCE				
Bombers or Bomber Squadrons**	21	23	3	4
Fighter Squadrons	26		30	30
Active Fighter Wings	7	8	10	10
Reserve Fighter Wings				
Airlift/Tankers	239	167	388	293

	1993 BUR	1997 QDR	2001 QDR	2006 QDR	2010 QDR	2010 Indep. Panel	2-MRC Paper	2014 QDR	2014 NDP
ARMY									
Total Troop Deployment During Engagement	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Divisions*	10	10	10	11	18	11	10	10	n/a
Reserve Component Divisions Total for Strategic Documents	n/a	5	8	8		7	8	8	n/a
Total Army End Strength During Engagement, During Year of Strategy Document Active	572.0	492.0	481.0	505.0	566.0	566.0	550.0	490.0	490.0
Total Active End Strength Recommendations	n/a	n/a	n/a	482.4	n/a	1,106.0	600.0	450.0	490.0
NAVY									
Total Fleet During Engagement	346	310	n/a	n/a	n/a	346	350	n/a	346
Aircraft Carriers	12	12	12	11	11	11	11	11	n/a
Carrier Air Wings	12	11	11	n/a	10	10	10	10	n/a
Large Surface Combatants	124	116	116	n/a	84–88	n/a	120	92	n/a
Small Surface Combatants				n/a	14–28	n/a	n/a	43	n/a
Attack Submarines	55	50	55	n/a	53–55	55	50	51	n/a
Amphibious Vessels	41	36	36	n/a	29–31	n/a	38	33	n/a
Combat Logistics and Support Ships	65	n/a	n/a	n/a	58	n/a	75	n/a	n/a
Fighter/Attack Squadrons	33	30	30	n/a	30	30	30	30	n/a
MARINE CORPS									
Total Troop Deployment During Engagement	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Active Divisions*	4	3	3	n/a	3	n/a	n/a	3	n/a
Reserve Divisions	1	1	1	n/a	1	n/a	n/a	1	n/a
Marine Expeditionary Force	3	3	3	n/a	3	3	3	2	n/a
Air Wings Active/Reserve	n/a	4	4	n/a	4	n/a	n/a	4	n/a
Total Marine Corps End Strength During Engagement by Year of Strategy Document	174.0	174.0	173.0	180.0	202.0	202.0	196.0	182.0	182.0
Total Recommended End Strength	n/a	n/a	n/a	175.0	n/a	243.0	202.0	182.0	182.0
AIR FORCE									
Bombers or Bomber Squadrons**	200	187	112	n/a	96	180	200	96***	n/a
Fighter Squadrons	54	54	46	n/a	42	66	54	48	n/a
Active Fighter Wings	13	12+	15	n/a	n/a	20	20	9	n/a
Reserve Fighter Wings	7	8	12	n/a	n/a	n/a		7	n/a
Airlift/Tankers	n/a	n/a	n/a	n/a	1023	1023	1,000	954	n/a

* Figures for engagements are numbers deployed; figures for documents are totals.
** Figures for Air Force bombers for Korean War, Vietnam War, Persian Gulf War, and Iraq are bomber squadrons. All other figures are bombers.
*** 2014 QDR prescribed nine heavy bomber squadrons, equaling 96 aircraft.

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percent, both to account for forces and platforms likely to be unavailable and to provide a strategic reserve to guard against unforeseen demands. Summarizing the totals, this *Index* concluded that a Joint Force capable of dealing with two MRCs simultaneously or nearly simultaneously would consist of:

- Army: 50 BCTs.
- Navy: 346 ships and 624 strike aircraft.
- Air Force: 1,200 fighter/attack aircraft.
- Marine Corps: 36 battalions.

America's security interests require the services to have the capacity to handle two major regional conflicts successfully.

Readiness. The consequences of the sharp reductions in funding mandated by sequestration have caused military service officials, senior DOD officials, and even Members of Congress to warn of the dangers of recreating the "hollow force" of the 1970s when units existed on paper but were staffed at reduced levels, minimally trained, and woefully ill-equipped. To avoid this, the services have traded quantity/capacity and modernization to ensure that what they do have is "ready" for employment.

As was the case in 2015, the service chiefs have stated that current and projected levels of funding continue to take a toll on the ability of units to maintain sufficient levels of readiness across the force. Some units have reduced manning. Though progress has been made in some areas due to funding provided by Congress in 2014 and 2015, the return of further cuts under the Budget Control Act of 2011 threaten to undo these gains. For example:

- General Mark Milley, Chief of Staff of the Army, and Acting Secretary of the Army Patrick J. Murphy testified in April 2016 that the Army can maintain only one-third of its force at acceptable levels of readiness to meet full-spectrum operations. They discussed the challenges posed by this crisis in stark terms: "The risk of deploying unready forces into combat is higher U.S. casualty rates and increased risk to mission success."[14]

- Air Force Chief of Staff General Mark A. Welsh and Secretary of the Air Force Deborah Lee James echoed the challenges expressed by General Milley and Acting Secretary Murphy, arguing that "the size of our force and state of our full-spectrum readiness are at or near all-time lows."[15]

- While the Navy has fared better in rebuilding its readiness over the past year, Admiral Michelle J. Howard, Vice Chief of Naval Operations, has testified that "[w]e are still paying down the readiness debt we accrued over the last decade but more slowly than we would prefer...." She further warned that "[w]e will only maintain our status as the world's greatest navy with constant vigilance, dedication to restoring our readiness and a commitment to sustained forces around the globe."[16] The Navy has preserved readiness over the past year through fastidious management of its resources and a resistance to overtaxing the fleet, but as demand for America's global naval presence continues to remain high, this will stretch thin until the fleet grows to a healthy level.

It is one thing to have the right capabilities to defeat the enemy in battle. It is another thing to have a sufficient amount of those capabilities to sustain operations over time and many battles against an enemy, especially when attrition or dispersed operations are significant factors. But sufficient numbers of the right capabilities are rather meaningless if the force is unready to engage in the task.

Scoring. In our final assessments, we tried very hard not to convey a higher level of precision than we think is achievable using unclassified, open-source, publicly available documents; not to reach conclusions that could

be viewed as based solely on assertions or opinion; and not to rely solely on data and information that can be highly quantified, since simple numbers do not tell the whole story.

We believe the logic underlying our methodology is sound. This *Index* drew from a wealth of public testimony from senior government officials, from the work of recognized experts in the defense and national security analytic community, and from historical instances of conflict that seemed most appropriate to this project. This *Index* considered several questions, including:

- How does one place a value on the combat effectiveness of such concepts as Air-Sea Battle, Network-centric Operations, Global Strike, or Joint Operational Access?

- Is it entirely possible to assess accurately (1) how well a small number of newest-generation ships or aircraft will fare against a much larger number of currently modern counterparts when (2) U.S. forces are operating thousands of miles from home, (3) orchestrated with a particular operational concept, and (4) the enemy is leveraging a "home field advantage" that includes strategic depth and much shorter and perhaps better protected lines of communication and (5) might be pursuing much dearer national objectives than the U.S. such that the political will to conduct sustained operations in the face of mounting losses might differ dramatically?

- How does one neatly quantify the element of combat experience, the erosion of experience as combat operation events recede in time and those who participated in them leave the force, the health of a supporting workforce, the value of "presence and engagement operations," and the related force structures and deployment/employment patterns that presumably deter war or mitigate its effects if it does occur?

This *Index* focused on the primary purpose of military power—to defeat an enemy in combat—and the historical record of major U.S. engagements for evidence of what the U.S. defense establishment has thought was necessary to execute a major conventional war successfully. To this we added the two-MRC benchmark, on-the-record assessments of what the services themselves are saying about their status relative to validated requirements, and the analysis and opinions of various experts in and out of government who have covered these issues for many years.

Taking it all together, we rejected scales that would imply extraordinary precision and settled on a scale that conveys broader characterizations of status that range from very weak to very strong. Ultimately, any such assessment is a judgment call informed by quantifiable data, qualitative assessments, thoughtful deliberation, and experience. We trust that our approach makes sense, is defensible, and is repeatable.

U.S. Military Power

	VERY WEAK	WEAK	MARGINAL	STRONG	VERY STRONG
Army		✓			
Navy			✓		
Air Force			✓		
Marine Corps			✓		
Nuclear			✓		
OVERALL			✓		

Endnotes:

1. Les Aspin, Secretary of Defense, *Report on the Bottom-Up Review* (Washington: U.S. Department of Defense, October 1993), p. iii, http://www.google.com/url?sa=t&rct=j&q=&esrc=s&source=web&cd=2&ved=0CCUQFjABahUKEwjj4dWf6N3HAhVEmh4KHdG1Cdg&url=http%3A%2F%2Fwww.dtic.mil%2Fcgi-bin%2FGetTRDoc%3FAD%3DADA359953&usg=AFQjCNFvzw730XRz7YRxpc5BNr5_UdfMiQ (accessed September 4, 2015).
2. Ibid., p. 8.
3. Daniel Gouré, "Building the Right Military for a New Era: The Need for an Enduring Analytic Framework," in Dakota L. Wood, ed., *2015 Index of U.S. Military Strength* (Washington: The Heritage Foundation, 2015), pp. 27–36, http://index.heritage.org/militarystrength/important-essays-analysis/building-right-military-new-era/.
4. John Y. Schrader, Leslie Lewis, and Roger Allen Brown, *Quadrennial Defense Review 2001: Lessons on Managing Change in the Department of Defense* (Santa Monica, CA: RAND Corporation, National Defense Research Institute, 2003), http://www.rand.org/content/dam/rand/pubs/documented_briefings/2005/DB379.pdf (accessed September 4, 2015).
5. The United States has not had to contend in combat with any credible air force since the Vietnam War, but U.S. Air Force planners are increasingly concerned about an enemy's ground-based, anti-air missile capability. For naval planners, ship-based, air-based, and shore-based anti-ship cruise missiles are of much greater concern than is the number of conventional surface combatants armed with large-caliber guns that an enemy navy has. Likewise, ground force planners have to consider the numbers and types of guided anti-armor weapons that an enemy possesses and whether an opposing force has guided artillery, mortar, or rocket capabilities. Guided/precision weapons are less expensive (by orders of magnitude) than the platforms they target, which means that countries can produce far more guided munitions than primary weapons platforms. Some examples: Harpoon ASCM ($2 million)/DDG-51 *Arleigh Burke*-Class destroyer ($2 billion); AT4 anti-armor weapon ($1,500)/M1A1 Abrams main battle tank ($9 million); 120mm guided mortar round ($10,000) or 155mm guided artillery round ($100,000)/M198 155mm howitzer ($500,000); S-300 anti-air missile ($1 million)/F/A-18 Hornet ($60 million) or F-35A Lightning II ($180 million).
6. One example of balancing the forces is the Army's Aviation Restructure Initiative, in which the active-duty force seeks to redistribute certain rotorcraft platforms among the active-duty Army and the National Guard, a plan that the Guard has contended will reduce the capabilities it has gained during recent combat engagements, such as its pilots' proficiency flying Apache helicopters. For more on this issue, see U.S. Government Accountability Office, *Force Structure: Army's Analyses of Aviation Alternatives*, GAO–15–430R, February 26, 2015 (updated April 27, 2015), http://www.gao.gov/assets/670/669857.pdf (accessed September 7, 2015).
7. Paul L. Winfree, Romina Boccia, Justin T. Johnson, Daren Bakst, Nicolas D. Loris, James L. Gattuso, Jason Snead, Rachel Greszler, Robert E. Moffit, PhD, David R. Burton, and Curtis S. Dubay, "Analysis of the Bipartisan Budget Act of 2015," Heritage Foundation *Issue Brief* No. 4477, October 28, 2015, http://www.heritage.org/research/reports/2015/10/analysis-of-the-bipartisan-budget-act-of-2015 (accessed August 30, 2016).
8. Ibid.
9. See, for example, *Ensuring a Strong U.S. Defense for the Future: The National Defense Panel Review of the 2014 Quadrennial Defense Review*, July 2014, p. 4, http://www.usip.org/sites/default/files/Ensuring-a-Strong-U.S.-Defense-for-the-Future-NDP-Review-of-the-QDR_0.pdf (accessed September 7, 2015).
10. Since World War II, the U.S. has fought four major wars: the Korean War (1950–1953); the Vietnam War (1965–1973); the Gulf War/Operation Desert Shield/Desert Storm (1990–1991); and the Iraq War/Operation Iraqi Freedom (2003–2011).
11. Defense references to war have varied over the past few decades from "major combat operations" (MCO) and "major theater war" (MTW) to the current "major regional contingency" (MRC). Arguably, there is a supporting argument for such shifts as planners attempt to find the best words to describe the scope and scale of significant military efforts, but the terms are basically interchangeable.
12. William Cole, "Army Secretary's Pacific Tour Stops in Hawaii," July 27, 2016, http://www.military.com/daily-news/2016/07/27/army-secretary-pacific-tour-stops-hawaii.html (accessed August 30, 2016).

13. The Department of Defense, through the Joint Staff and Geographic Combatant Commanders, manages a relatively small set of real-world operational plans (OPLANS) focused on specific situations where the U.S. feels it is most likely to go to war. These plans are reviewed and updated regularly to account for changes in the Joint Force or with the presumed enemy. They are highly detailed and account not only for the amount of force the U.S. expects it will need to defeat the enemy, but also for which specific units would deploy; how the force would actually flow into the theater (the sequencing of units); what ports and airfields it would use; how much ammunition, fuel, and other supplies it would need at the start; how much transportation or "lift" would be needed to get the force there (by air, sea, trucks, or rail); and the basic plan of attack. The Pentagon also routinely develops, explores, and refines various notional planning scenarios in order to better understand the implications of different sorts of contingencies, which approaches might be more effective, how much of what type of force might be needed, and the regional issue or issues for which there would have to be an accounting. These types of planning events inform service efforts to develop, equip, train, and field military forces that are up to the task of defending national security interests. All of these efforts and their products are classified national security information and therefore not available to the public.
14. The Honorable Patrick J. Murphy, Acting Secretary of the Army, and General Mark A. Milley, Chief of Staff, United States Army, "On the Posture of the United States Army," statement before the Committee on Armed Services, U.S. Senate, April 7, 2016, p. 4, http://www.armed-services.senate.gov/imo/media/doc/Murphy-Milley_04-07-16.pdf (accessed August 30, 2016).
15. The Honorable Deborah Lee James, Secretary of the Air Force, and General Mark A. Welsh III, Chief of Staff, United States Air Force, "Fiscal Year 2017 Air Force Posture Statement," statement before the Subcommittee on Defense, Committee of Appropriations, U.S. Senate, February 10, 2016, p. 3, http://www.af.mil/Portals/1/documents/airpower/FY16_AF_PostureStatement_FINALversion2-2.pdf (accessed August 30, 2016).
16. Congressional Quarterly, "House Armed Services Subcommittee on Readiness Holds Hearing on President Obama's Fiscal 2017 Budget for the Navy Posture," CQ Congressional Transcripts, March 17, 2016, http://www.cq.com/doc/congressionaltranscripts-4856025?0 (accessed August 30, 2016).

U.S. Army

The U.S. Army is America's primary land warfare component. Although it addresses all types of operations across the range of ground force employment, its chief value to the nation is its ability to defeat and destroy enemy land forces in battle.

As is the case with the other services, the U.S. Army has sought ways to absorb the budget cuts driven by the Budget Control Act (BCA) of 2011 while still meeting the missions outlined in the 2012 Defense Strategic Guidance (DSG).[1] Fiscal challenges have strained the Army's ability to meet the national security requirements outlined in the DSG even as it has worked to find a proper balance among readiness, modernization, and end strength.[2] The Army has continued to reduce its end strength and accept greater risk to its modernization programs to preserve readiness levels—an even more challenging problem given that its proposed budget for fiscal year (FY) 2017 is $1.4 billion lower than FY 2016 enacted levels.[3]

From a height of 566,000 in FY 2011, the Army's active duty end strength has shrunk to nearly 475,000 in FY 2016[4] on a path to 460,000 by the end of FY 2017.[5] These cuts are in line with the Army's accelerated troop reduction plan to arrive at an end strength of 450,000 in FY 2018—the minimum outlined in the DSG.[6] Although the Bipartisan Budget Act of 2015 provided a brief period of stability for the Department of Defense (DOD), funding levels continue to force the Army "to prioritize near-term operational requirements and readiness at the expense of end strength, sustainment and modernization."[7] If BCA-mandated budget caps return in FY 2018,[8] reduced funding levels and continued unpredictability wrought by short-term funding fixes such as continuing resolutions will result in further reductions in end strength and delays in modernization, threatening both capacity and capability.[9]

Operationally, the Army has approximately 190,000 soldiers forward stationed across 140 countries.[10] This is a significant increase from the previous year's level of 143,000 soldiers, a noteworthy contrast to the continued reduction in end strength signifying a smaller Army shouldering an increased workload.[11] This includes authorization for up to 9,800 troops that will be stationed in Afghanistan through 2016.[12] Despite past pledges to reduce troop levels in Afghanistan to 5,500 by the end of 2016, President Barack Obama recently announced that the U.S. will maintain 8,400 troops in Afghanistan into 2017.[13] Of the total number of U.S. forces deployed globally, "[t]he Army currently provides 40% of planned forces committed to global operations and over 60% of forces for emerging demands from Combatant Commanders."[14]

Capacity

In FY 2016, total Army end strength was 1,030,000 soldiers: 483,000 Active soldiers, 200,000 in the Army Reserve, and 348,000 in the Army National Guard.[15] In FY 2016, a portion of these personnel costs was paid through the Overseas Contingency Operations (OCO) budget function.[16] This is unlike FY 2015, when all soldiers in the Active Component were paid for in the base budget.

The Army also refers to its size in terms of brigade combat teams (BCTs). BCTs are the basic "building blocks" for employment of Army combat forces. They are normally employed within a larger framework of U.S. land operations but are sufficiently equipped and organized so that they can conduct independent operations as circumstances demand.[17] A BCT averages 4,500 soldiers in strength depending on its variant: Stryker, Armored, or Infantry. A Stryker BCT is a mechanized infantry force organized around the Stryker ground combat vehicle (GCV). Armored BCTs are the Army's principal armored units and employ the Abrams main battle tank and the M2 Bradley fighting vehicle. An Infantry BCT is a highly maneuverable motorized unit.

The Army also has a separate air component organized into combat aviation brigades (CABs), which also can operate independently.[18] CABs are made up of Army rotorcraft, such as the AH-64 Apache, and perform various roles including attack, reconnaissance, and lift.

CABs and Stryker, Infantry, and Armored BCTs make up the Army's main combat force, but they do not make up the entirety of the Army. About 90,000 troops form the Institutional Army and provide support, such as preparing and training troops for deployments and overseeing military schools and Army educational institutions.[19] The troops constituting the Institutional Army cannot be reduced at the same ratio as BCTs or CABs, and the Army plans to insulate these soldiers from drawdown and restructuring proposals in order to "retain a slightly more senior force in the Active Army to allow growth if needed."[20] According to Army assessments a minimum of 87,400 active component soldiers in these forces is necessary to maintain the proposed 980,000 end strength for the total force.[21] In addition to the Institutional Army, a great number of functional or multi-functional support brigades (amounting to approximately 13 percent of the active component force based on historical averages)[22] provide air defense, engineering, explosive ordnance disposal (EOD), military police, military intelligence, and medical support among other types of battlefield support for BCTs.

While end strength is a valuable metric in understanding Army capacity, counting BCTs is a more telling measure of actual hard-power capacity. In concert with the end strength reduction to approximately 475,000 soldiers,[23] the Active Army underwent brigade restructuring that decreased the number of BCTs from 38 to 31 in April 2016.[24] As a part of this reorganization, the Army also added a third maneuver battalion to its infantry and armored BCTs in FY 2015.[25] Additionally, all BCTs received additional engineer and fire support capabilities (additional 105mm and/or 155mm howitzers).[26] The FY 2017 budget will support the conversion of one Stryker BCT into an Infantry BCT.[27]

The Department of the Army's FY 2016 budget requests supported a drawdown to 30 BCTs by the end of the fiscal year.[28] However, in February 2016, Army Chief of Staff General Mark Milley recommended delaying deactivation of the 4th Infantry BCT stationed in Alaska for at least one year in order to continue to provide rapid deployment capabilities and Arctic security.[29]

The Army's aviation units also face near-term reductions. In May 2015, the Active Army deactivated the first of three combat aviation brigades and converted the 12th CAB into a headquarters element,[30] leaving only 11 CABs remaining in the active component.[31] In the conversion process, the 12th CAB shed five of its seven battalions, intending to augment the remaining battalions with rotational units.[32] The 3rd CAB is slated to be deactivated in FY 2019, which would leave only 10 in the Active Army.

It should be noted that the National Commission on the Future of the Army suggested in its 2016 report to Congress that maintaining an 11th CAB would leave the Army "better postured to retain a forward stationed aviation brigade in Korea" and would provide an advantage over rotational forces in maintaining aviation capability.[33]

The reduction in end strength in the past year has continued to have a disproportionate effect on BCTs. The Active Army has been downsized from 45 BCTs (552,100 soldiers) in FY 2013 to 31 BCTs[34] (475,000 soldiers) in FY 2016.[35] Thus, a 14 percent reduction in troop numbers resulted in a 31 percent reduction in BCTs. The proposed elimination of the 4th BCT in Alaska by the end of FY 2016 would have resulted in a 33 percent reduction in Active Army BCTs even as "demand for Army forces across Combatant Commands has increased by 23 percent during the same period."[36] General Milley warned the Senate Armed Services Committee in March 2016 that at current end strength, "the Army risks consuming readiness as fast as we build it."[37]

Capability

The Army's main combat platforms are ground vehicles and rotorcraft. The upgraded M1A2 Abrams and M2/M3 Bradley vehicles are primarily used in active component Armored BCTs, while reserve component ABCTs still rely on the earlier M1A1 variant.[38] Stryker BCTs, as one would expect, are equipped with Stryker vehicles. Infantry BCTs rely on the inventory of M113 armored personnel carriers (APCs). CABs are made up of Army helicopters including AH-64 Apaches, UH-60 Black Hawks, and CH-47 Chinooks.

Overall, the Army's equipment inventory is relatively healthy. While some equipment has been worn down by usage in Afghanistan and Iraq, the Army has undertaken a "reset" initiative that is discussed below in the readiness section. The bulk of Army vehicles are young because of recent remanufacture programs for the Abrams and Bradley that have extended the service life of both vehicles beyond FY 2028.[39]

The Army has been methodically replacing the oldest variants of its rotorcraft and upgrading others that still have plenty of airframe service life. Today, the UH-60M, which is a newer version of the UH-60A, makes up approximately two-thirds of the total UH-60 inventory. Similarly, the CH-47F Chinook, a rebuilt variant of the Army's CH-47D heavy lift helicopter, is expected to extend the platform's service life at least through 2038.[40] However, the current budget request for aircraft procurement stands at $2.3 billion less than FY 2016 enacted levels.[41] The proposed budget will decelerate fleet modernization, potentially resulting in 24 fewer Black Hawks and nine fewer Apaches than previously planned for FY 2017.[42]

In addition to the viability of today's equipment, the military must ensure the health of future programs. While future modernizing programs are not current hard-power capabilities that can be applied against an enemy force, they are a significant indicator of a service's overall fitness for sustained combat operations: The service may be able to engage an enemy but be forced to do so with aging equipment and no program in place to maintain viability or endurance in sustained operations.

The U.S. military services are continually assessing how best to stay a step ahead of competitors: whether to modernize the force today with currently available technology or wait to see what their investments in research and development produce years down the road. Technologies mature and proliferate, becoming more accessible to a wider array of actors over time. U.S. forces will be challenged by state and non-state competitors that will leverage the latest developments in matériel, computing, platform sciences, and designs.

The Army is currently undertaking several modernization programs to replace or improve its ground combat vehicles and current rotorcraft fleet.[43] However, budget reductions levied in previous years have significantly affected modernization, with Research and Development, Acquisition, and Procurement accounts all experiencing 35 percent funding cuts between 2011 and 2015.[44] In fact, "[s]ince 2011 the Army has ended 20 programs, delayed 125 and restructured 124."[45]

The Army's most high-profile joint service Major Defense Acquisition Program (MDAP) is the Joint Light Tactical Vehicle (JLTV), a program shared with the Marine Corps.

Intended to combine the protection offered by Mine Resistant Ambush Protected Vehicles (MRAPs) with the mobility of the original unarmored High Mobility Multipurpose Wheeled Vehicle (HMMWV), the JLTV is a follow-on to the HMMWV (also known as the Humvee) and features design improvements that will increase its survivability against anti-armor weapons and improvised explosive device (IED) threats.

The Army plans to procure a total of 49,100 vehicles over the life of the program,[46] replacing only a portion of the current HMMWV fleet. The program is heavily focused on vehicle survivability and is not intended as a one-for-one replacement of the HMMWV.[47] In fact, the JLTV is intended to take on high-risk missions traditionally tasked to the HMMWV, to include scouting and troop transport in adverse environments, guerrilla ambushes, and artillery bombardment.[48] Several issues, including changed requirements and some technical obstacles in the early development phases, delayed the program from its originally intended schedule by about one year. In August 2015, the Army awarded Oshkosh a low-rate initial production (LRIP) contract for the JLTV, [49] with initial deliveries scheduled to begin in June 2016.[50] For the final year of LRIP in FY 2017, the Army plans to procure 1,828 JLTVs, which would bring the Army's JLTV order to a total of 2,690.[51] A full-rate production decision is expected in FY 2018.[52]

Other Army MDAPs of note in FY 2017 include the M1A2 Abrams, M2 Bradley, M109A6 Paladin 155mm Howitzers, and Stryker.[53] These platforms will undergo various structural modifications and upgrades that are needed to keep them ready to meet future contingencies.

The M1A2 is currently being enhanced with Vehicle Health Management and Power Train Improvement & Integration Optimization in order to upgrade the tank's reliability, durability, and fuel efficiency so that it can provide ground forces with superior battlefield firepower.[54] Similarly, the M109A6 is being outfitted with the Paladin Integrated Management (PIM) program, which consists of a new drivetrain and suspension components, in order to sustain the platform's utility in combat through 2050.[55] Planned upgrades for the Stryker include improved survivability and lethality,[56] and a major Engineering Change Proposal (ECP) aimed at improving mechanical and electrical power, an enhanced chassis, and electronics network.[57]

The Army's rotorcraft modernization programs do not include any new platform designs. Instead, the Army is upgrading current rotorcraft to account for more advanced systems.

The Army's main modernization programs are not encumbered by any major problems, but there is concern about the future direction of Army capability. Fifteen years of sustained combat operations and limited resources has "limited the Army's ability to modernize for future fights."[58]

For example, cancellation of the Ground Combat Vehicle program raises the question of replacing the M2 Bradley. The Army awarded contracts to BAE Systems and General Dynamics Land Systems in May 2015 to begin work on design concepts for a Future Fighting Vehicle, a possible successor to the GCV.[59] Contract work is due to be completed in November 2016 and will help to inform the Army's decision to upgrade or entirely replace the Bradley.[60] However, "[t]here are currently no ground combat vehicle developmental programs."[61] At current funding levels, this could mean that "the Bradley and Abrams will be in the Army inventory for 50–70 years."[62] Updating the capability that the Bradley Infantry Fighting Vehicle provides remains a priority, and the Army is currently "refining concepts, requirements, and key technologies"[63] as part of a series of engineering change proposals, which will include suspension, engine, transmission, and lethality upgrades.[64]

The Army is also continuing development efforts for the Armored Multi-Purpose Vehicle (AMPV) to replace its 1960s-vintage M113 Armored Personnel Carrier.[65] The AMPV will

have five mission modules, including General Purpose, Medical Treatment, Medical Evacuation, Mortar Carrier, and Mission Command.[66] Because it is still in development[67] and is not expected to enter LRIP until FY 2020,[68] the AMPV is not yet an MDAP and is not included in this year's scoring.

Readiness

As a result of sequestration in FY 2013, the Army experienced a shortage in readiness funding that resulted in "significantly and rapidly degraded Army readiness," which the Secretary of the Army and the Army Chief of Staff testified would "translate directly into FY 14 and beyond."[69] Although a higher level of funding in FY 2015 and FY 2016 provided two years of stability and modest budget relief, funding levels have not kept pace with the growing threat environment, including an FY 2017 base budget request that is $1.4 billion less than FY 2016 enacted levels.[70] As a result, the Army has chosen to "protect current readiness at the expense of future modernization and end strength."[71] Army Vice Chief of Staff General Daniel Allyn explained that:

> To build readiness...the Army reduced key installation services, individual training programs, and modernization to a level that impacts future readiness and quality of life. In addition to the effects on Soldier quality of life, these cuts force Commanders to divert Soldiers from training to perform life-support tasks.[72]

Recognizing the risk that degraded readiness introduces into its ability to respond to an emergent threat, the Army continues to prioritize operational readiness over other expenditures for FY 2017.[73] A return to "full spectrum combat readiness" will require sustained investment for a number of years. As a result of years of high operational tempos and sustained budget cuts, the Army is not expected to return to sufficient readiness levels until FY 2020.[74]

This tiered readiness strategy means that only a limited number of BCTs are available and ready for decisive action. Accordingly, the tiered readiness model employed by the Army has resulted in approximately one-third of the 31 Active BCTs being ready for contingency operations in FY 2016.[75] This is an improvement from early in 2014 when 80 percent of the Army was considered to be "at a lower readiness level."[76] As stated, the Army had prioritized funding in readiness over capacity and modernization, allowing it to regain some of the readiness lost as a result of sequestration the prior year.

The Army uses Combat Training Centers (CTCs) to train its forces to desired levels of proficiency. Specifically, the mission of the CTC Program is to "provide realistic Joint and combined arms training" to approximate actual combat and increase "unit readiness for deployment and warfighting."[77] The Army financed 19 CTC rotations in FY 2016 and is expected to maintain the same number of rotations in FY 2017.[78] Although utilizing CTCs continues to be a priority for the Army,[79] resource constraints have limited investment in readiness.

The Army may already be experiencing the effect of reduced training hours. Army Aviation reported five major accidents in the first two quarters of FY 2016 that it determined to be a result of human error.[80] While human error cannot be entirely eliminated, the Army has found that "[t]he most effective means of reducing human error is aggressive and realistic training that increases repetition and grows confidence and competence in the individual and collective team."[81]

Aviation maintenance personnel are similarly starving for opportunities "to gain experience or maintain proficiency in their Military Occupational Specialty."[82] In order to stay within presidentially authorized end strengths in Afghanistan while at the same time maximizing combat capability, most maintenance personnel have been left behind as aircrew and aircraft have deployed. Instead, deployed forces have relied primarily on contractors to meet maintenance requirements, leaving Army maintenance personnel to perform only minor tasks.[83]

In FY 2015, the Army supported the Army Contingency Force (ACF) initiative that is developing "a contingency response force which provides Combatant Commanders an initial response capability that can achieve early objectives for most contingency plans."[84] Under the ACF model, the Army maintains readiness for only 20 of the 60 total BCTs maintained by the Active, National Guard, and Reserve Components. Of those 20 that are considered ready, 11 are committed to ongoing missions, "leaving only nine to provide strategic flexibility for unforecasted contingencies."[85]The other 40 BCTs maintained by the Total Army are limited to "minimum Individual/Crew/Squad resourcing levels through sufficient Training Support Systems."[86] The aforementioned numbers can be misleading, as the Active Component maintains a total of only 31 BCTs and realistically maintains only about 30 percent of them at acceptable levels of combat readiness.[87]

Another key factor in readiness is sustainment of equipment. At the most basic level, a unit's equipment must work when the unit is deployed. As a result of extensive combat usage in Afghanistan and the lingering effects of nearly a decade of combat operations in Iraq, the Army has continued with its reset program to restore used equipment to desired capability or to replace worn-out equipment for use in future engagements. The Army estimates that it will require three years of reset funding "after the last piece of equipment has been retrograded from the combatant command theater of operations."[88] It also anticipates that the timeline for reset requirements will continue into FY 2020 for equipment retrograded from Afghanistan.[89]

Reduced funding throughout FY 2013, a consequence of sequestration, forced the Army to postpone the reset of several pieces of equipment. Operations and maintenance funding for FY 2017 supports the repair and restoration of "30,000 battle damaged items including aircraft, aviation support equipment, artillery and missile, communication equipment, individual and crew served weapons, tactical wheeled vehicles, and general support equipment."[90] If the necessary funding is again reduced by the BCA, the Army's efforts to recover from recent operations and prepare for the future will be further stymied.

Scoring the U.S. Army

Capacity Score: Weak

Historical evidence shows that, on average, the Army needs 21 brigade combat teams to fight one major regional conflict. Based on a conversion of roughly 3.5 BCTs per division, the Army deployed 21 BCTs in Korea, 25 in Vietnam, 14 in the Persian Gulf War, and around four in Operation Iraqi Freedom—an average of 16 BCTs (or 21 if the much smaller Operation Iraqi Freedom initial invasion operation is excluded). In the 2010 Quadrennial Defense Review, the Obama Administration recommended a force capable of deploying 45 active BCTs. Previous government force-sizing documents discuss Army force structure in terms of divisions; they consistently advocate for 10–11 divisions, which equates to roughly 37 active BCTs.

Considering the varying recommendations of 35–45 BCTs and the actual experience of nearly 21 BCTs deployed per major engagement, 42 BCTs would be needed to fight two MRCs.[91] Taking into account the need for a strategic reserve, the Active Army force should also include an additional 20 percent of the 42 BCTs.

- **Two-MRC Benchmark:** 50 brigade combat teams.
- **Actual 2016 Level:** 31 brigade combat teams.

The Army's current Active Component BCT capacity meets 64 percent of the two-MRC benchmark and thus is scored as "weak."

Capability Score: Marginal

The Army's aggregate capability score remains "marginal." While the Army will continue to pursue a model of tiered readiness with the aim of improving, if only slightly, troop readiness levels in FY 2015 over the previous year, the service's overall capability score remains static due to continued reductions in end strength that degrade capability. Additionally, in spite of progress with the JLTV and AMPV, budget reductions and continuing resolutions have led to inadequate and shortsighted funding for the development of future modernization programs, negatively affecting platform innovation and modernization. These subsequent reductions have set back the Army's development of future capabilities needed to remain dominant in any operational environment.

This aggregate score is a result of "marginal" scores for "Age of Equipment," "Size of Modernization Programs," and "Health of Modernization Programs." The Army scored "weak" for "Capability of Equipment."

Readiness Score: Weak

Just over a third of Active BCTs were ready for action according to official Army testimony by the Chief of Staff in April 2016.[92] The Army had 32 BCTs; therefore, roughly 11 of the Active Army BCTs were considered ready for combat. For that reason, this *Index* assesses Army readiness as "weak." However, it should be noted that the Vice Chief of Staff also reported in March that of the BCTs fully trained for "decisive action operations," the readiness of nine had been consumed in support of ongoing operations, which means that only three were uncommitted and ready for use.[93] With this in mind, *actual* readiness is therefore likely dangerously close to nearing a state of "very weak."

Overall U.S. Army Score: Weak

The Army's overall score is calculated based on an unweighted average of its capacity, capability, and readiness scores. The average score was 2.3; thus, the overall Army score is "weak." This was derived from the aggregate score for capacity ("weak"); capability ("marginal"); and readiness ("weak"). This score is the same as the score in the *2016 Index* and indicates continued concerns for the Army, particularly when it comes to capacity in light of increased demand on the service around the globe.

U.S. Military Power: Army

	VERY WEAK	WEAK	MARGINAL	STRONG	VERY STRONG
Capacity		✓			
Capability			✓		
Readiness		✓			
OVERALL		✓			

Endnotes:

1. The Honorable John M. McHugh, Secretary of the Army, and General Raymond T. Odierno, Chief of Staff, United States Army, "On the Posture of the United States Army," statement before the Committee on Armed Services, U.S. Senate, 114th Cong., 1st Sess., March 5, 2015, p. ii, http://www.g8.army.mil/pdf/HASC_2015_Army_Posture_Statement.pdf (accessed August 8, 2015).
2. Ibid.
3. Major General Thomas A. Horlander, Director, U.S. Army Budget, *Army FY 2017 Budget Overview*, February 2016, p. 7, http://asafm.army.mil/Documents/OfficeDocuments/Budget/budgetmaterials/fy17//overview.pdf (accessed June 21, 2016).
4. U.S. Department of Defense, Office of the Under Secretary of Defense (Comptroller), *National Defense Budget Estimates for FY 2017*, March 2016, p. 260, http://comptroller.defense.gov/Portals/45/Documents/defbudget/fy2017/FY17_Green_Book.pdf (accessed August 17, 2016).
5. U.S. Department of the Army, *Fiscal Year (FY) 2017 President's Budget Submission: Military Personnel, Army, Justification Book*, February 2016, p. 9, http://asafm.army.mil/Documents/OfficeDocuments/Budget/budgetmaterials/fy17/milpers/mpa.pdf (accessed August 13, 2016).
6. Michelle Tan, "Army Lays out Plan to Cut 40,000 Soldiers," *Army Times*, July 10, 2015, http://www.armytimes.com/story/military/pentagon/2015/07/09/army-outlines-40000-cuts/29923339/ (accessed July 14, 2015).
7. Horlander, *Army FY 2017 Budget Overview*, p. 5.
8. General Daniel Allyn, Vice Chief of Staff, U.S. Army, "Current State of Readiness of the U.S. Forces in Review of the Defense Authorization Request for FY 2017 and the FYDP," statement before the Subcommittee on Readiness and Management Support, Committee on Armed Services, U.S. Senate, 114th Cong., 2nd Sess., March 15, 2016, p. 2, http://www.armed-services.senate.gov/imo/media/doc/Allyn_03-15-16.pdf (accessed June 21, 2016).
9. The Honorable Patrick J. Murphy and General Mark A. Milley, "Army Posture Statement 2016," statement submitted to the Committees and Subcommittees of the U.S. Senate and U.S. House of Representatives, 114th Cong., 2nd Sess., March–April 2016, p. 14, https://www.army.mil/e2/rv5_downloads/aps/aps_2016.pdf (accessed August 13, 2016).
10. Ibid., p. 1.
11. The Honorable John M. McHugh, Secretary of the Army, and General Raymond T. Odierno, Chief of Staff, United States Army, "On the Posture of the United States Army," statement before the Committee on Armed Services, U.S. House of Representatives, 114th Cong., 1st Sess., March 17, 2015, p. i, http://docs.house.gov/meetings/AS/AS00/20150317/103091/HHRG-114-AS00-Wstate-OdiernoUSAR-20150317.pdf (accessed August 17, 2016).
12. U.S. Department of Defense, Office of the Under Secretary of Defense (Comptroller), Chief Financial Officer, *United States Department of Defense Fiscal Year 2017 Budget Request: Defense Budget Overview*, February 2016, p. 7-2, http://comptroller.defense.gov/Portals/45/Documents/defbudget/fy2017/FY2017_Budget_Request_Overview_Book.pdf (accessed August 13, 2016).
13. Melanie Garunay, "An Update on Our Mission in Afghanistan," The White House, July 6, 2016, https://www.whitehouse.gov/blog/2016/07/06/update-our-mission-afghanistan (accessed August 13, 2016).
14. Murphy and Milley, "Army Posture Statement 2016," p. 5.
15. Lieutenant General James C. McConville, Deputy Chief of Staff, G-1, U.S. Army, "On Active Guard, Reserve and Civilian Personnel Programs," statement before the Subcommittee on Personnel Subcommittee, Committee on Armed Services, U.S. Senate, 114th Cong., 2nd Sess., March 8, 2016, p. 2, http://www.armed-services.senate.gov/imo/media/doc/McConville_03-08-16.pdf (accessed August 13, 2016).
16. U.S. Department of Defense, Assistant Secretary of the Army [Financial Management and Comptroller], *FY 2017 President's Budget Highlights*, February 2016, p. 8, http://asafm.army.mil/Documents/OfficeDocuments/Budget/budgetmaterials/fy17/pbhl.pdf (accessed June 21, 2016).
17. United States Army, "Operational Unit Diagrams," http://www.army.mil/info/organization/unitsandcommands/oud/ (accessed August 12, 2014).
18. Ibid.
19. Andrew Feickert, "Army Drawdown and Restructuring: Background and Issues for Congress," Congressional Research Service, *Report for Members and Committees of Congress*, February 28, 2014, p. 18, https://www.fas.org/sgp/crs/natsec/R42493.pdf (accessed July 10, 2015).
20. Ibid.
21. U.S. Government Accountability Office, *Army Planning: Comprehensive Risk Assessment Needed for Planned Changes to the Army's Force Structure*, GAO–16–327, April 2016, p. 12, http://www.gao.gov/assets/680/676516.pdf (accessed June 21, 2016).

22. Ibid. The 13 percent estimate is based on a review of historical figures as referenced in the GAO report.
23. U.S. Department of Defense, *National Defense Budget Estimates for FY 2017*, p. 260.
24. Allyn, "Current State of Readiness of the U.S. Forces," March 15, 2016, p. 3.
25. Ibid.
26. Michelle Tan, "Big BCT Changes Mapped out for 2015," *Army Times*, February 9, 2015, http://www.armytimes.com/story/military/pentagon/2015/02/09/army-bct-reorganization/22936227/ (accessed July 10, 2015).
27. Horlander, *Army FY 2017 Budget Overview*, p. 10.
28. U.S. Department of Defense, Office of the Under Secretary of Defense, Chief Financial Officer, *United States Department of Defense Fiscal Year 2016 Budget Request: Overview*, February 2015, p. 8-4, http://comptroller.defense.gov/Portals/45/Documents/defbudget/fy2016/FY2016_Budget_Request_Overview_Book.pdf (accessed August 13, 2016).
29. Congressional Quarterly, "Senate Appropriations Subcommittee on Defense Holds Hearing on President Obama's Fiscal 2017 Budget Request for the U.S. Army," CQ Congressional Transcripts, February 24, 2016, http://www.cq.com/doc/congressionaltranscripts-4841086?6&search=qvkLCJJX (accessed June 24, 2016).
30. Allyn, "Current State of Readiness of the U.S. Forces," March 15, 2016, p. 6.
31. Lieutenant General Kevin W. Mangum, Deputy Commanding General, U.S. Army Training and Doctrine Command, "On Aviation Readiness," statement before the Subcommittee on Readiness, Committee on Armed Services, U.S. House of Representatives, 114th Cong., 2nd Sess., July 6, 2016, p. 7, http://docs.house.gov/meetings/AS/AS03/20160706/105159/HHRG-114-AS03-Wstate-MangumK-20160706.pdf (accessed August 13, 2016).
32. Michelle Tan, "Army Europe Leaders Want More Helicopters to Fill "Aviation Deficit,'" *Army Times*, December 1, 2015, http://www.armytimes.com/story/military/2015/12/01/army-europe-leaders-want-more-helicopters-fill-aviation-deficit/76634812/ (accessed June 24, 2016).
33. National Commission on the Future of the Army, *Report to the President and the Congress of the United States*, January 28, 2016, p. 2, http://www.ncfa.ncr.gov/sites/default/files/NCFA_Full%20Final%20Report_0.pdf (accessed August 13, 2016).
34. Staff Sergeant Aaron R. Knowles, "3rd Brigade Combat Team Cases Colors," *Army Times*, April 20, 2016, https://www.army.mil/article/166365/3rd_brigade_combat_team_cases_colors (accessed August 13, 2016).
35. U.S. Department of Defense, *FY 2017 President's Budget Highlights*, p. 15.
36. Allyn, "Current State of Readiness of the U.S. Forces," March 15, 2016, p. 3.
37. Ibid.
38. Andrew Feickert, "The Army's M-1 Abrams, M-2/M-3 Bradley, and M-1126 Stryker: Background and Issues for Congress," Congressional Research Service *Report for Members and Committees of Congress*, April 5, 2016, p. 9, https://www.fas.org/sgp/crs/weapons/R44229.pdf (accessed June 24, 2016).
39. Ibid, p. 1.
40. U.S. Department of Defense, Office of the Undersecretary of Defense (Comptroller)/Chief Financial Officer, *United States Department of Defense Fiscal Year 2017 Budget Request: Program Acquisition Cost by Weapon System*, February 2016, p. 1-10, http://comptroller.defense.gov/Portals/45/Documents/defbudget/fy2017/FY2017_Weapons.pdf (accessed August 13, 2016).
41. Horlander, *Army FY 2017 Budget Overview*, p. 13.
42. U.S. Department of Defense, Office of the Under Secretary of Defense (Comptroller)/CFO, *Fiscal Year 2017 Budget Request*, February 9, 2016, p. 8, "Cuts to Hit the Lower FY 2017 Topline," http://comptroller.defense.gov/Portals/45/Documents/defbudget/fy2017/FY2017_Budget_Request.pdf (accessed August 14, 2016).
43. U.S. Army Training and Doctrine Command; Army Capabilities Integration Center; Maneuver, Aviation, and Soldier Division, *The U.S. Army Combat Vehicle Modernization Strategy*, September 15, 2015, http://www.arcic.army.mil/app_Documents/CVMS_SEP_Master.pdf (accessed August 14, 2016).
44. Allyn, "Current State of Readiness of the U.S. Forces," March 15, 2016, p. 5.
45. Ibid.
46. Andrew Feickert, "Joint Light Tactical Vehicle (JLTV): Background and Issues for Congress," Congressional Research Service *Report for Members and Committees of Congress*, February 18, 2016, p. 5, https://www.fas.org/sgp/crs/weapons/RS22942.pdf (accessed June 24, 2016).

47. Andrew Feickert, "The Army's Ground Combat Vehicle (GCV) Program: Background and Issues for Congress," Congressional Research Service *Report for Members and Committees of Congress*, March 14, 2014, p. 9, http://fas.org/sgp/crs/weapons/R41597.pdf (accessed March 26, 2015).
48. Sydney J. Freedberg Jr., "The 21st Century Jeep: JLTV Race Hits Final Stretch," *Breaking Defense*, June 22, 2015, http://breakingdefense.com/2015/06/21st-century-jeep-jltv-race-in-final-stretch-this-summer/ (accessed July 10, 2015).
49. U.S. Army, "JLTV Enters Low Rate Production," August 25, 2015, https://www.army.mil/article/154425/JLTV_enters_low_rate_production/ (accessed June 24, 2016).
50. Andrew Feickert, "Joint Light Tactical Vehicle (JLTV)," p. 5.
51. U.S. Department of Defense, *United States Department of Defense Fiscal Year 2017 Budget Request: Program Acquisition Cost by Weapon System*, p. 3-2.
52. U.S. Army, "JLTV Enters Low Rate Production."
53. U.S. Department of Defense, *United States Department of Defense Fiscal Year 2017 Budget Request: Program Acquisition Cost by Weapon System*, p. 3-1.
54. Ibid., p. 3-5.
55. Ibid., p. 3-6.
56. Feickert, "The Army's M-1 Abrams, M-2/M-3 Bradley, and M-1126 Stryker," p. 20.
57. U.S. Department of Defense, *United States Department of Defense Fiscal Year 2017 Budget Request: Program Acquisition Cost by Weapon System*, p. 3-8.
58. Lieutenant General Michael E. Williamson, Principal Military Deputy to the Assistant Secretary of the Army for Acquisition, Logistics and Technology and Director, Acquisition Career Management; Lieutenant General Joseph Anderson, Deputy Chief of Staff of the Army, G/3-5-7; Lieutenant General Herbert R. McMaster, Jr., Director, Army Capabilities Integration Center, U.S. Army Training and Doctrine Command; and Lieutenant General John M. Murray, Deputy Chief of Staff of the Army, G-8, "Army Modernization in Review of the Defense Authorization Request for FY 2017 and the Future Years Defense Program," statement before the Subcommittee on Airland, Committee on Armed Services, U.S. Senate, 114th Cong., 2nd Sess., April 5, 2016, p. 11, http://www.armed-services.senate.gov/imo/media/doc/Williamson-Anderson-McMaster-Murray_04-05-16.pdf (accessed August 14, 2016).
59. Joe Gould, "US Army Awards Contracts for FFV Designs," *Defense News*, June 2, 2015, http://www.defensenews.com/story/breaking-news/2015/06/02/us-army-awards-contracts-for-future-fighting-vehicle-designs/28358693/ (accessed August 14, 2016).
60. Ibid.
61. Williamson, Anderson, McMaster, and Murray, "Army Modernization in Review of the Defense Authorization Request for FY 2017 and the Future Years Defense Program," p. 11.
62. Ibid.
63. Feickert, "The Army's Ground Combat Vehicle (GCV) Program," pp. 10–11.
64. Feickert, "The Army's M-1 Abrams, M-2/M-3 Bradley, and M-1126 Stryker," p. 15.
65. U.S. Department of Defense, Office of the Under Secretary of Defense (Comptroller/CFO), *United States Department of Defense Fiscal Year 2016 Budget Request: Program Acquisition Cost by Weapon System*, February 2015, p. 3-3, http://comptroller.defense.gov/Portals/45/Documents/defbudget/fy2016/FY2016_Weapons.pdf (accessed August 13, 2016).
66. Ibid.
67. Andrew Feickert, "The Army's Armored Multi-Purpose Vehicle (AMPV): Background and Issues for Congress," Congressional Research Service *Report for Members and Committees of Congress*, February 25, 2015, http://www.fas.org/sgp/crs/weapons/R43240.pdf (accessed July 10, 2015).
68. Ibid.
69. The Honorable John M. McHugh, Secretary of the Army, and General Raymond T. Odierno, Chief of Staff, United States Army, "On the Posture of the United States Army," statement before the Committee on Armed Services, U.S. Senate, 113th Cong., 1st Sess., April 23, 2013, p. 1, http://www.armed-services.senate.gov/imo/media/doc/McHugh-Odierno_04-23-13(1).pdf (accessed August 17, 2016).
70. Murphy and Milley, "Army Posture Statement 2016," p. 13.
71. Horlander, *Army FY 2017 Budget Overview*, p. 7.
72. Allyn, "Current State of Readiness of the U.S. Forces," March 15, 2016, p. 7.

73. Horlander, *Army FY 2017 Budget Overview*, p. 20.
74. Jim Garamone, "Dunford: No Compromise on Training for Iraq, Afghanistan," U.S. Department of Defense, March 22, 2016, http://www.defense.gov/News-Article-View/Article/699869/dunford-no-compromise-on-training-for-iraq-afghanistan (accessed June 24, 2016).
75. Congressional Quarterly, "Senate Armed Services Committee Holds Hearing on Army Posture," CQ Congressional Transcripts, April 7, 2016, http://www.cq.com/doc/congressionaltranscripts-4864185?9&search=XqpLG9V3 (accessed August 14, 2016).
76. McHugh and Odierno, "On the Posture of the United States Army," March 25, 2014, p. 14.
77. U.S. Department of the Army, "Combat Training Center Program," Army Regulation 350–50, April 3, 2013, p. 1, http://www.apd.army.mil/pdffiles/r350_50.pdf (accessed March 23, 2015).
78. U.S. Department of Defense, *United States Department of Defense Fiscal Year 2017 Budget Request: Defense Budget Overview*, p. 8-6.
79. McHugh and Odierno, "On the Posture of the United States Army," March 5, 2015, p. 11.
80. Mangum, "On Aviation Readiness," p. 7.
81. Ibid.
82. Ibid.
83. Ibid.
84. U.S. Department of Defense, Office of the Under Secretary of Defense (Comptroller)/Chief Financial Officer, *United States Department of Defense Fiscal Year 2015 Budget Request: Overview*, March 2014, p. 3-3, http://comptroller.defense.gov/Portals/45/Documents/defbudget/fy2015/fy2015_Budget_Request_Overview_Book.pdf (accessed March 23, 2015).
85. Allyn, "Current State of Readiness of the U.S. Forces," p. 3.
86. McHugh and Odierno, "On the Posture of the United States Army," March 5, 2015, p. 11.
87. Tan, "Big BCT Changes Mapped out for 2015."
88. U.S. Department of the Army, *Fiscal Year (FY) Budget Estimates: Volume III, Operation and Maintenance, Army, Overseas Contingency Operations (OCO) Request*, "Budget Activity 01 - Operating Forces, Activity Group 13 - Land Forces Readiness Support, Detail by Subactivity Group 137 - Reset," p. 96, http://asafm.army.mil/Documents/OfficeDocuments/Budget/budgetmaterials/fy17/OCO//oma.pdf (accessed August 14, 2016).
89. Ibid., p. 100.
90. Lynn M. Williams and Pat Towell, "FY2017 Defense Budget Request: In Brief," Congressional Research Service *Report for Members and Committees of Congress*, February 12, 2016, p. 5, https://www.fas.org/sgp/crs/natsec/R44379.pdf (accessed August 13, 2016).
91. Note that the first figures derive from an average BCT size of 4,500 and average division size of 15,000. The second set of numbers derives from the current average of around 3.5 BCTs per division and analysis of the structure of each Army division.
92. Congressional Quarterly transcript of Senate Armed Services Committee hearing, April 7, 2016.
93. General Daniel Allyn, Vice Chief of Staff, United States Army, "The Current State of Readiness of U.S. Forces," statement before the Subcommittee on Readiness and Management Support, Committee on Armed Services, U.S. Senate, 114th Cong., 1st Sess., March 25, 2015, http://www.armed-services.senate.gov/imo/media/doc/Allyn_03-25-15.pdf (accessed July 24, 2015).

U.S. Navy

Chief of Naval Operations (CNO) Admiral John M. Richardson, in the 2016 document *A Design for Maintaining Maritime Superiority*, describes the U.S. Navy's mission as follows:

> The United States Navy will be ready to conduct prompt and sustained combat incident to operations at sea. Our Navy will protect America from attack and preserve America's strategic influence in key regions of the world. U.S. naval forces and operations—from the sea floor to space, from deep water to the littorals, and in the information domain—will deter aggression and enable peaceful resolution of crises on terms acceptable to the United States and our allies and partners. If deterrence fails, the Navy will conduct decisive combat operations to defeat any enemy.[1]

As the military's primary maritime arm, the Navy enables the United States to project military power in the maritime and air domains, a critical capability in war, crisis response, and peacetime engagement missions. Unlike land forces (or even, to a large extent, air forces), which are tethered to a set of fixed, larger-scale support bases, the Navy is able to shift its presence wherever needed so long as the world's oceans and seas permit. In addition to the ability to project combat power rapidly anywhere in the world, the Navy's peacetime forward presence supports missions that include securing sea lines of communication (SLOC) for the free flow of goods and services, assuring U.S. allies and friends, deterring adversaries, and providing a timely response to crises short of war.

A few key documents inform the Navy as to the level of its day-to-day fleet requirements: the 2012 Defense Strategic Guidance (DSG);[2] the Global Force Management Allocation Plan (GFMAP);[3] the 2015 update to "A Cooperative Strategy for 21st Century Seapower"[4]; and the *Design for Maintaining Maritime Superiority*. The 2012 DSG issued by the Secretary of Defense describes 10 primary missions for the Navy and the other branches of the U.S. military. In addition, the U.S. Navy must meet forward presence requirements laid out in the fiscal year (FY) 2016 GFMAP, which states the force presence needed around the world as determined by the combatant commanders (COCOMs) and the Secretary of Defense.[5]

While Admiral Richardson acknowledged in his March 2016 posture statement that the 2015 Bipartisan Budget Act provided some relief from funding shortfalls, he argued that recent years' cuts and unstable budgets have caused the Navy to "modify our behaviors with a host of inefficient practices" and that "budget constraints are forcing choices that limit our naval capability in the face of growing and rising threats."[6]

Capacity

For the Navy, capacity is measured by the number of ships rather than the number of sailors, and not all ships are counted equally. The Navy focuses mainly on the size of its "battle force," which is composed of ships considered to be directly related to its combat missions.[7]

In 2015, the Navy increased its battle force requirement to 308 ships, two more than the

CHART 3

Navy Requirements and Current Inventory

This chart compares the Navy's stated fleet requirement from its January 2015 report to Congress with their battle force ship capacity in 2016 as reported in the Naval Vessel Register.

Ship Type	FY 2015 Inventory	FY 2015 Requirement	FY 2016 Inventory	2016 Difference: Inventory Minus Requirement
Aircraft Carriers	10	11	10	−1
Large Surface Combatant	84	88	84	−4
Small Surface Combatant	17	52	17	−35
Attack Submarines	54	48	52	4
Cruise Missile Submarines	4	0	4	4
Ballistic Missile Submarine	14	12	14	2
Amphibious Warfare Ships	30	34	31	−3
Combat Logistics Force	30	29	30	1
Support Ships	28	34	30	−4
Total	271	308	272	−36

SOURCES: Ronald O'Rourke, "Navy Force Structure and Shipbuilding Plans: Background and Issues for Congress," Congressional Research Service, August 10, 2015, https://www.fas.org/sgp/crs/weapons/RL32665.pdf (accessed August 25, 2015), and U.S. Department of Navy, Naval Sea Systems Command, Shipbuilding Support Office, "Ship Battle Forces," http://www.nvr.navy.mil/nvrships/sbf/fleet.htm (accessed August 25, 2015).

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previous year. The additional two ships in the fleet requirement are an LPD-17 amphibious ship and a Mobile Landing Platform vessel.[8] Congress added funding for the amphibious ship in FY 2013 and FY 2015; it had not been requested by the Navy. While this may seem excessive since the Navy did not officially request a 12th LPD-17 ship, the Navy's amphibious fleet is currently well below the Navy and Marine Corps program of record requirement (34 hulls) as well as this *Index*'s assessment (50); therefore, the addition of an unrequested LPD-17 contributes to the Navy's broader amphibious vessel and overall fleet needs.[9]

In both FY 2016 and FY 2017 budget materials, the Navy maintained its force structure goal of 308 ships.[10] A new Force Structure Assessment (FSA) released by the Navy on July 12, 2016, also "supports a battle force requirement of 308 ships, but notes the force structure assessment under way for the fiscal 2018 budget submission will determine a new force level that will affect the shipbuilding plan.[11]

The Navy currently sails 274 vessels as part of its battle force fleet, up from 271 the previous year but still well below both the Navy's fleet goal as well as a level sufficient to uphold a two-MRC (major regional contingency) construct. The Navy requested seven ships to be procured in FY 2017.[12] This figure is below the number that the Congressional Budget Office (CBO) finds is necessary, on average annually, for the Navy to reach its fleet goal of 308 ships.[13]

The largest proportional shortfall in the Navy fleet assessed in the *2017 Index* is the same as in the past two editions: small surface combatants.[14] This includes Littoral Combat Ships and Mine Countermeasure Ships and

previously included Frigates. All *Oliver Hazard Perry*-class frigates were decommissioned by the end of 2015.[15] There are currently 11 mine countermeasure (MCM) vessels and six LCS vessels for a total of 17 small surface combatants in the fleet, far below the objective requirements established by the Navy (52).

The aircraft carrier fleet currently suffers a capacity shortfall of three hulls: 10 are currently in the fleet, while the two-MRC construct requires 13. This also falls below a legal minimum of 11 carriers in the fleet, which is currently waived.[16] The carrier gap resulted from the delayed delivery of the first-of-its-kind *Ford*-class carrier, which was supposed to enter the fleet as the USS *Enterprise* was decommissioned in 2012. The Congressional Research Service reported in May 2016 that "The *Gerald R. Ford* (CVN-78), the lead ship in the CVN-78 class, is scheduled to be delivered to the Navy in late August or early September 2016" and "will likely be commissioned some months after that, returning the Navy's carrier force to a total of 11 ships."[17] These and other shortfalls are partly due to underinvestment in the Shipbuilding and Conversion, Navy (SCN) budget to procure new hulls quickly enough to increase the size of the Navy.[18]

In October 2015, the CBO calculated that the Navy's 308-ship fleet goal would cost $20.2 billion in shipbuilding funds annually, well above the historical average of $15.7 billion per year.[19] The Navy's SCN request for FY 2017 totaled over $18 billion, much closer to the figure the CBO has assessed is necessary to reach fleet goals.[20] However, as noted, this only includes funding for seven battle force ships to be procured in this fiscal year, which will make it difficult to increase the fleet size. The mismatch between higher funding but not more hulls is due in part to the fact that a large portion of this funding is dedicated to advanced procurement of the next-generation ballistic missile submarine program (SSBN(X) *Columbia*-class) as well as non-battle force requirements such as a training ship.[21]

Without significant funding increases in procuring more vessels across ship types each year, it appears unlikely that the Navy will reach its own capacity goals for the foreseeable future.[22] Due to expected funding shortfalls relative to fleet goals:

> [T]he Navy projects that the fleet would experience a shortfall in large surface combatants (i.e., cruisers and destroyers) from FY2034 through FY2037, and from FY2041 through at least FY2046; a shortfall in small surface combatants (i.e., LCSs and frigates) for the entire 30-year period; a shortfall in attack submarines from FY2025 through FY2036; and a shortfall in amphibious ships from FY2017 through FY2021, in FY2040, and from FY2042 through at least FY2046.[23]

By the publication of the *2016 Index*, small surface combatants were projected to experience a shortfall solely between FY 2016 and FY 2027; but according to the 2016 Force Structure Assessment for FY 2017, the Secretary of Defense's 2015 decision to reduce the LCS/Frigate program from 52 ships to 40 ships has upped the small surface combatant shortfall projection to a 30-year duration.[24]

As important as the total fleet size is, the Navy must also consider the number of ships that are forward deployed to meet operational demands. Not all ships in the battle force are at sea at the same time. The majority of ships are based in the continental U.S. (CONUS) to undergo routine maintenance and training, as well as to limit deployment time for sailors. However, given the COCOMs' requirements for naval power presence in each of their regions, there is an impetus to have as many ships forward deployed as possible. Striking a balance between deploying ships to meet operational demands and keeping them in port to perform needed maintenance and provide relief to sailors is a constant challenge.

Today, the Navy has 94 ships deployed globally—35 percent of the total available fleet and roughly on par with the 2016 level of 95 ships.[25] While the Navy remains committed to deploying roughly a third of its fleet at all times, it should be noted that this is nevertheless an insufficient global presence because

the total fleet falls well below necessary levels both for the Navy's stated presence needs and for a fleet capable of projecting power at the two-MRC level. The Navy has tried to increase forward presence by emphasizing non-rotational deployments: having a ship "home-ported" overseas or keeping the ship forward stationed:[26]

- **Home-ported:** The ships, crew, and their families are stationed at the port or based abroad.

- **Forward Stationed:** Only the ships will be based abroad while crews are rotated out to the ship.[27]

Both of these non-rotational deployment options require cooperation from friends and allies to permit the Navy's use of their facilities as well as investment in additional facilities abroad. However, these options allow one ship to provide a greater level of presence than four ships based in CONUS and in rotational deployment since they offset the time necessary to deploy ships to distant theaters.[28] A key example of the use of this practice is the Navy's constant home porting of an aircraft carrier at the U.S. naval base in Yokosuka, Japan. In May 2015, the USS *George Washington* (CVN-73) departed this base with the USS *Ronald Reagan* sailing there to replace it.[29] The *George Washington*, stationed at Yokosuka since 2008, left to undergo its midlife refueling and complex overhaul (RCOH).

The Navy maintains that it currently will be able to meet GFMAP requirements and the 10 missions outlined in the DSG. However, as noted, Admiral Richardson has indicated that the fleet will continue to be stretched to meet demand.

Capability

Scoring the U.S. Navy's overall ability to protect U.S. interests globally is not just a matter of counting the fleet. The quality of the battle force is also important in determining the strength of the Navy.

A comprehensive measure of platform capability would involve a comparison of each ship and its weapons systems relative to the military capabilities of other nations. For example, a complete measure of naval capabilities would have to assess not only how U.S. platforms would match up against an enemy's weapons, but also whether operational concepts like the often discussed Air-Sea Battle would be effective in a conflict. This assessment would then have to be replicated for each potential conflict. While this is a necessary exercise and one in which the military currently engages, it is beyond the scope of this *Index* because such details and analysis are routinely classified.

Capability can be usefully assessed based on the age of ships, the modernity of the platform, and whether or not modernization programs will maintain the fighting edge of the fleet. The Navy has several classes of ships that are nearing the end of their lifespan, and this will precipitate a consolidation of ship classes in the battle force.

As noted, the Navy retired its entire fleet of *Oliver Hazard Perry*-class guided missile frigates by the end of 2015. The *Perry*-class is being replaced by the Littoral Combat Ship (LCS), but some naval analysts have suggested that the LCS lacks the firepower of the frigate.[30] In 2015, the Navy modified its LCS program to add more firepower to future hulls, and it will be referring to these upgunned LCSs as frigates beginning in FY 2019.[31] This modification resulted from a restructuring of the LCS program initiated in 2014 by Secretary of Defense Chuck Hagel. The upgrades that the Navy says will give this future block of LCS/frigates capabilities closer to those of the *Perry*-class frigates include "[o]ver-the-horizon surface to surface missile and additional weapon systems and combat system upgrades" and "increased survivability [through] incorporating additional self-defense capabilities and increased hardening of vital systems and vital spaces."[32]

The FY 2017 Future Years Defense Program (FYDP) includes funding for the

construction of seven Littoral Combat Ships through FY 2021. Currently, the Navy projects that 10 LCSs will be in the deployable force by the end of FY 2016—double the five commissioned in FY 2015—and 14 by the end of FY 2017 if the funding requested for the construction of four additional LCSs is approved this summer.[33] However, this is still well below the fleet size of small surface combatants necessary to fulfill the Navy's global responsibilities (52) even when combined with the remaining mine countermeasure vessels in the fleet (11). Noting the age of these legacy vessels and LCS delays, the U.S. Congress mandated in the FY 2016 National Defense Authorization Act (NDAA) that the Department of Defense (DOD) produce a "Mine countermeasures master plan and report" that would assess the "capabilities, capacities, and readiness levels of the defensive capabilities of the Navy for MCM" and "ensur[e] the operational effectiveness of the MCM vessels, including the decommissioned MCM-1 and MCM-2 ships and the potential of such ships for reserve operational status."[34] This report is due in winter 2016.

The Navy is attempting to put the remaining *Ticonderoga*-class cruiser fleet into temporary layup status in order to extend this class's fleet service time into the 2030s, even though these ships are younger than their expected service lives. The Navy's FY 2017 budget request renewed its cruiser phased modernization plan as an alternative to a continuation of the 2-4-6 directive passed by Congress in 2015.[35] This meant that "two cruisers would enter in a modernization cycle each year, [and] no cruisers will remain in layup for more than four years with no more than six cruisers out of service at one time," according to Rear Admiral William Lescher, Deputy Assistant Secretary of the Navy for Budget.[36] Driven by budget shortfalls, this plan (like the previous year's) is an attempt to keep 11 of the 22 commissioned cruisers in service at all times through 2034.[37]

In early 2016, Rear Admiral Lescher advocated for an alternative to the current 2-4-6, which has already put the USS *Cowpens* (CG-63) and the USS *Gettysburg* (CG-64) into modernization periods in FY 2015 with two to follow in the summer of 2016. The alternative phased modernization plan in the FY 2017 budget request asks Congress to allow the Navy to put the remaining seven unmodernized cruisers into maintenance in FY 2017, arguing that it saves $3 billion in operating costs over the FYDP. There is currently no program to replace the *Ticonderoga*-class cruisers; a program initiated in FY 2001, called CG(X), was to yield a replacement cruiser vessel, but it was canceled in FY 2011 after it was deemed too expensive.[38]

The Navy's two current dock landing ships (LSD), the *Whidbey Island*-class and *Harpers Ferry*-class amphibious vessels, are reaching the end of their service lives in the 2025 time frame and are to be replaced by the next-generation LX(R) program. The Navy requested $6.4 million for this program, dedicated to research and development, in FY 2017 following FY 2016 funding of $325.5 million (of which $250 million was advanced procurement funding) added by Congress. LX(R) was initially to begin procurement in FY 2017 but has since been delayed until FY 2020.[39]

Many of the other ships that the Navy sails are also legacy platforms. Of the 18 classes of ships in the Navy, only seven are currently in production. For example, 72 percent of the Navy's attack submarines are *Los Angeles*-class submarines, an older platform that is being replaced with a more modern and capable *Virginia*-class.[40] This will shift as the Navy continues to purchase more ships.

The procurement of ships is critical to meeting Navy capacity requirements, maintaining ship capabilities, and maintaining the industrial capacity to build any warships. The Navy plans to procure 38 ships between FY 2017 and FY 2021, including seven battle force ships in FY 2017 alone.[41] Compared to the FY 2016 plan to procure 48 new ships between FY 2016 and FY 2020, the FY 2017–FY 2021 plan projects a 10-ship reduction to 38 ships to account for the reduced annual

procurement rate for the Littoral Combat Ship (LCS)/Frigate program (52 ships to 40 ships) initiated by the Secretary of Defense in December 2015. This plan also directs the Navy to reduce planned annual procurement quantities of LCSs during the FY 2017–FY 2021 shipbuilding plan and downselect to one variant of the ship class.[42]

Modernization programs supplement procurement plans and are intended to replace current platforms as they reach the end of their planned service lives, build up forces to meet capacity requirements, and introduce new technologies to the operating forces. Ship modernization programs as they currently stand are problematic because they do not "keep pace to deal with high-end adversary weapons systems by 2020."[43] The CBO has reported both in 2014 and most recently in October 2015 that to reach its procurement goals for the FY 2016 NDAA, the Navy would need to increase spending on shipbuilding by one-third over what it has spent per year during the past 30 years.[44] It is worth noting that this assessment was for the Navy's goal of a 308-ship Navy, maintaining the FY 2015 aim of 308 through FY 2016 and now in FY 2017 but still well below this *Index*'s prescribed fleet size of 346 ships.

Because ships take such a long time to build and only a few shipyards are capable of building them, and because shipbuilding programs require carefully orchestrated, long-lead-time planning to account for sequencing in the shipyards, supply chain and workforce management, and multi-year funding, the Navy publishes a 30-year plan as its top-level document that captures objectives by class and sequencing of replacements as older ships reach the end of their service lives.[45] According to the current 30-year plan, the Navy will reach its 308-ship requirement by FY 2021.[46]

However, the 30-year shipbuilding plan is not limited to programs of record and assumes procurement programs that have yet to materialize. For that reason, it is often considered overly optimistic. For example, the goal of 308 ships stated in the Navy's most recent 30-year plan includes an objective for 12 SSBN(X) *Columbia*-class submarines to replace the legacy *Ohio*-class, which will require a significant portion of the SCN account when it goes into production if the overall budget is not increased. The Navy's FY 2013 budget deferred the procurement of the lead boat from FY 2019 to FY 2021, projecting a shortfall of 11 or 10 SSBN boats for the period FY 2029 to FY 2041.[47] This is something that the Navy will continue to have difficulty maintaining as it struggles to sustain, overhaul, modernize, and eventually retire the remainder of its legacy SSBN fleet. The Navy allocated over $773 million in its FY 2017 request, or 4 percent of its total shipbuilding budget, to advanced procurement funding for the *Columbia*-class.[48]

The service is planning to acquire the first *Columbia*-class SSBN(X) in FY 2021.[49] In March 2016, the Government Accountability Office (GAO) reported that total program acquisition costs will be about $97 billion, including $12 billion for research and development and $85.1 billion for procurement.[50] According to the Congressional Research Service, "The Navy in January 2015 estimated the average procurement cost of boats 2 through 12 in the *Ohio* replacement program at about $5.2 billion each in FY2010 dollars."[51] Based on the historical average, the Navy will have to spend more than a third of its shipbuilding budget on one *Columbia* hull each year that it procures one.[52] This *Index* therefore relies on budget and programmatic data from programs of record to determine the state of Navy modernization.

The most glaring problem with the Navy's current modernization program has to do with how many ships it plans to purchase. While the Navy has stated its intent to purchase additional attack submarines, the current *Virginia*-class program of record is slated to produce a total of 30 submarines. Under the Navy's FY 2017 30-year plan, the SSN force would reach a minimum of 41 boats in FY 2029 and stay below 48 boats through FY 2036. The Navy has stated that it will attempt to lengthen deployments

and possibly perform service life extensions on some of the existing attack submarines to account for this shortfall.[53] Similarly, the Navy plans to replace the 14 aging *Ohio*-class SSBNs with 12 *Columbia*-class hulls.[54]

All remaining *Oliver Hazard Perry*-class frigates were retired in 2015, so the Littoral Combat Ship will increasingly assume the entire small surface combatant fleet requirement. As noted, the LCS and its follow-on, which will be called a frigate, are intended to make up this shortfall with a procurement of 52 total projected LCS/frigates. Timing for the small surface combatants will be another issue. While the LCS/frigate procurement has been scheduled, ship delivery will not be rapid enough to fill all small surface combatant requirements. The 2015 plan and the 2016 plan therefore do not expect to reach a count of 52 small surface combatants until the year 2028—again, a rosier projection than that determined by the CBO's shipbuilding budget analysis.[55]

Of the seven classes of ships the Navy is building, some have been relatively successful, whereas others are more problematic. Both the *Virginia*-class submarines and *Arleigh Burke*-class destroyers have a steady production rate and are being considered for upgrades to improve their respective capabilities. The newer *Arleigh Burke*-class Flight III design will be able to support a new and larger Air and Missile Defense Radar (AMDR). The Navy also intends to build some *Virginia*-class hulls with extended lengths through the Virginia Payload Module starting in FY 2019 to provide space for additional missiles or torpedoes and has requested continued research and development funding in FY 2017 for this program.[56] The *San Antonio*-class LPD-17 program procured its 12th ship in FY 2016 but is not likely to continue procurement beyond this.[57] As noted, the LX(R) is to replace these vessels, but its initial procurement year has been delayed a number of times.[58]On the other hand, the *Ford*-class aircraft carrier, *America*-class amphibious ship, *Zumwalt*-class (DDG-1000) destroyer, and LCS have experienced varying degrees of difficulty in cost overruns and reductions in intended fleet size. The *Zumwalt* class was essentially relegated to an experimental order, having been reduced from a projected fleet of 32 hulls to just three. Despite obstacles in experimentation and funding, however, the lead *Zumwalt*-class guided missile destroyer DDG-1000, the USS *Zumwalt*, was commissioned on May 20, 2016, and will enable the Navy to test new and developing capabilities such as smaller crewing, an electric-drive propulsion system,[59] and even possibly rail gun weapon technology.[60]

The delivery of CVN-78, the first of the new *Gerald R. Ford* class of aircraft carriers, was significantly delayed, causing a shortfall in the number of aircraft carriers (down to 10) in the U.S. fleet. The Navy is currently confident that it will commission the USS *Ford* in Fall 2016 as 97 percent of the ship is completed.[61] Both the *America*-class amphibious ship and the LCS also face delays and adjustments of requirements. The *America* class will produce only two ships of the current design, and the survivability and strike requirements for the LCS continue to be questioned. All four programs have experienced cost growth, with the *Zumwalt*-class, *Ford*-class, and *America*-class ships incurring cost breaches under the Nunn–McCurdy Act.[62] In December 2015, Secretary of Defense Ashton Carter directed the Navy to reduce the number of LCS hulls that it will procure from 52 to 40.[63] However, the Navy has somewhat defiantly maintained its program of record for a requirement of 52 small surface combatants (though not necessarily all of them LCSs).[64] Despite these difficulties, the Navy regards its fleet as capable of handling today's threats, albeit with increased risk.

The Navy's long-range strike capability derives from its ability to launch various missiles and combat aircraft. Of the two, naval aircraft are much more expensive and difficult to modernize as a class. Not long ago, the Navy operated several models of strike aircraft that included the F-14 Tomcat, A-6 Intruder, A-4 Skyhawk, and F/A-18 Hornet.[65] Over the past 20 years, this variety has been winnowed to a single model: the F/A-18. While the F/A-18

A–D variants were first introduced in 1983 and already have undergone service life extensions, the Navy flies a significant number of F/A-18 E/F Super Hornets that are not only newer, but also considered to be extremely capable. The Navy is implementing efforts to extend the life of some of the older variants but plans to have a mix of the F-35C and F/A-18 E/F Super Hornets.

The F-35C is the Navy's largest aviation modernization program. It is a fifth-generation fighter (all F/A-18 variants are considered fourth-generation) that will have greater stealth capabilities and state-of-the-art electronic systems, allowing it to communicate with multiple other platforms. The Navy plans to purchase 260 F-35Cs (along with 80 F-35Bs for the Marine Corps, discussed in the section on that service)[66] to replace a current inventory of 457 F/A-18 A–Ds and EA-18G Growler electronic attack aircraft.[67] The F-35 is supposed to be a more capable aircraft relative to the F/A-18, but at 260 aircraft, it will not be enough to make up for the Hornets that the Navy will need to replace.

In addition, like the other F-35 variants, the F-35C has faced development problems. The system has been grounded because of engine problems, and software development issues have threatened further delay. The aircraft also has grown more expensive through the development process. The Navy's FY 2017 budget request indicates that it plans to buy four additional F-35Cs in 2017 and 64 between FY 2017 and FY 2021.[68]

The F-35C is expected to reach initial operating capability (IOC) by August 2018. This is later than the previous expectation of IOC by FY 2015. Moreover, Deputy CNO for Warfare Systems Rear Admiral Michael C. Manazir conceded during congressional questioning that "there is some risk to that date."[69] Former CNO Admiral Jonathan Greenert stated in 2015 that this delay, combined with unforeseen higher operational tempo (OPTEMPO) on the existing fighter fleet caused by strikes against ISIS, is leading to a possible fighter shortfall of 36 aircraft.[70] At least six years behind schedule as of 2016, the Navy is looking at a possible shortfall of as many as 138 aircraft by the 2020s.[71] This shortfall and delayed development have led the Navy to extend the service lives of its legacy F/A-18 C/D Hornet aircraft. The Navy requested two additional F/A-18E/Fs in FY 2017 through OCO funding and intends to procure an additional 14 in FY 2018.[72]

The Navy's other aircraft programs, EA-18G Growler and E-2D Advanced Hawkeye, have been relatively successful. The EA-18G program, which had completed its previously planned procurement of 135 aircraft in FY 2014, added 15 aircraft in FY 2015 and 10 aircraft in FY 2016 that it had sought through that fiscal year's "unfunded priorities" list.[73] The Navy included 12 F/A-18F Super Hornets in its FY 2016 list of unfunded priorities that the service explained could be "built...to be converted to EA-18G Growler electronic attack aircraft if necessary."[74] DOD has also established an Electronic Warfare (EW) Executive Committee that is currently assessing, among other issues, the potential necessity of additional Growlers in the future.[75] However, the FY 2017 Navy budget request did not seek additional Growlers.[76] The E-2D program is on a steady procurement schedule, with the Navy having successfully procured its requested level of five aircraft each in FY 2015 and FY 2016. The Navy requested an additional six in FY 2017 and intends to procure 23 over the FY 2017 FYDP.[77]

In FY 2017, the Navy requested the authority to eliminate a carrier air wing,[78] which would bring the total to nine.[79] This decision was driven partly by the fact that the Navy has consistently fielded only 10 aircraft carriers for a number of years, with the service's practice being one carrier air wing less than the number of carriers in the fleet based on the assumption that one carrier at any time will be effectively out of commission for its RCOH. This deactivation of one air wing is scheduled to take place in the fall of 2016.

This *Index* rejects this assumption and assumes that there should be an equal number

of air wings and aircraft carriers. The number of air wings is also well below the capacity required to field a two-MRC force by either count, as such a force requires 13 carriers. Therefore, if the Navy were to continue its one-less-air wing assumption, 12 would actually be necessary today. This *Index* assesses that 13 are actually necessary to provide enough aviation assets for every carrier at any given time.

It should be noted that this divestment of one carrier air wing (the aircraft and associated assets are being diverted to other wings) was driven largely by a mismatch between demand for naval aviation assets and the supply of ready air wings. As the Navy has experienced a higher-than-expected OPTEMPO in recent years, each air wing has been strained for available aircraft while performing necessary maintenance work, so the decision to draw down one wing was made to supplant the demand of those that were active in U.S. engagements.[80]

Readiness

Although the Navy states that it can still deploy forces in accordance with GFMAP requirements, various factors indicate a continued decline in readiness over the past year. Admiral Michelle Howard, Vice Chief of Naval Operations, has reported that:

> We have not yet recovered from the readiness impacts resulting from a decade of combat operations. The cumulative effect of budget reductions, complicated by four consecutive years of continuing resolutions, continues to impact maintenance, afloat and ashore. The secondary effects of these challenges impact material readiness of the force, and the quality of life of our Sailors and their families.[81]

As a result of the inconsistent and insufficient funding experienced by the Navy in recent years:

> Full recovery of the material readiness of the Fleet is likely to extend beyond 2020. Stable funding, improvement in on-time execution of ship and aviation depot maintenance, and steady state operations are required to meet our Fleet readiness goals. To mitigate impacts ashore, Navy has made difficult decisions and focused on shore items directly tied to our primary missions.[82]

Like the other services, the Navy has had to dedicate readiness funding to its immediate needs of various engagements around the globe, which means that maintenance and training for those ships and sailors not deployed has not been prioritized.

The Navy's undersized fleet has contributed greatly to the readiness challenges it faces. For example, carrier strike groups (CSGs) have experienced the following problems in recent years, according to the GAO:

- [C]arrier strike group deployment lengths have increased from an average of 6.4 months between 2008–2011 and 8.2 months between 2012–2014, to 9 months for three carrier strike groups in 2015.
- Increased deployment lengths have resulted in declining ship conditions and materiel readiness, and in a maintenance backlog that has not been fully identified or resourced, according to Navy officials.
- The declining condition of ships has increased the duration of time that ships spend undergoing maintenance in the shipyards, which in turn compresses the time available in the schedule for training and operations.[83]

According to Congressman J. Randy Forbes, chairman of the Subcommittee on Seapower and Projection Forces of the House Committee on Armed Services:

> [W]e have received data showing that [at current funding levels], next year, around the world, we will only be able to fulfill:
>
> - 56% of our commanders' requests for carriers,

- 54% of the requests for amphibious groups,
- 42% of the requests for submarines, and
- 39% of the requests for cruisers and destroyers.[84]

To support fleet readiness, the Navy has synchronized maintenance and modernization with the fleet training required to achieve GFMAP objectives utilizing the Optimized Fleet Response Plan (O-FRP).[85] This plan was implemented only because of years of a shrinking fleet and deferred maintenance. According to the Navy, O-FRP's "aim is to produce a more comprehensively manned and completely trained Naval force that is ready to deploy on a more predictable schedule" given suboptimal capacity or readiness funding.[86]

A GAO analysis of O-FRP's performance since its implementation in 2014 compared to naval readiness of the recent past yielded mixed results. The GAO found that in the period from 2011 to the implementation of O-FRP, the Navy's deployment and maintenance schedules were in poor condition. However, the three aircraft carriers that have implemented O-FRP "have not completed maintenance tasks on time, a benchmark that is crucial to meeting the Navy's employability goals. Further, of the 83 cruisers and destroyers, only 15 have completed a maintenance availability under OFRP."[87] The GAO found that these rates were better than before O-FRP was implemented, but only slightly.

Admiral Philip S. Davidson, Commander of U.S. Fleet Forces Command, testified on behalf of a group of commanding officers of ships and aircraft squadrons in May 2016, detailing a number of ways that budget shortfalls would strain naval readiness, The impacts of these shortfalls included restricting flying hours for a carrier air wing and deferring ship maintenance across the fleet.[88] Admiral Davidson further testified that "the $848 [million] shortfall will have no impact to our forces currently deployed, but deferring depot and continuous maintenance availabilities would likely delay a number of deployments," echoing the readiness challenges of the other services experiencing higher-than-expected OPTEMPO.[89]

The Navy's aviation readiness is also suffering as a result of years of deferred maintenance work and cuts in training budgets. Admiral Manazir testified in July 2016 that:

> Navy aviation readiness is in a precarious position today as we continue to meet deployed readiness requirements, albeit at the expense of non-deployed force training.... [W]e continue to face challenges associated with increased costs and effort in sustaining legacy aircraft [that are] being demanded more than anticipated and retained longer than planned, while some of their intended replacements have not yet arrived. Furthermore, fiscal constraints force difficult trades in capacity and readiness for capability improvements. Simply, the Navy is challenged to modernize our fleet while also sustaining an aging force.[90]

While Admiral Manazir's assessment of Navy aviation readiness was more positive over the past year than the assessments of his counterparts in the other services, he warned that the continued high OPTEMPO could strain his service's readiness if not paired with additional funding to maintain aircraft and train pilots that are not deployed. Commenting on the extension of the USS *Harry Truman*'s deployment by a month, Admiral Manazir said, "The particular impact is more readiness dollars to keep the carrier strike group out there for an additional month...that caused some impacts to training—the forces in training down the road."[91]

According to Admiral Manazir, the delays in IOC for the F-35C also have caused a number of readiness challenges, as the Navy has had to retain older F/A-18A–D aircraft longer than expected:

> [W]e didn't plan to do that maintenance and when we opened those airplanes up they had significant corrosion that we did not plan for.... [T]he second effect it had was we were over flying our F-18s, Super Hornets, Es and Fs. We

> didn't plan to fly them this much nor this early in their life. So it's accelerating the life used on the F-18 Es and Fs.[92]

Admiral Manazir added that the CNO's primary priority that was not covered by the President's FY 2017 budget request is the funding to bridge the gap between the older F/A-18s and the F-35C.[93]

The Navy also has stated its readiness challenges in terms of maintenance work being performed. According to Admiral Howard:

> Resetting our surface ships and aircraft carriers after more than a decade of war led to significant growth in public and private shipyard workload. The Navy baseline [FY 2017] request funds 70% of the ship maintenance requirements across the force.... OCO funding provides the remaining 30%.... The Aviation Depot Maintenance program is funded to 76% in baseline and 85% with OCO for new work to be inducted in FY17.[94]

Admiral Howard, however, rated facilities sustainment poorly as in the past few years, stating that:

> [O]ur FY17 facilities sustainment account is resourced at 70%...which falls short of DOD's goal of 90% for the sixth year in a row. Navy's FY17 request for restoration and modernization funding is roughly half of FY16 levels. This is only enough to address the most critical deficiencies for the naval shipyards.... By deferring less-critical repairs, we are increasing risk of greater requirements in the outyears and acknowledge that our overall facilities maintenance backlog will increase.[95]

It is worth noting again that the Navy's own readiness assessments are based on the ability to execute a strategy that assumes a force sizing construct that is smaller than the one prescribed by this *Index*.

Scoring the U.S. Navy

Capacity Score: Marginal

The Navy is unusual relative to the other services in that its capacity requirements must meet two separate objectives. First, during peacetime, the Navy must maintain a global forward presence. This ongoing peacetime requirement to be present around the world is the driving force behind ship count requirements: a set total number to ensure that the required number of ships is actually available to provide the necessary global presence.

On the other hand, the Navy also must be able to fight and win wars. In this case, the expectation is to be able to fight and win two simultaneous or nearly simultaneous MRCs. When thinking about naval combat power in this way, the defining metric is not necessarily a total ship count, but rather the carrier strike groups, amphibious ships, and submarines deemed necessary to win both the naval component of a war and the larger war effort by means of strike missions inland or cutting off the enemy's maritime access to sources of supply.

An accurate assessment of Navy capacity takes into account both sets of requirements and scores to the larger requirement.

It should be noted that the scoring in this *Index* includes the Navy's fleet of ballistic-missile and fast attack submarines to the extent that they contribute to the overall size of the battle fleet and with general comment on the status of their respective modernization programs. Because of their unique characteristics and the missions they perform, their detailed readiness rates and actual use in peacetime and planned use in war are classified. Nevertheless, the various references consulted are fairly consistent, both with respect to the numbers recommended for the overall fleet and with respect to the Navy's shipbuilding plan.

The role of SSBNs (fleet ballistic missile submarines) as one leg of America's nuclear triad capability is well known; perhaps less well known are the day-to-day tasks undertaken by the SSN force, which can include

collection, surveillance, and support to the special operations community and whose operations often take place apart from the operations of the surface Navy.

Two-MRC Requirement. The primary elements of naval combat power during a major regional contingency operation derive from carrier strike groups (which include squadrons of strike aircraft and support ships) and amphibious assault capacity. Since the Navy is constantly deployed around the globe during peacetime, many of its fleet requirements are beyond the scope of the two-MRC construct. However, it is important to observe the historical context of naval deployments during a major theater war.

13 Deployable Carrier Strike Groups. The average number of aircraft carriers deployed in the Korean War, Vietnam War, Persian Gulf War, and Operation Iraqi Freedom was between five and six. This correlates with the figures recommended in the 1993 Bottom-Up Review (BUR) and subsequent government force-sizing documents, each of which recommended at least 11 aircraft carriers.[96] Assuming that 11 aircraft carriers are needed to engage simultaneously in two MRCs, and assuming that the Navy ideally should have a 20 percent strategic reserve in order to avoid having to commit 100 percent of its carrier groups and account for scheduled maintenance, the Navy should have 13 CSGs.

The aircraft carrier is the centerpiece of a CSG, composed of one guided missile cruiser, two guided missile destroyers, one attack submarine, and a supply ship in addition to the carrier itself.[97] Therefore, based on the requirement for 13 aircraft carriers, the following numbers of ships are necessary for 13 deployable CSGs:

- 13 aircraft carriers,
- 13 cruisers,
- 26 destroyers, and
- 13 attack submarines.

13 Carrier Air Wings. Each carrier deployed for combat operations was equipped with a carrier air wing, meaning that five to six air wings were necessary for each of those four major contingencies listed. The strategic documents differ slightly in this regard because each document suggests one less carrier air wing than the number of aircraft carriers.

A carrier air wing usually includes four strike fighter squadrons.[98] Twelve aircraft typically comprise one Navy strike fighter squadron, so at least 48 strike fighter craft are required for each carrier air wing. To support 13 carrier air wings, the Navy therefore needs a minimum of 624 strike fighter aircraft.[99]

50 Amphibious Ships. The 1993 BUR recommended a fleet of 45 large amphibious vessels to support the operations of 2.5 Marine Expeditionary Brigades (MEBs). Since then, the Marine Corps has expressed a need to be able to perform two MEB-level operations simultaneously, with a resulting fleet of 38 amphibious vessels required. The 1996 and 2001 QDRs each recommended 12 "amphibious ready groups" (ARGs). One ARG typically includes one amphibious assault ship (LHA/LHD); one amphibious transport dock ship (LPD); and one dock landing ship (LSD).[100] Therefore, the 12-ARG recommendation equates to 36 amphibious vessels.

The number of amphibious vessels required in combat operations has declined since the Korean War, in which 34 amphibious vessels were used; 26 were deployed in Vietnam, 21 in the Persian Gulf War, and only seven in Operation Iraqi Freedom (which did not require as large a sea-based expeditionary force).[101] The Persian Gulf War is the most pertinent example for today because similar vessels were used, and modern requirements for an MEB most closely resemble this engagement.[102]

While the Marine Corps has consistently advocated a fleet of 38 amphibious vessels to execute its two-MEB strategy, it is more prudent to field a fleet of at least 42 such vessels based on the Persian Gulf engagement.[103] Similarly, if the USMC is to have a strategic reserve of 20 percent, the ideal number of amphibious ships would be 50.

TABLE 2

Current Navy Capacity—Scoring

Ship Type	Two-Major Regional Contingencies Requirement (plus 20% strategic reserve)	Full Navy Requirement (per 1993 Bottom-Up Review)	FY 2016 Capacity	Score
Aircraft Carriers	13	12	10	3
Surface Combatants	39	124	101	3
Mine Countermeasures Ships	n/a	26	11	2
Amphibious Warships	50	41	31	2
Ballistic Missile Submarines	n/a	14*	14*	5
Attack Submarines	13	55	52	5
Combat Logistics Force	n/a	43	30	2
Support Ships	n/a	22	30	5
Air Wings	13	n/a	10	3

Average: 3.3

* Bottom-Up Review stated a requirement of 18 ballistic missile submarines based on strategic guidance, but the subsequent 1994 Nuclear Posture Review reduced this strategic requirement to 14 boats. For more information on fleet requirement adjustments, see Ronald O'Rourke, "Navy Force Structure and Shipbuilding Plans: Background and Issues for Congress," Congressional Research Service, August 10, 2015, https://www.fas.org/sgp/crs/weapons/RL32665.pdf (accessed August 26, 2015).

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Total Ship Requirement. The bulk of the Navy's battle force ships are not directly tied to a carrier strike group. Some surface vessels and attack submarines are deployed independently, which is often why their requirements exceed those of a CSG. The same can be said of the ballistic missile submarine (nuclear missiles) and guided missile submarine (conventional cruise missiles), which operate independently of an aircraft carrier.

This *Index* uses the benchmark set by previous government reports, mainly the 1993 BUR, which was one of the most comprehensive reviews of military requirements. Similar Navy fleet size requirements have been echoed in follow-on reports.

The numerical values used in the score column refer to the five-grade scale explained earlier in this section, where 1 is "very weak" and 5 is "very strong." Taking the full Navy requirement of 346 ships as the benchmark, the Navy's current battle forces fleet capacity of 274 ships retains a score of "marginal," as was the case in the *2016 Index*. Given the CBO's assessment that the Navy will continue to underfund its shipbuilding programs, and in view of the impending need for a ballistic missile submarine replacement that could cost nearly half of the current shipbuilding budget per hull, the Navy's capacity score could fall to "weak" in the near future.

Capability Score: Weak

The overall capability score for the Navy is "weak." This was consistent across all four components of the capability score: "Age of Equipment," "Capability of Equipment," "Size of Modernization Program," and "Health of

Modernization Programs." Given the number of programs, ship classes, and types of aircraft involved, the details that informed the capability assessment are more easily presented in a tabular format as shown in the Appendix.

This *Index* does not include an assessment of future programs such as the *Columbia*-Class SSBN(X); unmanned carrier-launched aircraft; and LX(R) because these are not yet categorized by the government as MDAPs.

Readiness Score: Strong

The Navy's readiness score has returned to the original edition's assessment of "strong," up from the *2016 Index*'s score of "marginal." This assessment combines two major elements of naval readiness: the ability to consistently provide the required levels of presence around the globe and surge capacity. As elaborated below, the Navy's ability to maintain required presence in key regions is "strong," but its ability to surge to meet combat requirements ranges from "weak" to "very weak" depending on how one defines the requirement. In both cases—presence and surge—the Navy is sacrificing long-term readiness to meet current demand.

The Navy has reported that it continues to meet GFMAP goals but at the cost of future readiness. The GAO reported in May 2016 that "[t]o meet heavy operational demands over the past decade, the Navy has increased ship deployment lengths and has reduced or deferred ship maintenance"[104] The GAO has further found that as the Navy seeks to provide the same amount of forward presence with an undersized fleet, this "resulted in declining ship conditions across the fleet" and has "increased the amount of time that ships require to complete maintenance in the shipyards."[105]

Though the Navy has been able to maintain a third of its fleet globally deployed, and although the O-FRP has preserved readiness for individual hulls by restricting deployment increases, demand still exceeds the supply of ready ships to meet requirements sustainably. As Admiral Howard testified in March 2016:

> We generate forces that are fully prepared to do the full spectrum of operations. And so for us, it's as if we have this team of assets, but like every good team, we have a bench. And that bench are the assets that are the next ready to go or the assets we have if we ever have to get into a war fight. We refer to that bench as our surge capability. So we invest to make sure that as people are required to do their daily operations, they're ready. Where we've made choices, our ability to surge, that bench has become smaller. We have lowered the readiness of those assets and, in some cases, the readiness was lowered because we consumed that readiness.[106]

The Navy's readiness as it pertains to providing global presence is rated as "strong." The level of COCOM demand for naval presence and the fleet's ability to meet that demand is similar to that of 2015. The Navy maintains its ability to forward deploy a third of its fleet and has been able to stave off immediate readiness challenges through the O-FRP. However, without further recapitalization and without more hulls entering the fleet, this level of readiness will likely not be sustainable.

Another element of naval readiness is the ability to surge forces to respond to a major contingency. The Navy's goal is the ability to surge three CSGs and three ARGs for a contingency operation, but at current ship-count levels, it falls short of meeting this goal. Responding to questions about this issue, Admiral Manazir stated that the Navy is "currently...resourced to deploy two amphibious readiness groups and two carrier strike groups. It will take us to about the end of this future year defense plan, 2020 to 2022, to be able to resource a third deployed amphibious readiness group."[107] It should be noted that this was reported only during questioning in a congressional hearing, a departure from previous years when this information was provided in prepared testimony by naval officials. This is consistent with this *Index*'s analysis of the other armed services, where elements of readiness typically reported each year were either omitted or altered in prepared statements.

Nevertheless, Navy readiness in 2016 is an improvement over the past few years, where the Navy could only generate a surge capacity of one ARG and one CSG. This yields a surge capacity score of "marginal," up from "weak" in the *2016 Index*.

Since the *Index of U.S. Military Strength* uses the two-MRC construct as its benchmark level of necessary military force, the Navy would actually need to be able to surge forces to a level higher than three CSGs and three ARGs. However, doubling the Navy's surge capacity requirement to account for this is an oversimplification, as not enough public information exists to assess how much surge capacity the Navy would require to engage in a second contingency. Therefore, this *Index* notes that the Navy must be able to surge remaining forces if the U.S. finds itself responding to a second MRC but does not attempt to determine or count this additional level in its scoring.

Overall U.S. Navy Score: Marginal

The Navy's overall score for the *2017 Index* is "marginal," the same as for the previous year. This was derived by aggregating the scores for capacity ("marginal"); capability ("weak"); and readiness ("strong"). However, given the continued upward trends in OPTEMPO that have not been matched by similar increases in capacity or readiness funding, the Navy's overall score could degrade in the near future if the service does not more robustly recapitalize and maintain the health of its fleet.

U.S. Military Power: Navy

	VERY WEAK	WEAK	MARGINAL	STRONG	VERY STRONG
Capacity			✓		
Capability		✓			
Readiness				✓	
OVERALL			✓		

Endnotes:

1. Admiral John M. Richardson, *A Design for Maintaining Maritime Superiority, Version 1.0*, January 2016, http://www.navy.mil/cno/docs/cno_stg.pdf (accessed July 22, 2016).
2. U.S. Department of Defense, *Sustaining U.S. Global Leadership: Priorities for 21st Century Defense*, January 2012, http://www.defense.gov/news/Defense_Strategic_Guidance.pdf (accessed June 17, 2015).
3. U.S. Department of Defense, Defense Logistics Agency, "Instruction: Global Force Management (GFM)," effective February 5, 2014, p. 9, www.dla.mil/issuances/Documents/i3000.03.pdf (accessed August 25, 2014).
4. United States Navy, "A Cooperative Strategy for 21st Century Seapower," 2015, http://www.navy.mil/local/maritime/ (accessed July 10, 2015).
5. U.S. Department of Defense, "Instruction: Global Force Management (GFM)," p. 9.
6. Admiral John M. Richardson, Chief of Naval Operations, "Fiscal Year 2017 Navy Budget," statement before the Committee on Armed Services, U.S. Senate, March 15, 2016, http://www.armed-services.senate.gov/imo/media/doc/Richardson_03-15-16.pdf (accessed July 25, 2016).
7. U.S. Department of the Navy, Office of the Secretary, "SECNAV Instruction 5030.8B: General Guidance for the Classification of Naval Vessels and Battle Force Ship Counting Procedures," March 7, 2014, pp. 1–2, http://www.nvr.navy.mil/5030.8B.pdf (accessed June 17, 2015).
8. Ronald O'Rourke, "Navy Force Structure and Shipbuilding Plans: Background and Issues for Congress," Congressional Research Service *Report for Members and Committees of Congress*, May 27, 2016, p. 1, https://www.fas.org/sgp/crs/weapons/RL32665.pdf (accessed August 10, 2016).
9. Ibid.
10. U.S. Department of the Navy, Office of the Assistant Secretary of the Navy, Financial Manager and Comptroller, *Highlights of the Department of the Navy FY 2016 Budget*, 2015, p. 3-3, http://www.secnav.navy.mil/fmc/fmb/Documents/16pres/Highlights_book.pdf (accessed July 25, 2016).
11. Richard R. Burgess, "Navy Ship Requirement Stays at 308 Until New Force Structure Assessment for 2018 Budget," *Seapower*, July 12, 2016, http://www.seapowermagazine.org/stories/20160712-ships.html (accessed August 30, 2016). For the full text of the FSA, see U.S. Navy, Office of the Chief of Naval Operations, Deputy Chief of Naval Operations (Integration of Capabilities and Resources) (N8), *Report to Congress on the Annual Long-Range Plan for the Construction of Naval Vessels for Fiscal Year 2017*, July 2016, https://news.usni.org/2016/07/12/20627 (accessed August 30, 2016).
12. U.S. Department of Defense, *Fiscal Year (FY) 2017 President's Budget Submission: Justification Book Volume 1 of 1, Shipbuilding and Conversion, Navy*, February 2016, http://www.secnav.navy.mil/fmc/fmb/Documents/17pres/SCN_Book.pdf (accessed August 10, 2016).
13. Congressional Budget Office, *An Analysis of the Navy's Fiscal Year 2016 Shipbuilding Plan*, October 2015, https://www.cbo.gov/sites/default/files/114th-congress-2015-2016/reports/50926-Shipbuilding_OneCol-2.pdf (accessed July 25, 2016).
14. "An Assessment of U.S. Military Power: U.S. Navy," in *2015 Index of U.S. Military Strength*, ed. Dakota L. Wood (Washington: The Heritage Foundation, 2015), p. 247.
15. U.S. Navy, "SUBJ/FY15 Projected Ship Inactivation Schedule and Update Remaining FY14 Ship Inactivation Schedule," July 14, 2014, http://www.public.navy.mil/bupers-npc/reference/messages/Documents/NAVADMINS/NAV2014/NAV14152.txt (accessed August 10, 2016).
16. Ronald O'Rourke, "Navy Ford (CVN-78) Class Aircraft Carrier Program: Background and Issues for Congress," Congressional Research Service *Report for Members and Committees of Congress*, May 27, 2016, p. 1, http://www.fas.org/sgp/crs/weapons/RS20643.pdf (accessed July 25, 2016).
17. Ibid.
18. Congressional Budget Office, *An Analysis of the Navy's Fiscal Year 2016 Shipbuilding Plan*.
19. Ibid.
20. U.S. Department of Defense, *Fiscal Year (FY) 2017 President's Budget Submission: Shipbuilding and Conversion, Navy.*
21. Ibid.
22. Eleven cruisers will also be placed in "Reduced Operating Status" but will be included in the ship count as they are not being retired.
23. O'Rourke, "Navy Force Structure and Shipbuilding Plans," Summary.

24. Ibid., p. 12.
25. U.S. Department of the Navy, Office of the Assistant Secretary of the Navy, Financial Manager and Comptroller, *Highlights of the Department of the Navy FY 2017 Budget*, 2016, p. 1-2, http://www.secnav.navy.mil/fmc/fmb/Documents/17pres/Highlights_book.pdf (accessed July 25, 2016).
26. Rotational deployments involve a ship sailing to a location for a set amount of time and returning to the United States.
27. Admiral Jonathan Greenert, U.S. Navy, Chief of Naval Operations, "FY 2016 Department of the Navy Posture," statement before the Subcommittee on Defense, Committee on Armed Services, U.S. Senate, March 4, 2015, p. 10, http://www.navy.mil/cno/docs/CNO_SACD.pdf (accessed August 10, 2016).
28. On average, rotational deployments require four ships for one ship being forward deployed. This is because one ship is sailing out to location, one is at location, one is sailing back to the CONUS, and one is in the CONUS for maintenance.
29. Sam LaGrone, "Carrier George Washington Leaves Japan for the Last Time as Forward Deployed CVN," USNI News, May 19, 2015, http://news.usni.org/2015/05/19/carrier-george-washington-leaves-japan-for-the-last-time-as-forward-deployed-cvn (accessed July 10, 2015).
30. Ellen Mitchell, "Leaked Navy Memo Says $440 Million LCS Lack Firepower, Need Review," AL.com, March 28, 2013, http://www.al.com/business/index.ssf/2013/03/leaked_navy_memo_says_440_mill.html (accessed July 21, 2015).
31. Ronald O'Rourke, "Navy Littoral Combat Ship (LCS)/Frigate Program," Congressional Research Service *Report for Members and Committees of Congress*, June 12, 2015, pp. 1–2, https://news.usni.org/2015/06/19/document-report-to-congress-on-u-s-navys-littoral-combat-ship-program (accessed August 10, 2016).
32. Ibid., p. 16.
33. U.S. Department of the Navy, *Highlights of the Department of the Navy FY 2017 Budget*, p. 9.
34. O'Rourke, "Navy Littoral Combat Ship (LCS)/Frigate Program," pp. 37–38.
35. Megan Eckstein, "FY 2017 Budget: Navy Wants to Modernize Last 7 Cruisers Instead of Following 2/4/6 Directive from Congress," USNI News, February 9, 2016, https://news.usni.org/2016/02/09/fy-2017-budget-navy-wants-to-modernize-last-7-cruisers-instead-of-following-246-directive-from-congress (accessed July 25, 2016).
36. Sam LaGrone, "Navy Pitches Cruiser Layup Plan, Again," USNI News, February 2, 2015, https://news.usni.org/2015/02/02/navy-pitches-cruiser-layup-plan (accessed July 21, 2015).
37. Ibid.
38. Association of the United States Navy, "2015 Fact Sheet: *Ticonderoga* Class Cruisers (CG)," http://www.ausn.org/Advocacy/FactSheets/tabid/271/Default.aspx (accessed July 20, 2015).
39. O'Rourke, "Navy Force Structure and Shipbuilding Plans," pp. 4–5.
40. This is based on a calculation of the total number of attack submarines (which includes three different classes), which was 54 as of publication, and the number of *Los Angeles*-class submarines, which was 39 as of publication.
41. O'Rourke, "Navy Force Structure and Shipbuilding Plans," p. 1.
42. O'Rourke, "Navy Littoral Combat Ship (LCS)/Frigate Program."
43. Ibid.
44. Congressional Budget Office, *An Analysis of the Navy's Fiscal Year 2016 Shipbuilding Plan*, p. 3.
45. There are four shipbuilders and seven shipyard locations that build major naval vessels. The four shipbuilders are General Dynamics, Huntington Ingalls, Austal USA, and Marinette Marine Corporation. General Dynamics has three shipyards, Huntington Ingalls has two, and the remaining two shipbuilders have one each.
46. O'Rourke, "Navy Force Structure and Shipbuilding Plans"; Office of the Chief of Naval Operations, Deputy Chief of Naval Operations (Integration of Capabilities and Resources) (N8), *Report to Congress on the Annual Long-Range Plan for Construction of Naval Vessels for Fiscal Year 2016*, March 2015, p. 5, http://news.usni.org/2015/04/03/document-navys-30-year-shipbuilding-plan-to-congress-for-fiscal-year-2016 (accessed July 20, 2015).
47. Ronald O'Rourke, "Navy Columbia Class (Ohio Replacement) Ballistic Missile Submarine (SSBN[X]) Program: Background and Issues for Congress," Congressional Research Service *Report for Members and Committees of Congress*, October 3, 2016, https://www.fas.org/sgp/crs/weapons/R41129.pdf (accessed October 17, 2016).
48. U.S. Department of Defense, *Fiscal Year (FY) 2017 President's Budget Submission: Shipbuilding and Conversion, Navy*, p. Volume 1-12.

49. O'Rourke, "Navy Columbia Class (Ohio Replacement) Ballistic Missile Submarine (SSBN[X]) Program."
50. U.S. Government Accountability Office, *Defense Acquisitions: Assessments of Selected Weapons Programs*, GAO-15-342SP, March 2015, p. 148, http://www.gao.gov/assets/670/668986.pdf (accessed August 4, 2015).
51. O'Rourke, "Navy Columbia Class (Ohio Replacement) Ballistic Missile Submarine (SSBN[X]) Program," Summary.
52. This is based on a Congressional Budget Office analysis of historical shipbuilding funding, which the CBO calculates as $13.9 billion annually. See Congressional Budget Office, *An Analysis of the Navy's Fiscal Year 2016 Shipbuilding Plan*, p. 3.
53. Ronald O'Rourke, "Navy Virginia (SSN-774) Class Attack Submarine Procurement: Background and Issues for Congress," Congressional Research Service *Report for Members and Committees of Congress*, July 31, 2014, http://digital.library.unt.edu/ark:/67531/metadc461891/m1/1/high_res_d/RL32418_2014Jul31.pdf (accessed July 31, 2015).
54. Ibid., p. 14.
55. Congressional Budget Office, *An Analysis of the Navy's Fiscal Year 2016 Shipbuilding Plan*, p. 11.
56. Ronald O'Rourke, "Navy Virginia (SSN-774) Class Attack Submarine Procurement: Background and Issues for Congress," Congressional Research Service *Report for Members and Committees of Congress*, May 27, 2016, https://www.fas.org/sgp/crs/weapons/RL32418.pdf (accessed July 25, 2016).
57. Carlo Muñoz, "Dunford Backs Building 12th San Antonio-Class Warship," USNI News, updated July 22, 2014, http://news.usni.org/2014/07/17/dunford-backs-building-12th-san-antonio-class-warship (accessed August 27, 2014).
58. Ronald O'Rourke, "Navy LX(R) Amphibious Ship Program: Background and Issues for Congress," Congressional Research Service *Report for Members and Committees of Congress*, May 27, 2016, https://www.fas.org/sgp/crs/weapons/R43543.pdf (accessed July 25, 2016).
59. Ronald O'Rourke, "Navy DDG-51 and DDG-1000 Destroyer Programs: Background and Issues for Congress," Congressional Research Service *Report for Members and Committees of Congress*, May 20, 2016, https://www.fas.org/sgp/crs/weapons/RL32109.pdf (accessed July 25, 2016).
60. Shawn Snow, "U.S. May Field Railgun on Zumwalt Destroyer, *The Diplomat*, March 1, 2016, http://thediplomat.com/2016/03/u-s-may-field-railgun-on-zumwalt-destroyer/(accessed July 25, 2016).
61. Brad Lendon, "Supercarrier Ford to Join Navy Fleet in September," CNN, April 8, 2016, http://www.cnn.com/2016/04/07/politics/us-navy-aircraft-carrier-shipbuilding-plan/ (accessed July 25, 2016).
62. Moshe Schwartz and Charles V. O'Connor, "The Nunn–McCurdy Act: Background, Analysis, and Issues for Congress," Congressional Research Service *Report for Members and Committees of Congress*, May 12, 2016, https://www.fas.org/sgp/crs/natsec/R41293.pdf (accessed July 25, 2016).
63. Sydney J. Freedberg, Jr., "Navy Fights for 52 LCS After SecDef Cuts to 40: Presence vs. Warfighting," Breaking Defense, December 17, 2015, http://breakingdefense.com/2015/12/navy-fights-for-52-lcs-after-secdef-orders-cut-to-40-warfighting-vs-presence/ (accessed July 25, 2016).
64. Ibid.
65. Staff writer, "Navy Aircraft," Military Factory, last updated March 5, 2014, http://www.militaryfactory.com/aircraft/navy-carrieraircraft.asp (accessed August 26, 2014). The last of each of these aircraft were retired in 1997 (A-6); 2003 (A-4); and 2006 (F-14).
66. Jeremiah Gertler, "F-35 Joint Strike Fighter (JSF) Program," Congressional Research Service *Report for Members and Committees of Congress*, April 29, 2014, http://www.fas.org/sgp/crs/weapons/RL30563.pdf (accessed July 20, 2015).
67. International Institute for Strategic Studies, *The Military Balance 2015: The Annual Assessment of Global Military Capabilities and Defence Economics* (London: Routledge, 2015), pp. 45, 47.
68. U.S. Department of Defense, *Fiscal Year (FY) 2017 President's Budget Submission: Justification Book Volume 1 of 4, Aircraft Procurement, Navy, Budget Activity 01–04*, p. Volume 1-21, http://www.secnav.navy.mil/fmc/fmb/Documents/17pres/APN_BA1-4_BOOK.pdf (accessed July 25, 2016).,
69. Congressional Quarterly, "House Armed Services Committee Holds Hearing on Aviation Readiness," CQ Congressional Transcripts, July 6, 2016, http://www.cq.com/doc/congressionaltranscripts-4922435?2 (accessed August 17, 2016).
70. Megan Eckstein, "CNO Greenert Warns Congress of Fighter Shortfall, Boeing Super Hornet Line to Close in 2017 Absent New Orders," USNI News, March 12, 2015, http://news.usni.org/2015/03/12/cno-greenert-warns-congress-of-fighter-shortfall-boeing-super-hornet-line-to-close-in-2017-absent-new-orders (accessed July 20, 2015).
71. Kyle Mizokami, "F-35 Shortfall Forces the Navy to Buy More F-18s," *Popular Mechanics*, February 10, 2016, http://www.popularmechanics.com/military/weapons/news/a19393/us-navy-2017-budget-f-18-f-35/ (accessed July 26, 2016).

72. U.S. Department of Defense, *Fiscal Year (FY) 2017 President's Budget Submission, Aircraft Procurement, Navy*, p. Volume 1-11.
73. "Unfunded priorities" refers to the armed forces' desired programs that were not included in the President's budget request. See Bill Carey, "Navy's 'Unfunded' Order Would Extend EA-18G Growler Line," AINonline, April 10, 2014, http://www.ainonline.com/aviation-news/defense/2014-04-10/navys-unfunded-order-would-extend-ea-18g-growler-line (accessed August 3, 2015). For procurement quantities, see U.S. Department of Defense, *Fiscal Year (FY) 2017 President's Budget Submission, Aircraft Procurement, Navy*, p. Volume 1-43.
74. Christopher P. Cavas, "Aircraft, Modernization Top DoD's Unfunded List," *Defense News*, March 31, 2015, http://www.defensenews.com/story/defense/policy-budget/budget/2015/03/31/budget-pentagon-unfunded requirements-list-air-force-navy-marines-armynational-guard-southern-command-southcom-strike-fighters-jsf- super-hornet/70707166/ (accessed July 24, 2015).
75. Megan Eckstein, "Electronic Warfare Executive Committee to Focus on Strategy, Acquisition," USNI News, March 18, 2015, http://news.usni.org/2015/03/18/electronic-warfare-executive-committee-to-focus-on-strategy acquisition (accessed July 21, 2015).
76. U.S. Department of Defense, *Fiscal Year (FY) 2017 President's Budget Submission, Aircraft Procurement, Navy*, p. Volume 1-1.
77. Ibid.
78. "A carrier air wing consists of one fully staffed headquarters, four strike fighter squadrons (VFA or VMFA; 44 F/A-18A/C/E/F aircraft), one airborne early warning squadron (VAW; four E-2C or five E-2D aircraft), one electronic warfare squadron (VAQ; five or six EA-18G aircraft), one helicopter sea combat squadron (HSC; eight MH-60S aircraft), one helicopter maritime strike squadron (HSM; 11 MH-60R aircraft), one carrier onboard delivery detachment (VRC; two C-2A aircraft)." O'Rourke, "Navy Ford (CVN-78) Class Aircraft Carrier Program," p. 13.
79. Meghann Myers, "Navy to Disband a Carrier Air Wing in Fiscal 2017," *Navy Times*, February 9. 2016, http://www.navytimes.com/story/military/2016/02/09/navy-disband-carrier-air-wing-fiscal-2017/80062898/ (accessed July 25, 2016).
80. Ibid.
81. Admiral Michelle Howard, Vice Chief of Naval Operations; Vice Admiral Philip H. Cullom, Deputy Chief of Naval Operations for Fleet Readiness and Logistics; Vice Admiral John C. Aquilino, Deputy Chief of Naval Operations for Operations, Plans, and Strategy, joint statement in hearing, *The Department of the Navy 2017 Operations and Maintenance Budget Request and Readiness Posture*, Subcommittee on Readiness, Committee on Armed Services, U.S. House of Representatives, March 17, 2016, p. 1, http://docs.house.gov/meetings/AS/AS03/20160317/104351/HHRG-114-AS03-Wstate-AquilinoJ-20160317.pdf (accessed August 10, 2016).
82. Ibid., p. 2.
83. U.S. Government Accountability Office*, Military Readiness: Progress and Challenges in Implementing the Navy's Optimized Fleet Response Plan*, GAO-16-466R, May 2, 2016, p. 7, http://www.gao.gov/assets/680/676904.pdf (accessed July 25, 2016).
84. "Opening Remarks of Chairman [Randy] Forbes" in hearing, *Navy Force Structure and Readiness: Perspectives from the Fleet*, Subcommittee on Seapower and Projection Forces and Subcommittee on Readiness, Committee on Armed Services, U.S. House of Representatives, 114th Cong., 2nd Sess., May 26, 2016, https://armedservices.house.gov/news/press-releases/opening-remarks-chairman-forbes-12 (accessed August 10, 2016).
85. U.S. Navy, U.S. Fleet Forces Command, "What Is the Optimized Fleet Response Plan and What Will It Accomplish?," Navy Live, January 15, 2014, http://navylive.dodlive.mil/2014/01/15/what-is-the-optimized-fleet-response-plan-and-what-will-it-accomplish/ (accessed August 10, 2016).
86. Ibid.
87. U.S. Government Accountability Office, *Military Readiness: Progress and Challenges in Implementing the Navy's Optimized Fleet Response Plan*, p. 2.
88. Admiral Philip S. Davidson, Commander, U.S. Fleet Forces Command, "On Navy Readiness," statement before the Subcommittee on Seapower and Projection Forces and Subcommittee on Readiness, Committee on Armed Services, U.S. House of Representatives, May 26, 2016, p. 4, http://docs.house.gov/meetings/AS/AS28/20160526/104967/HHRG-114-AS28-20160526-SD001.pdf (accessed August 2, 2016).
89. Ibid., p. 5.
90. Rear Admiral Michael C. Manazir, Deputy Chief of Naval Operations for Warfare Systems (N9), "Aviation Readiness," statement before the Subcommittee on Readiness, Committee on Armed Services, U.S. House of Representatives, July 6, 2016, http://docs.house.gov/meetings/AS/AS03/20160706/105159/HHRG-114-AS03-Wstate-ManazirM-20160706.pdf (accessed August 29, 2016).
91. Congressional Quarterly transcript of House Armed Services Committee hearing, July 6, 2016.

92. Ibid.
93. Ibid.
94. Statement of Howard, Cullom, and Aquilino, pp. 5–6.
95. Ibid., p. 7.
96. This requirement is derived from the BUR's requirement for four–five carrier strike groups per MRC; however, this *Index* finds that number low by historical accounts and recommends one additional carrier per MRC.
97. U.S. Navy, "The Carrier Strike Group," http://www.navy.mil/navydata/ships/carriers/powerhouse/cvbg.asp (accessed June 20, 2016).
98. U.S. Navy, "The Carrier Air Wing," http://www.navy.mil/navydata/ships/carriers/powerhouse/airwing.asp (accessed June 20, 2016).
99. The full array of aircraft actually embarked on a carrier is more than just the strike aircraft counted here and includes E-2 Hawkeye early warning, C-2 Greyhound cargo, and various helicopter aircraft, among others, that are fielded in a ratio that is roughly proportional to the number of aircraft carriers in the fleet.
100. U.S. Navy, "The Amphibious Ready Group," last updated May 26, 2009, http://www.navy.mil/navydata/nav_legacy.asp?id=148 (accessed September 17, 2014).
101. The size and capability of amphibious ships also have grown over time, with smaller amphibs like the old LST replaced by the much larger LSD and LPD classes. Consequently, fewer ships are needed to lift the same or an even larger amphibious force.
102. GlobalSecurity.org, "Marine Expeditionary Brigade (MEB)," last modified May 7, 2011, http://www.globalsecurity.org/military/agency/usmc/meb.htm (accessed September 17, 2014).
103. Congressional Budget Office, *An Analysis of the Navy's Amphibious Warfare Ships for Deploying Marines Overseas*, November 2011, http://www.cbo.gov/sites/default/files/cbofiles/attachments/11-18-AmphibiousShips.pdf (accessed September 17, 2014).
104. U.S. Government Accountability Office, *Military Readiness: Progress and Challenges in Implementing the Navy's Optimized Fleet Response Plan*, p. 1.
105. Ibid., p. 8.
106. Congressional Quarterly, "House Armed Services Subcommittee on Readiness Holds Hearing on President Obama's Fiscal 2017 Budget for the Navy Posture," CQ Congressional Transcripts, March 17, 2016, http://www.cq.com/doc/congressionaltranscripts-4856025?0 (accessed August 17, 2016).
107. Congressional Quarterly transcript of House Armed Services Committee hearing, July 6, 2016.

U.S. Air Force

The U.S. Air Force (USAF) provides military dominance in the domains of air and space, enabling the Joint Force to project power quickly anywhere in the world at any time. Successful Operation Plan (OPLAN) execution relies on this service being able to rapidly respond to contingencies across the world, to guarantee the global freedom of movement and access that Americans have come to expect, and to project our nation's power, influence, and reach.[1]

To support and defend America's global interests along with the Joint Force, the Air Force focuses on five main missions:

- Air and space superiority;
- Intelligence, surveillance, and reconnaissance (ISR);
- Mobility and lift;
- Global strike; and
- Command and control (C2).

The Air Force has used the 2012 Defense Strategic Guidance (DSG) as its framework for determining investment priorities and posture. As a result of the DSG and fiscal constraints, the Air Force has "traded size for quality" by aiming to be a "smaller, but superb, force that maintains the agility, flexibility, and readiness to engage a full range of contingencies and threats."[2] In light of recent budget cuts, the Air Force has characterized this as a key year for the future of the service's readiness and capabilities:

> The FY 2017 budget request represents a "pivot point" for the Air Force to continue the recovery to "balance the force" for today's readiness and the readiness needed 10 to 20 years from now. However FY 2017 could simply represent a pause to the devastating effects of sequestration level funding that will return in FY 2018.[3]

But while the Air Force's fleet has been cut intentionally to maintain capability, continued cuts in capacity will result in a loss of that capability:

> Americans have invested in airpower for well over 60 years to ensure the fight is never fair. But today—after many years of continual operations and a few fiscal upheavals—the Nation is at a crossroads, with a fundamental disconnect between its airpower expectations and its airpower capability.
>
> There was a time when the Air Force could trade some capacity in order to retain capability. But we have reached the point where the two are inextricable; lose any more capacity, and the capability will cease to exist.[4]

Capacity

Due to the constrained fiscal environment of the past few years, the Air Force continues to prioritize capability over capacity. Air Force leadership has also made it clear that near-term reductions will be made in lift, command and control, and fourth-generation fighter aircraft to ensure that its top three modernization programs—the F-35A, Long-Range Strike Bomber (LRS-B), and KC-46A—are preserved.[5] The USAF is now the oldest

and smallest in its history, and as the demand for air power continues to increase, the problem of capacity limiting capability will continue to grow.[6] Unlike some of the other services, the Air Force did not grow during the post-9/11 buildup.[7] Rather, it got smaller as older aircraft were retired and replacement programs, such as the F-35, experienced successive delays in bringing new aircraft into the fleet.

The Air Force's capacity in terms of number of aircraft has been on a constant downward slope since 1952.[8] As Air Force officials testified in 2016:

> [P]rior to 1992, the Air Force procured an average of 200 fighter aircraft per year. In the two and a half decades since, curtailed modernization has resulted in the procurement of less than an average of 25 fighters yearly. In short, the technology and capability gaps between America and our adversaries are closing dangerously fast.[9]

This reduction in capacity is expected to continue because of ongoing budgetary pressure. Under BCA-mandated spending caps, the Air Force would shrink to 39 total active duty fighter squadrons,[10] of which only 26 would be combat-coded.[11] This is a far cry from the 70 active duty fighter squadrons within the Air Force during Operation Desert Storm (1991).[12]

This *Index* assesses the Air Force's fleet of tactical aircraft based on a 2011 Air Force assessment that a force of 1,200 fighter aircraft was required to execute a two-MRC strategy.[13] More recently, the service acknowledged that it could reduce the requirement by 100 fighters by assuming more risk.[14] Of the 5,456 manned and unmanned aircraft in the USAF's inventory, 1,303 are fighters, 1,159 of which[15] are combat-coded aircraft (not associated with operational testing, evaluation, or training of replacement pilots). The continuation of constrained funding levels will deepen the shortage of fighters and readiness levels, degrading vital air operations as well as operational testing and training expertise.[16]

Capability

Reductions in funding brought about by the Budget Control Act of 2011 and other budget constraints have forced the Air Force to prioritize future capability over capacity. This strategy centers on the idea of developing and maintaining a capable force that can win against advanced fighters and surface-to-air missile systems that are being developed by top-tier potential adversaries like China and Russia. The only way the Air Force can sustain that technological edge in the current budget environment is by reducing its fleet of aircraft that are moving toward obsolescence.

The state of aircraft capability includes not only the incorporation of advanced technologies, but also the overall health of the inventory. Most aircraft have programmed life spans of 20 to 30 years, based on a programmed level of annual flying hours. The bending and flexing of airframes over time in the air generates predictable levels of stress and metal fatigue. The average age of Air Force aircraft is 27 years, and some fleets, such as the B-52 bomber, are much older.[17] Although service life extension programs can lengthen the useful life of airframes, their dated systems become increasingly expensive to maintain. That added expense consumes available funding and reduces the amount available to invest in modernization, which is critical to ensuring future capability.[18]

The average age of the F-15C fleet is over 32 years, leaving less than 10 percent of its useful service life remaining.[19] That same fleet comprises 42 percent of USAF air superiority platforms.[20] The fleet of F-16Cs are, on average, 25 years old,[21] and the service has used up nearly 80 percent of its expected life span. KC-135s comprise 87 percent of the Air Force's tankers and are over 54 years old on average.[22]

The Air Force's ISR and lift capabilities face similar problems in specific areas that affect both capability and capacity. The bulk of the Air Force's ISR aircraft (339 of 482) are now unmanned aerial vehicles (UAVs),[23] which are relatively young and less expensive

to procure, operate, and maintain.[24] The RQ-4 Global Hawk is certainly one of the more reliable of those platforms, but gross weight restrictions limit the number of sensors that it can carry, and the warfighter still needs the capability of the U-2, which is now (on average) 33 years old.[25] The E-8 Joint Surveillance Target Attack Radar System (Joint-STARS) and the RC-135 Rivet Joint are critical ISR platforms, and each was built on the Boeing 707 platform, the last one of which was constructed in 1979. The reliability of the Air Force fleet is at risk because of the challenges linked to aircraft age and flight hours, and the fleet needs to be modernized.

A service's investment in modernization ensures that future capability remains healthy. Investment programs aim not only to procure enough to fill current capacity requirements, but also to advance future capabilities with advanced technology. In fiscal year (FY) 2016, the Air Force structured its budget to preserve funding for its three top acquisition priorities: the F-35A Joint Strike Fighter, the KC-46A Pegasus refueling aircraft, and the Long Range Strike-Bomber.[26]

The Air Force's number one priority remains the F-35A. It is the next-generation fighter scheduled to replace all legacy A-10, F-15, and F-16 aircraft. The Air Force's program of record is for 1,763 aircraft, replacing all F-16, all A-10, and possibly all F-15 aircraft currently in the inventory. The Air Force has not explicitly stated the rationale for purchasing 1,763 F-35s to replace 1,303 fighters currently in its inventory,[27] and this has led to speculation that they may partially offset the Defense Department's reduction of the Air Force's original plan to purchase 750 F-22As[28] to a final program of record of just 187.[29]

The Active Air Force currently has 268 F-15Cs, and there are concerns about what platform will fill this gap when the F-15C is eventually retired. Even with their superior technology, 159 combat-coded F-22As would be hard-pressed to fulfill the wartime requirement for air superiority fighters for a single major regional contingency (MRC).[30] The F-22A is world's most dominant air-to-air fighter and was designed to shoulder the air superiority mission for the Air Force, but with only 187 of a planned 750, this becomes a challenging burden for the F-22 community to carry on its own. The F-35A's multirole design favors the air-to-ground mission, but its fifth-generation faculties extend well into the air-to-air role,[31] which will allow it to augment the F-22A in many scenarios.[32]

Fulfilling the operational need for fighters will be further strained in the near term because the F-22 retrofit—a mix of structural alterations to 162 aircraft needed for the airframe to reach its promised service life—has been forecasted to run through 2021, a year later than previously predicted.[33] As a result of the retrofit, only 62 percent (99 of 169) of the mission fleet of F-22As are currently available.[34]

Like the F-35B and F-35C (the Marine Corps and Navy variants, respectively), the F-35A has experienced a host of problems including technological and production delays, cost overruns, and purchase reductions caused by budget cuts. As a result, the initial operating capability (IOC) date was pushed from 2013 to 2016. This system of systems relies heavily on software, and the currently fielded version 3I (IOC software) offers approximately 89 percent of the code required to deliver full warfighting capability. It is expected that 3F, the software that will enable full operating capability (FOC), will be fielded in mid-2017, half a year later than planned.[35] Given the age of the aircraft that the F-35A will be replacing, every slip in the Lightning II's program will necessarily affect the warfighting capability of the United States.

A second top priority for the USAF is the KC-46A air refueling tanker aircraft. The Air Force has stated that replacing the KC-135 (now over 50 years old) "remains one of the Air Force's top three acquisition priorities."[36] Though the KC-46 has experienced a series of delays, it reached a milestone in August 2016

that enabled low-rate initial production.[37] The Air Force awarded the contract for 19 initial aircraft in August 2016[38] toward Pegasus's program of record for 179 aircraft. As it stands now, this system will replace less than half of the current tanker inventory of 391 aircraft. The current program calls for the delivery of 70 aircraft by FY 2020.[39]

The third major priority for the USAF from an acquisition perspective is the B-21 bomber, formerly called the Long-Range Strike Bomber. The USAF awarded Northrop Grumman the B-21 contract to build the Engineering and Manufacturing Development (EMD) phase, which includes associated training and support systems and initial production lots. The B-21 is the service's next-generation deep-strike platform, intended to begin replacing a total of 119 B-52 Stratofortresses and B-1B Lancers by the mid-2020s.[40] The Air Force has 20 B-2s that apparently will remain in the fleet with an average age of 21 years. The B-21, still in the development phase, will constitute the Air Force's capability to penetrate highly contested environments defended by the most advanced air defense systems.[41]

The current plan for procurement includes the acquisition of 100 new bombers at an average cost of $564 million per plane.[42] One potential future concern for this program is that with a 100-airframe B-21 purchase, the Air Force's bomber fleet will fall from 159 aircraft to 120 aircraft.[43]

The Air Force's strategy of capability over capacity is encumbered by the requirement to sustain ongoing combat operations in Afghanistan, Iraq, and Syria. In a budget-constrained environment, the need to sustain those ongoing efforts while modernizing an outdated fleet of aircraft for operations in contested environments means that funding has to be pulled from other areas, adversely affecting readiness.

Readiness

Air Force Director of Current Operations Major General Scott West testified to the House Armed Services Committee in July 2016 on his force's aviation readiness,

> The Air Force must be ready to conduct full spectrum operations. That includes the continued conduct of nuclear deterrence operations, continued support of counter terror operations (CT), and readiness for potential conflict with a near-peer competitor.... While we are able to conduct nuclear deterrence operations and support CT operations, operations against a near-peer competitor would require a significant amount of training.... In sum, our readiness is imbalanced at a time when the Air Force is small, old, and heavily tasked.[44]

Air Force readiness relies on weapon systems availability (sustainment); training; wartime readiness materials (WRM); facilities; and installations.[45] While each of the four is important, weapon systems sustainment and WRM are the most critical. Reduced levels of funding, coupled with more than 13 years of continual air campaigns in the Middle East, have taken a significant toll on aircraft, pilot, and maintenance personnel availability.

Munitions are being used faster than they can be replaced. Air-to-surface weapons that offer stand-off, direct attack, and penetrators are short of current inventory objectives,[46] and the concurrent shortage of air-to-air weapons could lead to an increase in the time needed to gain and maintain air superiority in future environments,[47] particularly highly contested ones.

According to the Air Force, readiness has been declining since 2003. In FY 2013, flying hours were reduced by 18 percent, and 18 of 36 active duty, combat-coded squadrons (50 percent) were temporarily stood down.[48] In FY 2014, the Air Force prioritized funding for readiness, but not at a rate to make up completely for cuts in FY 2013, and the shortfalls in readiness have persisted into FY 2016.

Parts inventory shortfalls and a shortage of aircraft maintenance personnel (maintainers)[49] have reduced flying hours to the point where fighter pilots who once averaged over 200 hours a year struggled to get

120 hours in 2014.[50] In 2015, the average rose to 150 hours through combat deployments, in which the vast majority of a fighter pilot's time is spent patrolling or loitering (holding), over Iraq, Afghanistan, and Syria, where few sorties actually call for employment and no training is allowed. When they return home, those same pilots often average less than one sortie a week.[51]

To put this into context, in the1980s and 1990s, the demands on a "full spectrum capable" Air Force fighter pilot required, on average, 200 hours per year, or roughly four hours (or sorties) a week. All of that time was spent in the cockpit conducting combat-relevant missions (something other than flying in circles waiting for a call to action). This amount of flying enabled pilots not only to gain proficiency in a broad range of critical air-to-surface and air-to-air engagements, including low-altitude maneuvering, but also to improve those skills over time. At three hours per week (150 hours per year), a pilot might be able to sustain minimal levels of proficiency, but the Air Force typically would consider an inexperienced pilot (one having less than 500 hours of flying time) with that level of proficiency non-deployable for combat operations. At two hours (or two sorties) or less per week (100 hours per year), a pilot's skills drop precipitously. With most pilots now receiving 150 hours or less a year, it is hard to fathom which 50 percent of the fighter force is ready for full-spectrum combat.

In 2015, enlisted airmen were deployed for an average of 132 days, and officers were deployed for an average of 128 days,[52] but that average is skewed by the fact that only a small number of Air Force personnel actually deploy. The fact that 13.3 percent (64,655 of 485,000) of total Air Force personnel were deployed to contingency operations and exercises in 2015 means that a small percentage of the force is shouldering most of the burden of deploying for combat operations.[53] Thirteen continual years of deployment have taken a toll. The Air Force now has a shortfall of 4,000 maintenance personnel and 700 pilots.[54] While the service may be able to devise a plan to fill maintenance and pilot billets, it will take years to regain the experience lost through this flight of talent.

During his confirmation hearing for the position of Chief of Staff of the Air Force, General David Goldfein stated that at current readiness levels, the Air Force cannot muster a surge capacity for major OPLAN contingencies and meet all of the global demand with ready combat forces. In order to meet those contingencies, the Air Force must have 80 percent or more of its combat forces at full-spectrum readiness. Less than 50 percent of combat units are at that level, and while the Air Force could surge forces to meet combatant commander requirements, their lack of readiness would affect its ability to conduct all assigned mission-essential tasks.[55] It would also put those pilots at risk.

The Air Force has stated that it lacks the capacity to absorb additional cuts in manpower without also reducing capability. If requirements continue to increase, the Air Force "will have to make difficult decisions on mission priorities and dilute coverage across the board."[56] Even with sufficient funding, recovering from its current status would take no small amount of time. For example, standing down a unit for 60 days results in a degraded (unfit for combat) unit. To return the unit to desired levels of proficiency takes six months to a year.[57] As General Goldfein explained, "Bottom line—when an Air Force does not fly, readiness atrophies across the enterprise with impacts that cannot be reversed in the time it took to lose it."[58] The Air Force's FY 2017 budget submission seeks to strike a balance among capability, capacity, and readiness with the goal of achieving full-spectrum readiness by 2023.[59]

Scoring the U.S. Air Force

Capacity Score: Strong

One of the key elements of combat power in the U.S. Air Force is its fleet of fighter aircraft. In responding to major combat engagements since World War II, the Air Force has deployed an average of 28 fighter squadrons, based on an average of 18 aircraft per fighter squadron. That equates to a requirement of 500 active component fighter aircraft to execute one MRC. Based on government force-sizing documents that count fighter aircraft, squadrons, or wings, an average of 55 squadrons (990 aircraft) is required to field a two-MRC–capable force (rounded up to 1,000 fighter aircraft to simplify the numbers). This *Index* looks for 1,200 active fighter aircraft to account for the 20 percent reserve necessary when considering availability for deployment and the risk of employing 100 percent of fighters at any one time.

- **Two-MRC Level:** 1,200 fighter aircraft.
- **Actual 2016 Level:** 1,159 fighter aircraft.[60]

Based on a pure count of combat-coded fighter/attack platforms that have at least IOC, the USAF currently is only slightly below the two-MRC benchmark. However, this figure should be taken with a few caveats. The F-35 will become a highly advanced and capable multirole platform, but the 75 aircraft that have entered the USAF inventory to date are only nearing IOC and do not yet field many of the capabilities that would constitute full-spectrum readiness.

While the 1,159 figure would normally yield a capacity level of "very strong," aircraft require pilots to fly them and maintainers to launch, recover, and fix them. With a fighter pilot shortage of 700 and a maintenance shortfall of 4,000 personnel, the ability of the Air Force to meet the wartime manning requirements for fighter cockpits or sufficient maintenance personnel to continually repair, refuel, and rearm aircraft rapidly to meet wartime sortie requirements has been significantly reduced. Those factors, coupled with the lack of funding for a sufficient supply of spare parts, has reduced the capacity for employment from "very strong" in the *2016 Index* to a *2017 Index* assessment of "strong."

Capability Score: Marginal

The Air Force's capability score is "marginal," a result of being scored "strong" in "Size of Modernization Program," "marginal" for "Age of Equipment" and "Health of Modernization Programs," but "weak" for "Capability of Equipment." These scores have not changed from the *2016 Index*'s assessment. However, continued concern with the F-35 program's progress toward effective replacement of legacy aircraft could cause the USAF's capability score to decline in future years.

Readiness Score: Marginal

The Air Force scores "marginal" in readiness in the *2017 Index*, the same as it scored in the *2016 Index*. This is based primarily on the Air Force's reporting that 50 percent of its combat air forces met full-spectrum readiness requirements in 2016.[61] The Air Force should be prepared to respond quickly to an emergent crisis and retain full readiness of its combat airpower, but it has been suffering from degraded readiness since 2003, and implementation of BCA-imposed budget cuts in FY 2013 has only exacerbated the problem. Similar to the other services, the Air Force was able to make up some of its readiness shortfalls under the FY 2015 budget, but given its poor readiness assessment, much more improvement is required.

The Air Force's current deficits in both pilot and maintainer manpower are also very troubling indicators for readiness. They will strain the service in the immediate term and, if not reversed, could lead to broader readiness challenges in the future.

Overall U.S. Air Force Score: Marginal

The Air Force is scored as "marginal" overall. This is an unweighted average of its capacity score of "strong," capability score of "marginal," and readiness score of "marginal." While the overall score remains the same as the previous year's, the accumulating shortage of pilots and maintainers has begun to affect the ability of the Air Force to generate the amount of combat air power that would be needed to meet wartime requirements.

U.S. Military Power: Air Force

	VERY WEAK	WEAK	MARGINAL	STRONG	VERY STRONG
Capacity				✓	
Capability			✓		
Readiness			✓		
OVERALL			✓		

Endnotes:

1. The Honorable Deborah Lee James, Secretary of the Air Force, and General Mark A. Welsh III, USAF Chief of Staff, "Fiscal Year 2016 Air Force Posture," statement before the Subcommittee on Defense, Committee on Appropriations, U.S. Senate, February 25, 2015, p. 9, http://www.appropriations.senate.gov/imo/media/doc/hearings/FY16%20Air%20Force%20Posture%20Statement%20(Final)%20022515.pdf (accessed August 26, 2016).
2. The Honorable Michael B. Donley, Secretary of the Air Force, and General Mark A. Welsh III, Chief of Staff, United States Air Force, "Fiscal Year 2014 Air Force Posture Statement," statement before the Committee on Armed Services, U.S. House of Representatives, April 12, 2013, p. 2, http://www.dtic.mil/dtic/tr/fulltext/u2/a584783.pdf (accessed August 26, 2016).
3. U.S. Department of Defense, Office of the Under Secretary of Defense (Comptroller), Chief Financial Officer, *United States Department of Defense Fiscal Year 2017 Budget Request: Defense Budget Overview*, February 2016, p. 8-25, http://comptroller.defense.gov/Portals/45/Documents/defbudget/fy2017/FY2017_Budget_Request_Overview_Book.pdf (accessed August 26, 2016).
4. The Honorable Deborah Lee James, Secretary of the Air Force, and General Mark A. Welsh III, USAF Chief of Staff, "Fiscal Year 2016 Air Force Posture," statement before the Subcommittee on Defense, Committee on Appropriations, U.S. House of Representatives, February 27, 2015, p. 11, http://docs.house.gov/meetings/AP/AP02/20150227/102998/HHRG-114-AP02-Wstate-WelshM-20150227.pdf (accessed August 26, 2016).
5. Ibid., p. 18.
6. Honorable Deborah Lee James, Secretary of the Air Force, and General Mark A. Welsh III, Chief of Staff of the Air Force, "Air Force Posture," statement before the Committee on Armed Services, U.S. House of Representatives, March 16, 2016, pp. 7–8, http://docs.house.gov/meetings/AS/AS00/20160316/104662/HHRG-114-AS00-Bio-JamesD-20160316.pdf (accessed August 26, 2016).
7. James and Welsh, "Fiscal Year 2016 Air Force Posture," p. 6.
8. Technological advances in aircraft materials and structure greatly extended the service life of USAF equipment. As a result, the USAF was able to sustain its force structure while procuring fewer aircraft. See Colonel James C. Ruehrmund Jr. and Christopher J. Bowie, *Arsenal of Airpower: USAF Aircraft Inventory 1950–2009*, Mitchell Institute for Airpower Studies, November 2010), p. 8, http://higherlogicdownload.s3.amazonaws.com/AFA/6379b747-7730-4f82-9b45-a1c80d6c8fdb/UploadedImages/Mitchell%20Publications/Arsenal%20of%20Airpower.pdf (accessed August 27, 2014).
9. James and Welsh, "Air Force Posture," March 16, 2016, p. 7.
10. Dr. William A. LaPlante, Assistant Secretary of the Air Force (Acquisition); Lieutenant General James M. "Mike" Holmes, Deputy Chief of Staff (Strategic Plans and Requirements); and Lieutenant General Tod D. Wolters, Deputy Chief of Staff (Operations), "Fiscal Year 2016 Air Force, Force Structure and Modernization Programs," statement before the Subcommittee on Airland Forces, Committee on Armed Services, U.S. Senate, March 19, 2015, p. 9, http://www.armed-services.senate.gov/imo/media/doc/LaPlante_Holmes_Wolters_03-19-15.pdf (accessed August 26, 2016).
11. Figure 3-4, "Air Force Structure," in U.S. Department of Defense, *United States Department of Defense Fiscal Year 2015 Budget Request: Estimated Impacts of Sequester-Level Funding*, April 2014, p. 3-4, http://archive.defense.gov/pubs/2014_Estimated_Impacts_of_Sequestration-Level_Funding_April.pdf (accessed August 26, 2016); Ronald O'Rourke, "Tactical Aircraft Modernization: Issues for Congress," Congressional Research Service *Report for Congress*, July 9, 2009, http://fas.org/sgp/crs/weapons/RL33543.pdf (accessed July 10, 2015).
12. "The Air Force in Facts and Figures," in "USAF Almanac 1996," *Air Force Magazine*, Vol. 79, No. 5 (May 1996), p. 59, http://www.airforcemag.com/MagazineArchive/Magazine%20Documents/1996/May%201996/0596facts_figures.pdf (accessed August 26, 2016). The Air Force uses a variety of categorizations to describe or refer to its inventory of aircraft and units. This can make assessing Air Force capacity a challenge. "TACAIR," or tactical aircraft, units refers to any aviation unit that operates tactical aircraft, normally thought of as fighter or attack aircraft such as the F-15, F-16, A-10, F-22, and F-35. This generic term can include operational and training squadrons in the Active, Reserve, and Air National Guard components. "Combat coded" aircraft and related squadrons specifically refers to aircraft and units assigned a wartime mission. For the purpose of assessing capacity and readiness, this *Index* refers to combat-coded aircraft and units maintained within the Active component of the U.S. Air Force. See Report No., 112–329, *National Defense Authorization Act for Fiscal Year 2012*, Conference Report to Accompany H.R. 1540, U.S. House of Representatives, 112th Cong, 1st Sess., December 12, 2011, p. 25, http://www.gpo.gov/fdsys/pkg/CRPT-112hrpt329/pdf/CRPT-112hrpt329-pt1.pdf (accessed August 26, 2016). Note that these numbers differ from those reported in the 2015 and 2016 editions of this *Index*. The numbers reported earlier accounted for all combat-coded squadrons in the total Air Force, meaning those in the Active, Reserve, and Air National Guard components. The revised numbers reported here are only those in the Active component so as to maintain the *Index*'s focus on combat power in the Active components of the Joint Force.
13. LaPlante, Holmes, and Wolters, "Fiscal Year 2016 Air Force, Force Structure and Modernization Programs," p. 8.
14. Ibid.

15. International Institute for Strategic Studies, *The Military Balance 2016: The Annual Assessment of Global Military Capabilities and Defence Economics* (London: Routledge, 2016). Summed totals of Air Force Fighter Aircraft (1,303) and the subtracted seven AETC fighter squadrons and one ACC fighter squadron (8 x 18 = 144) that are RTU (non-combat-coded) squadrons.
16. Ibid., pp. 8–9.
17. James and Welsh, "Fiscal Year 2016 Air Force Posture," p. 12.
18. Ibid., p. 7.
19. "The Air Force in Facts and Figures," May 2016, p. 37. Age posted is "as of Sept. 30, 2015." Ten months were added due to the delay between publication of the Air Force Almanac and this publication.
20. International Institute for Strategic Studies, *The Military Balance 2016*, Pp. 46–48.
21. "The Air Force in Facts and Figures," May 2016, p. 37. Age posted is "as of Sept. 30 2015." Ten months were added due to the delay between publication of the Air Force Almanac and this publication.
22. Ibid.
23. International Institute for Strategic Studies, *The Military Balance 2016*, p. 47. This reference is missing 31 MC-12s (see "The Air Force in Facts and Figures," May 2016, p. 37) that were added to reach a total of 482.
24. Aaron Mehta, "Sources: U-2 in USAF Budget Request," *Defense News*, January 30, 2015, http://www.defensenews.com/story/defense/policy-budget/budget/2015/01/30/u2-in-usaf-fy16-budget-request/22603521/ (accessed August 26, 2016).
25. "The Air Force in Facts and Figures," May 2016, p. 37. Age posted is "as of Sept. 30, 2015." Ten months were added due to the delay between publication of the Air Force Almanac and this publication.
26. James and Welsh, "Fiscal Year 2016 Air Force Posture," p. 18.
27. Colonel Michael W. Pietrucha, U.S. Air Force, "The Comanche and the Albatross: About Our Neck Was Hung," *Air & Space Power Journal*, May–June 2014, pp. 133–156, http://www.au.af.mil/au/afri/aspj/digital/pdf/articles/2014-May-Jun/F-Pietrucha.pdf?source=Govt (accessed August 26, 2016).
28. Jeremiah Gertler, "Air Force F-22 Fighter Program," Congressional Research Service *Report for Congress*, July 11, 2013, p. 7, https://www.fas.org/sgp/crs/weapons/RL31673.pdf (accessed July 25, 2016).
29. Jeremiah Gertler, "F-35 Joint Strike Fighter (JSF) Program," Congressional Research Service *Report for Members and Committees of Congress*, April 29, 2014, p. 2, http://fas.org/sgp/crs/weapons/RL30563.pdf (accessed August 26, 2016).
30. Gertler, "Air Force F-22 Fighter Program," p. 7.
31. John Venable, "Operational Assessment of the F-35A Argues for Full Program Procurement and Concurrent Development Process," Heritage Foundation *Backgrounder* No. 3140, August 4, 2016, p. 2, http://www.heritage.org/research/reports/2016/08/operational-assessment-of-the-f-35a-argues-for-full-program-procurement-and-concurrent-development-process.
32. Dave Majumdar, "Can the F-35 Win a Dogfight?" War Is Boring, December 17, 2013, p. 1, https://warisboring.com/can-the-f-35-win-a-dogfight-95462ccd6745#.5pvpajaos (accessed August 30, 2016).
33. James Drew, "F-22 Raptor Retrofit to Take Longer, but Availability Hits 63%," *FlightGlobal*, July 6, 2015, http://www.flightglobal.com/news/articles/f-22-raptor-retrofit-to-take-longer-but-availability-hits-414341/ (accessed July 13, 2015).
34. Ibid.
35. Lara Seligman, "F-35 Full Combat Capability Will Be Four Months Late," *Defense News*, March 23, 2016, http://www.defensenews.com/story/defense/air-space/2016/03/23/f-35-full-combat-capability-four-months-late/82187648/ (accessed August 26, 2016).
36. United States Air Force, *Fiscal Year 2017 Budget Overview*, February 2016, p. CM-9, http://www.saffm.hq.af.mil/shared/media/document/AFD-160209-036.pdf (accessed August 26, 2016).
37. "KC-46A Pegasus Aerial Tanker Completes Firsts," *Defense Industry Daily*, August 22, 2016, https://www.defenseindustrydaily.com/the-usafs-kcx-aerial-tanker-rfp-03009/ (accessed August 30, 2016).
38. Colin Clark, "Boeing Wins $2.8B for KC-4 Tanker Low Rate Production," Breaking Defense, August, 18, 2016, http://breakingdefense.com/2016/08/boeing-wins-2-5b-for-kc-46-tanker-low-rate-production/ (accessed August 30, 2016).
39. U.S. Department of Defense, Office of the Under Secretary of Defense (Comptroller, Chief Financial Officer, *United States Department of Defense Fiscal Year 2016 Budget Request: Overview*, February 2015, p. 8-17, http://comptroller.defense.gov/Portals/45/Documents/defbudget/fy2016/FY2016_Budget_Request_Overview_Book.pdf (accessed August 26, 2016).

40. Bill Carey, "U.S. Air Force Sheds Some Light on Coming LRS-B Contract," AINonline, March 10, 2015, https://www.ainonline.com/aviation-news/defense/2015-03-10/us-air-force-sheds-some-light-coming-lrs-b-contract (accessed July 13, 2015).
41. U.S. Department of Defense, *United States Department of Defense Fiscal Year 2016 Budget Request: Overview*, p. 8-18.
42. Lieutenant General James M. "Mike" Holmes, USAF Deputy Chief of Staff (Strategic Plans and Requirements), and Lieutenant General Arnold W. Bunch, Jr., USAF, Military Deputy, Office of the Assistant Secretary of the Air Force (Acquisition), "Subject: Hearing on Air Force Bomber/Tanker/Airlift Acquisition Programs–HASC Seapower and Projection Forces," statement before the Subcommittee on Seapower and Projection Forces, Committee on Armed Services, U.S. House of Representatives, March 1, 2016, p. 4, http://docs.house.gov/meetings/AS/AS28/20160301/104353/HHRG-114-AS28-Wstate-BunchA-20160301.pdf (accessed August 26, 2016).
43. Jeremiah Gertler, "Air Force B-21 Long Range Strike Bomber," Congressional Research Service *Report for Members and Committees of Congress*, April 14, 2016, p. 9, https://www.fas.org/sgp/crs/weapons/R44463.pdf (accessed August 26, 2016).
44. Major General Scott West, Director of Current Operations, Deputy Chief of Staff for Operations, Headquarters, U.S. Air Force, "Subject: Military Aviation Readiness and Safety Hearing," statement before the Subcommittee on Readiness, Committee on Armed Services, U.S. House of Representatives, July 6, 2016, pp. 1–2, http://docs.house.gov/meetings/AS/AS03/20160706/105159/HHRG-114-AS03-Wstate-WestS-20160706.pdf (accessed August 26, 2016).
45. Donley and Welsh, "Fiscal Year 2014 Air Force Posture Statement," p. 17.
46. LaPlante, Holmes, and Wolters, "Fiscal Year 2016 Air Force, Force Structure and Modernization Programs," p. 16.
47. Ibid., p. 17.
48. Brian Everstine, "Reduced Flying Hours Forces USAF to Ground 17 Combat Air Squadrons," *Military Times*, April 8, 2014, http://www.militarytimes.com/story/military/archives/2013/04/08/reduced-flying-hours-forces-grounding-of-17-usaf-combat-air/78539120/ (accessed August 26, 2016) The numbers in this article were cross-referenced with the combat-coded, active duty squadrons found in International Institute for Strategic Studies, *The Military Balance 2014: The Annual Assessment of Global Military Capabilities and Defence Economics* (London: Routledge, 2014).
49. Jennifer Griffin and Lucas Tomlinson, "'Wiped Out': Air Force Losing Pilots and Planes to Cuts, Scrounging for Spare Parts," Fox News, May 14, 2016, http://www.foxnews.com/politics/2016/05/14/wiped-out-air-force-losing-pilots-and-planes-to-cuts-scrounging-for-spare-parts.html (accessed August 30, 2016).
50. Julian E. Barnes, "Warning Sounded on Cuts to Pilot Training," *The Wall Street Journal*, December 19, 2013, http://www.wsj.com/articles/SB10001424052702304773104579268651994849572 (accessed August 26, 2016).
51. Scott Maucione, "Air Force Puts a Number on Maintenance Staffing Deficit," Federal News Radio, June 16, 2016, http://federalnewsradio.com/defense/2016/06/air-force-puts-number-maintainence-staffing-deficit/ (accessed August 26, 2016).
52. Ibid.
53. Stephen Losey, "Air Force Deployment Tempo Brings New Kinds of Strains," *Air Force Times*, March 29, 2016, http://www.airforcetimes.com/story/military/2016/03/29/air-force-deployment-tempo-brings-new-kinds-strains/82163738/ (accessed August 26, 2016).
54. News Transcript, "Department of Defense Press Briefing by Secretary James and Gen. Goldfein on the State of the Air Force in the Pentagon Briefing Room," U.S. Department of Defense, August 10, 2016, http://www.defense.gov/News/Transcripts/Transcript-View/Article/911083/department-of-defense-press-briefing-by-secretary-james-and-gen-goldfein-on-the (accessed August 30, 2016).
55. *Hearing to Consider the Nomination of General David L. Goldfein, USAF, for Reappointment to the Grade of general and to be Chief of Staff, United States Air Force*, Committee on Armed Services, U.S. Senate, June 16, 2016, "Advance Policy Questions," pp. 7–8, http://www.armed-services.senate.gov/hearings/16-06-16-nomination_-goldfein (accessed August 30, 2016).
56. General Larry O. Spencer, Vice Chief of Staff of the Air Force, "Subject: Current Readiness of the U.S. Air Force," statement before the Subcommittee on Readiness, Committee on Armed Services, U.S. House of Representatives, March 26, 2015, p. 3, http://docs.house.gov/meetings/AS/AS03/20150326/103193/HMTG-114-AS03-Wstate-SpencerL-20150326.pdf (accessed August 31, 2016).
57. Donley and Welsh, "Fiscal Year 2014 Air Force Posture Statement," p. 3.
58. General David L. Goldfein, Chief of Staff of the Air Force, "Subject: Department of the Air Force 2017 Budget Request and Readiness Posture," statement before the Subcommittee on Readiness, Committee on Armed Services, U.S. House of Representatives, February 12, 2016, p. 4, http://docs.house.gov/meetings/AS/AS03/20160212/104347/HHRG-114-AS03-Wstate-GoldfeinD-20160212.pdf (accessed August 26, 2016).

59. U.S. Department of Defense, *United States Department of Defense Fiscal Year 2016 Budget Request: Overview*, p. 8-21.
60. This number represents total active component fighters. This *Index* considers requirements, such as aircraft, that are needed to perform Operation Noble Eagle (ONE), an ongoing mission to defend American airspace. Details regarding ONE are limited and largely unavailable to the public. Because the exact number of active component fighter aircraft participating in ONE is unknown, those fighters that may be tasked with the ONE mission are not counted in this total.
61. West, "Subject: Military Aviation Readiness and Safety Hearing," p. 2.

U.S. Marine Corps

The U.S. Marine Corps (USMC) is the nation's expeditionary armed force, positioned and ready to respond to crises around the world. Marine units assigned aboard ships ("soldiers of the sea") or at bases abroad stand ready to project U.S. power into crisis areas. Marines also serve in a range of unique missions, from combat defense of U.S. embassies abroad under attack to operating the President's helicopter fleet.

Although Marines have a wide variety of individual assignments, the focus of every Marine is on combat: Every Marine is first a rifleman. The USMC has positioned itself for crisis response and has evolved its concepts to leverage its equipment more effectively to support operations in a heavily contested maritime environment such as the one found in the Western Pacific. Worldwide, over 35,000 Marines are forward deployed and engaged.[1] Despite the drawdown of forces, in 2015, "Marines executed approximately 100 operations, 20 of them amphibious, 140 security cooperation activities with our partners and allies, and 160 major exercises" in addition to providing embassy security and short-term reinforcement of posts.[2]

Pursuant to the Defense Strategic Guidance (DSG), maintaining the Corps' crisis response capability is critical. Thus, given the fiscal constraints imposed, the Marines have prioritized "near-term readiness" at the expense of other areas, such as capacity, capability, modernization, home station readiness, and infrastructure.[3] This trade-off is a short-term fix to meet immediate needs: Over the longer term, the degradation of investment in equipment will lead to lowered readiness.

Capacity

The Marine Corps has managed the reduction in funding by cutting capacity. The Corps' measures of capacity are similar to the Army's: end strength and units (battalions for the Marines and brigades for the Army). End strength has been decreased from a force of 202,100 Active personnel in fiscal year (FY) 2012[4] to roughly 184,000 in FY 2016.[5] In FY 2016, the Marine Corps requested a pause in capacity cuts (to remain at an end strength of 184,000) in order to reduce the "impact on deployment to dwell ratios" and "assess the impact of its four[-]year drawdown."[6] The drawdown will resume in FY 2017, to reach an "enduring" end strength of 182,000 Active personnel funded entirely from the base budget.[7] Although the Bipartisan Budget Act gave the military partial, temporary relief from budget cuts, according to Secretary of Defense Ashton Carter, a return to BCA spending caps in FY 2018 remains the "greatest risk to the Department of Defense."[8] The DOD estimated in 2014 that if sequestration-level cuts occurred in FY 2016, Marine Corps end strength would be cut further to 175,000 by FY 2017.[9] With a force of that size, the USMC would be unable to meet the requirements of the DSG and according to General Joseph Dunford, recently Commandant of the Marine Corps, a new strategy would need to be developed.[10]

The Marine Corps organizes itself in infantry battalions, which are its basic combat unit. A battalion has about 900 Marines and

includes three rifle companies, a weapons company, and a headquarters and service company. The Marine Corps maintained 23 Active infantry battalions in FY 2016,[11] down from 25 in FY 2014 and 27 in FY 2012.[12] Funding at the requested levels for FY 2017 supports an increase to 24 Active infantry battalions after a one-year delay from the FY 2016 force structure plan.[13] However, under full sequestration, USMC end strength would be able to support only 21 infantry battalions,[14] which, according to General Dunford, would leave the Corps "with fewer active duty battalions and squadrons than would be required for a single major contingency."[15] It should be noted that the service was able to field only 23 battalions in 2016, although funding was to have been sufficient for 24.

Marine Aviation units have been particularly stressed by insufficient funding. Although operational requirements have not decreased, fewer Marine aircraft are available for tasking or training. For example, the number of active component squadrons (including both fixed-wing and rotary wing aircraft) decreased from 58 in 2003 to 55 in 2015.[16] Another way to look at this decline is through tactical air squadrons, which include the strike fighter and close air support aircraft in the USMC inventory. In July 2016, USMC Deputy Commandant for Aviation Lieutenant General Jon M. Davis explained, "right now, we're at 20 [tactical] air squadrons and we, like the Air Force, came down after Desert Storm."[17] General Davis added that the USMC had around 28 tactical air squadrons during that military engagement.

The number of available aircraft continues to decline as procurement of the F-35B and MV-22 struggles to keep pace with the decommissioning of aging aircraft squadrons, high operational tempos, and maintenance backlogs that have limited the number of Ready Basic Aircraft (RBA) for training and operational requirements.[18] The MV-22 has not yet been delivered in sufficient quantities to offset the retirement of the CH-46, resulting in a temporary reduction in vertical lift capacity.[19] Two additional MV-22 squadrons are planned for procurement in FY 2017.[20] Moreover, "shortages in aircraft availability due to increased wear on aging aircraft and modernization delays"[21] have led the Marine Corps to reduce the requirement of aircraft per squadron for the F/A-18, CH-53E, and AV-8B temporarily in order to provide additional aircraft for home station training.[22] Approximately 80 percent of Marine Corps aviation units are experiencing shortages below the minimum number of RBA required for training.[23] Any reduction in Marine aviation capability has a direct effect on overall Corps combat capability, as the Corps usually fights with its ground and aviation forces integrated as Marine Air-Ground Task Forces (MAGTFs).

Additionally, the current inventory of non-commissioned officers and staff non-commissioned officers does not meet USMC force structure requirements. This will pose readiness challenges for the Corps as the shortage of "small unit leaders with the right grade, experience, technical skills and leadership qualifications" grows.[24]

In 2010, the USMC determined that its ideal force size would be 186,800 in light of the requirements of the President's National Security Strategy.[25] However, given the budget pressures from the Budget Control Act (BCA) of 2011 and the newer 2012 DSG, the Corps decided that a force size of "182,100 active component Marines could still be afforded with reduced modernization and infrastructure support."[26]

One impact of reduced capacity is a reduction in dwell time. The stated ideal deployment-to-dwell (D2D) time ratio is 1:3 (seven months deployed for every 21 months at home), which is possible with 186,000 troops.[27] The "fundamental difference" between that optimal force size and an active end strength of 182,000 is a lower D2D ratio of 1:2, which translates to roughly seven-month deployments separated by stretches of 14 months at home.[28] Under current budget constraints, some individuals and even whole units with critical skills "are operating in excess of a 1:2

(D2D) ratio."[29] A return to BCA-level budget caps in FY 2018 could reduce capacity even further, and the dwell ratio for the Marine Corps could fall to 1:1.[30] This increase in deployment frequency would exacerbate the degradation of readiness, as people and equipment would be used more frequently with less time to recover between deployments.

Capability

The nature of the Marine Corps' crisis response role requires capabilities that span all domains. The USMC ship requirement is managed by the Navy and is covered in the Navy's section of the *Index*. The Marine Corps is focusing on "essential modernization" and emphasizing programs that "underpin our core competencies,"[31] making the Amphibious Combat Vehicle (ACV) and the F-35 Joint Strike Fighter (JSF) programs its top two priorities.[32]

Of the Marine Corps' current fleet of vehicles, its amphibious vehicles—specifically, the Assault Amphibious Vehicle (AAV-7A1) and Light Armored Vehicle (LAV)—are the oldest, with the AAV-7A1averaging over 40 years old[33] and the LAV averaging 25 years old.[34] The AAV-7A1 is currently undergoing survivability upgrades, with the first round of upgrades (AAV SU) delivered to U.S. Marine Corps Base Quantico on March 4.[35] These upgrades will help to bridge the capability gap until the fielding of the ACV. Comparatively, the Corps' M1A1 Abrams inventory is 26 years old[36] with an estimated 33-year life span, and its fleet of light tactical vehicles such as HMMWVs ("Humvees") is relatively young, averaging seven years old.[37]

The Corps' main combat vehicles all entered service in the 1970s and 1980s, and while service life extensions, upgrades, and new generations of designs have allowed the platforms to remain in service, these vehicles are quickly becoming ill-suited to the changing threat environment. For example, with the advent of improvised explosive devices (IEDs), the flat-bottom hulls found on most legacy vehicles are ineffective compared to the more blast-resistant V-shaped hulls incorporated in modern designs. Furthermore, the cost of maintaining these legacy systems diverts funding from innovation and modernization.[38]

The Corps' aircraft have age profiles similar to the Navy's. As of February 2016, the USMC had 262 F/A-18 A–Ds (including one reserve squadron) and 27 EA-6Bs in its primary mission aircraft inventory,[39] and both aircraft have already surpassed their originally intended life spans.[40] The Marine Corps began to retire its EA-6B squadrons in FY 2016 with the decommissioning of Marine Tactical Electronic Warfare Squadron 1[41] and will continue to decommission the remaining three at a rate of one per year through FY 2019.[42] The 2016 Marine Aviation Plan projects that a total of 18 Prowlers will remain in the active and reserve components in FY 2017.[43] Unlike the Navy, the Corps did not acquire the newer F/A-18 E/F Super Hornets; thus, the older F/A-18 Hornets are going through a service life extension program to extend their life span to 10,000 flight hours from the original 6,000 hours.[44] This was intended to bridge the gap to when the F-35Bs and F-35Cs enter service to replace the Harriers and most of the Hornets. However, delays in the service life extension program and "increased wear on aging aircraft" have further limited availability of the F/A-18 A-D and AV-8B.[45]The AV-8B Harrier, designed to take off from the LHA and LHD amphibious assault ships, will be retired from Marine Corps service in 2026.[46] The AV-8B received near-term capability upgrades in 2015 that will continue in 2017 in order to maintain its lethality and interoperability until the F-35 transition is complete.[47] The Corps declared its first F-35B squadron operationally capable on July 31, 2015, after it passed an "Operational Readiness Inspection" test.[48] However, problems with the aircraft's software continue to generate concern, with the potential for performance and schedule delays to accumulate between $20 billion and $100 billion in additional costs.[49] On June 30, 2016,

the Marine Corps stood up its second F-35B squadron, transitioning from an AV-8B Marine Attack Squadron to a Marine Fighter Attack Squadron.[50]

The Marine Corps has two Major Defense Acquisition (MDAP) vehicle programs: the Joint Light Tactical Vehicle (JLTV) and Amphibious Combat Vehicle (ACV).[51] The JLTV is a joint program with the Army to acquire a more survivable light tactical vehicle to replace a percentage of the older HMMWV fleet, originally introduced in 1985. The Army retains overall responsibility for JLTV development through its Joint Program Office.[52] The Marines intend to purchase 5,500 vehicles (10 percent of a total of 54,599),[53] and acquisition of the JLTVs should be completed by FY 2023. However, the FY 2017 USMC budget request funds only 192 vehicles, 77 fewer JLTVs than originally requested, in order to prioritize funding for ACV and GATOR.[54] The program is still in development and has experienced delays in the past due to a change in requirements, a contract award protest, and concerns regarding technical maturity.[55] In 2014, the Corps cancelled the HMMWV Sustainment Modification Initiative, which would have upgraded 13,000 vehicles,[56] in order to prioritize JLTV funding.[57] Although the Marine Corps has indicated that the JLTV will not be a one-for-one replacement of the HMMWV,[58] there are concerns that reduced procurement will create a battlefield mobility gap for some units.[59]

Following FY 2015 plans for the JLTV, the program awarded a low-rate initial production (LRIP) contract, which includes a future option of producing JLTVs for the Marine Corps, to defense contractor Oshkosh.[60] The Corps procured 130 JLTVs across FY 2015 and FY 2016.[61] The lack of operational detail in the Army's updated Tactical Wheeled Vehicle Strategy could be an issue for future USMC JLTV procurement and modernization plans.[62] Nevertheless, the USMC expects the JLTV program, consisting of "one infantry battalion fully fielded with the JLTV plus a training element," to reach initial operational capability (IOC) in the fourth quarter of 2018.[63]

The Marine Corps plans to replace the AAV-7A1 with the ACV, which completed its Milestone B requirements in November 2015[64] and will move into the engineering, manufacture, and development phase in FY 2017.[65] The ACV, which took the place of the Expeditionary Fighting Vehicle (EFV), "has been structured to provide a phased, incremental capability."[66] The AAV-7A1 was to be replaced by the EFV, a follow-on to the cancelled Advanced AAV, but the EFV was also cancelled in 2011 due to technical obstacles and cost overruns. Similarly, the Corps planned to replace the LAV inventory with the Marine Personnel Carrier (MPC), which would serve as a Light Armored Vehicle with modest amphibious capabilities but would be designed primarily to provide enhanced survivability and mobility once ashore.[67] However, budgetary constraints led the Corps to shelve the program, leaving open the possibility that it may be resumed in the future.

After restructuring its ground modernization portfolio, the Marine Corps determined that it would combine its efforts by upgrading 392 of its legacy AAVs and continuing development of the ACV in order to replace part of the existing fleet and complement the upgraded AAVs.[68] This would help the Corps to meet its requirement of armored lift for 10 battalions of infantry.[69] The USMC's acquisition objective for the ACV is 204 vehicles for the first increment.[70] Brigadier General Joseph Shrader confirmed that this ACV 1.1 increment would not replace the AAV, but rather would serve to "enhance that capability."[71]

The ACV 1.1 platform is notable in that it will be an amphibious wheeled vehicle instead of a tracked vehicle, capable of traversing open water only with the assistance of Navy shore connectors such as Landing Craft, Air Cushion Vehicles (LCAC). The ACV 1.2 platform is being planned as a fully amphibious, tracked version.[72] Development and procurement of the ACV program will be phased so that the new platforms can be fielded incrementally

alongside a number of modernized AAVs.[73] Plans call for a program of record of 694 vehicles, with the first battalion to reach IOC in FY 2020,[74] and for modernizing enough of the current AAV fleet to outfit four additional battalions,[75] which would allow the Corps to meet its armored lift requirement for 10 battalions. In addition, the Corps will purchase new vehicles based on the MPC concept.

The F-35B remains the Marine Corps' largest investment program in FY 2017. The Corps announced IOC of the F-35B variant in July 2015.[76] The service's total procurement will consist of 420 F-35s (357 F-35Bs and 63 F-35Cs). The AV-8Bs and F/A-18A-Ds will continue to receive interoperability and lethality enhancements in order to extend their useful service lives during the transition to the F-35.[77]

As the F-35 enters into service and legacy platforms reach the end of their service life, the Marine Corps expects a near-term inventory challenge. Specifically, this is due to a combination of reduced JSF procurement, increasing tactical aircraft utilization rates, and shortfalls in F/A-18A-D and AV-8B depot facility production.[78] In March 2016, General Robert Neller, Commandant of the Marine Corps, assessed that "[i]f these squadrons [in the F/A-18 community] were called on to fight today they would be forced to execute with 86 less jets than they need."[79] Like the F-35A, the F-35B and F-35C variants are subject to development delays, cost overruns, budget cuts, and production problems. The F-35B in particular was placed on probation in 2011 because of its technical challenges.[80] Probation has since been lifted, and the Corps declared IOC with its first F-35B squadron, VMFA-121, on July 31, 2015.[81]

Today, the USMC MV-22 program is operating with few problems and nearing completion of the full acquisition objective of 360 aircraft.[82] As of April 2016, the Marine Corps had received 269 of the 360 aircraft included in the program of record.[83] Following deactivation of the final CH-46 squadron in April 2015, the Osprey has replaced the Sea Knight as the USMC's primary medium lift platform.[84] However, new Osprey squadrons were not commissioned fast enough to replace the retiring CH-46 squadrons. Currently, there are 14 fully operational capability squadrons to meet these needs, and two additional squadrons are forming.[85] The MV-22's capabilities are in high demand from the Combatant Commanders (COCOMS), and the Corps is adding capabilities such as fuel delivery and use of precision-guided munitions to the MV-22 to enhance its value to the COCOMs.[86] The Marine Corps is struggling to sustain the Osprey's capability rates because of a shortfall in its "ability to train enlisted maintainers in the numbers and with the qualifications necessary to sustain the high demand signal."[87]

The USMC heavy lift replacement program, the CH-53K, conducted its first flight on October 27, 2015.[88] The CH-53K will replace the Corps' CH-53E, which entered service in 1980, However, "unexpected redesigns to critical components have delayed aircraft assembly and testing and have slowed delivery of test aircraft" pushing the expected LRIP decision into 2017.[89] The helicopter is now predicted to reach IOC in 2019, almost four years later than initially anticipated.[90] This is of increasing concern as the Marine Corps maintains only 146 CH-53Es, only 47 of which are considered flyable.[91] Although the Marine Corps began a reset of the CH-53E in 2016 to bridge the procurement gap, it will not have enough helicopters to meet its heavy-lift requirement without the transition to the CH-53K.[92] The FY 2017 request asks for continued Research, Development, Test and Evaluation (RDT&E) funding, along with $437 million for an initial procurement quantity of two CH-53Ks, and retains the current program of record of 200 CH-53Ks.[93]

Readiness

The Marine Corps' first priority is to be the crisis response force for the military, which is why investment in readiness has been prioritized over capacity and capability. However, in order to invest in readiness in a time of downward fiscal pressure, the Corps has

been forced to reduce end strength and delay investment in modernization. Even though funding for near-term readiness has been relatively protected from cuts, future readiness is threatened by underinvestment in long-term modernization and infrastructure.[94] As General Dunford has explained, extended or long-term imbalance among the USMC "pillars" of readiness, which address both operational and foundational readiness, "will hollow the force and create unacceptable risk for our national defense."[95]

In FY 2016, according to Marine Corps Assistant Commandant General John M. Paxton, Jr., "approximately half of our non-deployed units are suffering from some degree of personnel, equipment, or training shortfalls."[96] Personnel and equipment shortages, lower end strength, shorter dwell times, and a scarcity of prepositioned ships have inhibited sufficient training for home-station units and have "degraded full spectrum capability across the Service."[97]

Marine aviation in particular is experiencing significant readiness shortfalls. With a smaller force structure and fewer aircraft available for training, aviation units are having difficulty keeping up with demanding operational requirements. All of the Marine Corps' fixed-wing and tiltrotor aircraft are operating in excess of a 1:2 D2D ratio.[98] High operational tempos, coupled with a 5.6 percent reduction in operations and maintenance funding from FY 2015 to FY 2016, put increasing stress on depots.[99] This stress is increased by reduced procurement and workforce cuts, which contribute to readiness problems and leave fewer aircraft available for training or operations.[100]

Only 43 percent of the Marine Corps' total aircraft inventory is currently considered flyable, which "leaves the Corps shy of being able to meet our wartime commitments" and reduces the aircraft available for training.[101] As a result, average flight hours have reached "historic lows."[102]According to General Paxton, the Marine Corps is concerned about these conditions and the possible correlation to "an increasing number of aircraft mishaps and accidents," acknowledging that "if you fly less and maintain slower there's a higher likelihood of accidents."[103]

In order to achieve the minimum readiness goal, squadrons must be qualified to perform 70 percent of their Mission Essential Tasks. However, nearly half of the last 27 deployed squadrons failed to meet the necessary "training and readiness levels to be safe and meet the minimum for tactical proficiency."[104] In FY 2017, the Marine Corps will prioritize readiness funding for deployed and pre-deployment units.[105] This decision comes at the expense of non-deployed forces. According to General Paxton, "[b]y degrading the readiness of these bench forces to support those forward deployed, we are forced to accept increased risk in our ability to respond to further contingencies, our ability to assure we are the most ready when the nation is least ready."[106]

The Marines' Ground Equipment Reset Strategy has been progressing and is anticipated to be completed by the end of FY 2017. All of the equipment in Afghanistan was withdrawn by February 2015. As of March 2016, 78 percent of ground equipment had been reset, and the Marine Corps expects to complete its total reset requirement by 2019.[107] Reconstituting equipment and ensuring that the Corps' inventory can meet operational requirements are critical aspects of readiness.

Scoring the U.S. Marine Corps

Capacity Score: Weak

Based on the deployment of Marines across major engagements since the Korean War, the Corps requires roughly 15 battalions for one MRC.[108] Therefore, it would need a force of around 30 battalions to fight two

MRCs simultaneously. The government force-sizing documents that discuss Marine Corps composition support this. Though the documents that make such a recommendations count the Marines by divisions, not battalions, they are consistent in arguing for three Active Marine Corps divisions, which in turn requires roughly 30 battalions. With a 20 percent strategic reserve, the ideal USMC capacity for a two-MRC force-sizing construct is 36 battalions.

More than 33,000 Marines were deployed in Korea, and over 44,000 were deployed in Vietnam. In the Persian Gulf, one of the largest Marine Corps missions in U.S. history, some 90,000 Marines were deployed, and around 66,000 were deployed for Operation Iraqi Freedom. As the Persian Gulf War is the most pertinent example for this construct, a force of 180,000 Marines is a reasonable benchmark for a two-MRC force, not counting Marines that would be unavailable for deployment (assigned to institutional portions of the Corps) or that are deployed elsewhere. This is supported by government documents that have advocated for a force as low as 174,000 (1993 Bottom-Up Review) and as high as 202,000 (2010 Quadrennial Defense Review), with an average end strength of 185,000 being recommended.

- **Two-MRC Level:** 36 battalions.
- **Actual 2016 Level:** 23 battalions.

The Corps is operating with slightly less than 64 percent of the number of battalions relative to the two-MRC benchmark. This is the same capacity level as measured in the *2016 Index*, and the Corps' capacity is therefore scored as "weak" again in 2017.

Capability Score: Marginal

The Corps receives scores of "weak" for "Capability of Equipment," "marginal" for "Age of Equipment" and "Health of Modernization Programs," but "strong" for "Size of Modernization Program." Therefore, the aggregate score for Marine Corps capability is "marginal." Excluded from the scoring are various ground vehicle programs that have been cancelled and are now being reprogrammed. This includes redesign of the MPC.

Readiness Score: Marginal

In FY 2016, approximately half of USMC units experienced degraded readiness. As the nation's crisis response force, the Corps requires that all units, whether deployed or non-deployed, be ready. Thus, this *Index* scores the Corps' readiness as "marginal" because the USMC is meeting only half of its readiness requirement. Last year, the USMC reported more specifically that 42 percent of units experienced degraded readiness, leaving 58 percent ready. Since the reporting was more vague this year, this *Index* assumes that the level is nearly the same, although it could be lower given that half would literally mean 50 percent ready, 8 percent lower than the reported 58 percent measured in the *2016 Index*.

Overall U.S. Marine Corps Score: Marginal

The Marine Corps is scored as "marginal" overall in the *2017 Index*. This is the same as the assessment in the previous *Index*. However, the Corps is at the lower end of this category, and the possibility of further declines in both capacity and readiness signals that this score could drop to "weak" in the near future given continued high demand and OPTEMPO on this service and the need to preserve immediate readiness concerns at the expense of the future force.

U.S. Military Power: Marine Corps

	VERY WEAK	WEAK	MARGINAL	STRONG	VERY STRONG
Capacity		✓			
Capability			✓		
Readiness			✓		
OVERALL			✓		

Endnotes:

1. U.S. Department of the Navy, *FY 2017 President's Budget*, February 9, 2016, p. 3, http://www.secnav.navy.mil/fmc/fmb/Documents/17pres/DON_PRESS_BRIEF.pdf (accessed June 27, 2016).
2. General John Paxton, Assistant Commandant of the Marine Corps, "U.S. Marine Corps Readiness," statement before the Subcommittee on Readiness, Committee on Armed Services, U.S. Senate, March 15, 2016, p. 3, http://www.armed-services.senate.gov/imo/media/doc/Paxton_03-15-16.pdf (accessed August 28, 2016).
3. General Joseph Dunford, Commandant, United States Marine Corps, statement on Marine Corps readiness before the Subcommittee on Defense, Committee on Appropriations, U.S. House of Representatives, February 26, 2015, p. 10, http://www.hqmc.marines.mil/Portals/142/Docs/CMC%20Testimony%202015/USMC%20FY16%20Written%20Posture%20Statement_FINAL.pdf (accessed August 29, 2016).
4. Ibid., p. 11.
5. U.S. Department of Defense, Office of the Under Secretary of Defense (Comptroller), Chief Financial Officer, *United States Department of Defense Fiscal Year 2017 Budget Request: Defense Budget Overview*, February 2016, p. 8-13, http://comptroller.defense.gov/Portals/45/Documents/defbudget/fy2017/FY2017_Budget_Request_Overview_Book.pdf (accessed August 29, 2016).
6. U.S. Department of the Navy, *Fiscal Year (FY) 2016 Budget Estimates: Military Personnel, Marine Corps*, Justification of Estimates, February 2015, p. 5, http://www.secnav.navy.mil/fmc/fmb/Documents/16pres/MPMC_Book.pdf (accessed August 28, 2016).
7. Ibid.
8. Richard Sisk, "Carter: Return to Sequestration Biggest Threat to National Security," Military.com, March 17, 2016, http://www.military.com/daily-news/2016/03/17/carter-return-sequestration-biggest-threat-national-security.html (accessed August 18, 2016).
9. U.S. Department of Defense, *Fiscal Year 2015 Budget Request: Estimated Impacts of Sequestration-Level Funding*, April 2014, p. 3-2, http://archive.defense.gov/pubs/2014_Estimated_Impacts_of_Sequestration-Level_Funding_April.pdf (accessed August 29, 2016).
10. General Joseph F. Dunford, Jr., USMC, Commandant of the Marine Corps, statement in *Hearing to Receive Testimony on the Impact of the Budget Control Act of 2011 and Sequestration on National Security*, Committee on Armed Services, U.S. Senate, January 28, 2015, pp. 32–33, http://www.armed-services.senate.gov/imo/media/doc/15-04%20-%201-28-15.pdf (accessed August 29, 2016).
11. U.S. Department of Defense, *United States Department of Defense Fiscal Year 2017 Budget Request: Defense Budget Overview*, p. A-1.
12. David Alexander, "Marines to Cut Four Battalions, 12 Air Squadrons," Reuters, March 14, 2012, http://www.reuters.com/article/us-usa-defense-marines-idUSBRE82E00Y20120315 (accessed August 17, 2016).
13. U.S. Department of Defense, *United States Department of Defense Fiscal Year 2017 Budget Request: Defense Budget Overview*, p. 4-2.
14. U.S. Department of Defense, *Fiscal Year 2015 Budget Request: Estimated Impacts of Sequestration-Level Funding*, p. 3-2.
15. Dunford statement, January 28, 2015, p. 32.
16. General John Paxton, Assistant Commandant, United States Marine Corps, statement on Marine Corps readiness and FY 2016 budget request before the Subcommittee on Readiness and Management Support, Committee on Armed Services, U.S. Senate, March 25, 2015, p. 7, http://www.armed-services.senate.gov/imo/media/doc/Paxton_03-25-15.pdf (accessed July 14, 2016).
17. Congressional Quarterly, "House Armed Services Committee Holds Hearing on Aviation Readiness," CQ Congressional Transcripts, July 6, 2016, http://www.cq.com/doc/congressionaltranscripts-4922435?3&search=lXd1KGHk (accessed August 29, 2016).
18. International Institute for Strategic Studies, *The Military Balance 2016: The Annual Assessment of Global Military Capabilities and Defence Economics* (London: Routledge, 2016), pp. 44–45. The prior year figure was not repeated in recent testimony. Since publication of the 2016 IISS *Military Balance*, one Prowler squadron has been decommissioned, and one harrier squadron has been transitioned to an F-35B squadron. Factoring in these changes to the IISS *Military Balance*, there are 60 total squadrons in the Marine Corps active component, including all fixed-wing and rotary aircraft squadrons, training and transport squadrons, and one combat search and rescue squadron (does not include the "VIP" transport squadron). Using the same metrics, the total for 2015 based on the IISS *Military Balance* would have been 64.

19. Vice Admiral Paul Grosklags, Representing Assistant Secretary of the Navy (Research, Development and Acquisition); Lieutenant General Jon Davis, Deputy Commandant for Aviation; and Rear Admiral Michael C. Manazir, Director Air Warfare, "Department of the Navy's Aviation Programs," statement before the Subcommittee on Seapower, Committee on Armed Services, U.S. Senate, April 20, 2016, p. 19, http://www.armed-services.senate.gov/imo/media/doc/Grosklags-Davis-Manazir_04-20-16.pdf (accessed August 29, 2016).
20. U.S. Department of Defense, *United States Department of Defense Fiscal Year 2017 Budget Request: Defense Budget Overview*, p. 8-12.
21. Paxton, "U.S. Marine Corps Readiness," March 15, 2016, p. 9.
22. Ibid.
23. General John Paxton, Assistant Commandant of the Marine Corps, "Marine Corps 2017 Budget Request and Readiness," statement before the Subcommittee on Readiness, Committee on Armed Services, U.S. House of Representatives, March 3, 2016, p. 8, http://docs.house.gov/meetings/AS/AS03/20160303/104349/HHRG-114-AS03-Wstate-PaxtonJ-20160303.pdf (accessed August 28, 2016).
24. Paxton, "U.S. Marine Corps Readiness," March 15, 2016, p. 11.
25. General Joseph F. Dunford, Jr., testimony in *Hearing to Receive Testimony on the Impact of the Budget Control Act of 2011 and Sequestration on National Security*, p. 100.
26. General James F. Amos, Commandant of the Marine Corps, "2014 Report to Congress on the Posture of the United States Marine Corps," statement before the Committee on Armed Services, U.S. House of Representatives, March 12, 2014, p. 12, http://www.hqmc.marines.mil/portals/142/docs/FY_2015_CMC_POSTURE_STATEMENT.pdf (accessed August 29, 2016).
27. Paxton, "U.S. Marine Corps Readiness," March 15, 2016, p. 8.
28. Dunford statement on Marine Corps readiness, February 26, 2015, pp. 24–25.
29. Paxton, "U.S. Marine Corps Readiness," March 15, 2016, p. 8.
30. Dunford testimony in *Hearing to Receive Testimony on the Impact of the Budget Control Act of 2011 and Sequestration on National Security*, p. 75.
31. Paxton, statement on Marine Corps Readiness and FY 2016 budget request, March 25, 2015, p. 10.
32. Ibid., p. 11.
33. General Robert B. Neller, Commandant of the Marine Corps, "Navy and Marine Corps FY17 Budget Request," statement before the Committee on Armed Services, U.S. Senate, March 15, 2016, p. 16, http://www.armed-services.senate.gov/imo/media/doc/Neller_03-15-16.pdf (accessed August 29, 2016).
34. U.S. Marine Corps, "Ground Equipment Age," Concepts & Programs, last revised April 3, 2014, https://marinecorpsconceptsandprograms.com/resources/ground-equipment-age (accessed August 23, 2016).
35. News release, "SAIC Delivers First AAV SU to U.S. Marine Corps Ahead of Schedule," Science Applications International Corporation, March 11, 2016, http://investors.saic.com/press-release/saic-delivers-first-aav-su-us-marine-corps-ahead-schedule (accessed June 27, 2016).
36. Paxton, "U.S. Marine Corps Readiness," March 15, 2016, p. 15.
37. U.S. Marine Corps, "Ground Equipment Age."
38. Lieutenant General Robert S. Walsh, Deputy Commandant, Combat Development and Integration, and Commanding General, Marine Corps Combat Development Command, and Thomas P. Dee, Deputy Assistant Secretary of the Navy, Expeditionary Programs and Logistics Management, "Marine Corps Ground Modernization," statement before the Subcommittee on Seapower, Committee on Armed Services, U.S. Senate, April 13, 2016, p. 4, http://www.armed-services.senate.gov/imo/media/doc/Walsh-Dee_04-13-16.pdf (accessed August 29, 2016).
39. International Institute for Strategic Studies, *The Military Balance 2016,* p. 45.
40. U.S. Marine Corps, "Aircraft Age Chart," Concepts & Programs, July 2, 2014, https://marinecorpsconceptsandprograms.com/resources/aircraft-age-chart (accessed June 3, 2016).
41. Lieutenant Colonel Ricky B. Johnson (ret.), "The Military Will Need the Marines' Electronic Warfare Squadrons Beyond 2019," *Marine Corps Times*, May 28, 2016, http://www.marinecorpstimes.com/story/opinion/2016/05/28/military-need-marines-electronic-warfare-squadrons-beyond-2019/84623644/ (accessed August 29, 2016).
42. U.S. Marine Corps, *Marine Aviation Plan 2016*, Concepts & Programs, p. 48, https://marinecorpsconceptsandprograms.com/sites/default/files/files/Marine%20Aviation%20Plan%202016%20FINAL.pdf (accessed August 29, 2016).

43. Ibid., p. 39.
44. U.S. Marine Corps, "Legacy Aircraft," Concepts & Programs, last revised March 3, 2015, https://marinecorpsconceptsandprograms.com/programs/aviation/legacy-aircraft (accessed August 23, 2016); Jeremiah Gertler, "Navy F/A-18E/F and EA-18G Aircraft Procurement and Strike Fighter Shortfall: Background and Issues for Congress," Congressional Research Service *Report for Congress*, December 22, 2009, p. 5, https://www.fas.org/sgp/crs/weapons/RL30624.pdf (accessed August 23, 2016).
45. Paxton, "U.S. Marine Corps Readiness," March 15, 2016, p. 9.
46. U.S. Marine Corps, "Legacy Aircraft."
47. Grosklags, Davis, and Manazir, "Department of the Navy's Aviation Programs," April 20, 2016, p. 3.
48. Megan Eckstein, "Marines Declare Initial Operational Capability on F-35B Joint Strike Fighter," USNI News, July 31, 2015, https://news.usni.org/2015/07/31/marines-declare-initial-operational-capability-on-f-35b-joint-strike-fighter (accessed August 23, 2016).
49. U.S. Government Accountability Office, *F-35 Sustainment: DOD Needs a Plan to Address Risks Related to Its Central Logistics System*, GAO-16-439, April 2016, p. 2, http://www.gao.gov/assets/680/676576.pdf (accessed June 10, 2016).
50. Megan Eckstein, "Second F-35B Squadron Stands Up at Marine Corps Air Station Yuma," USNI News, June 30, 2016, https://news.usni.org/2016/06/30/20458 (accessed August 29, 2016).
51. U.S. Department of Defense, Office of the Under Secretary of Defense (Comptroller)/Chief Financial Officer, *United States Department of Defense Fiscal Year 2017 Budget Request: Program Acquisition Cost by Weapon System*, February 2016, pp. 3-2 and 3-9, http://comptroller.defense.gov/Portals/45/Documents/defbudget/fy2017/FY2017_Weapons.pdf (accessed August 29, 2016).
52. Andrew Feickert, "Joint Light Tactical Vehicle (JLTV): Background and Issues for Congress," Congressional Research Service *Report for Members and Committees Congress*, February 18, 2016, pp. 1–2, https://fas.org/sgp/crs/weapons/RS22942.pdf (accessed August 23, 2016).
53. U.S. Department of Defense, Joint Program Office, *Selected Acquisition Report (SAR): Joint Light Tactical Vehicle (JLTV) As of FY 2017 President's Budget*, March 22, 2016, p. 39, http://www.dod.mil/pubs/foi/Reading_Room/Selected_Acquisition_Reports/16-F-0402_DOC_43_JLTV_DEC_2015_SAR.pdf (accessed August 29, 2016).
54. U.S. Department of Defense, *Department of Defense Fiscal Year (FY) 2017 President's Budget Submission: Procurement, Marine Corps*, Justification Book Volume 1 of 1, February 2016, p. 343, http://www.secnav.navy.mil/fmc/fmb/Documents/17pres/PMC_Book.pdf (accessed August 29, 2016).
55. Feickert, "Joint Light Tactical Vehicle (JLTV)," February 18, 2016, pp. 2–3.
56. Lieutenant General Kenneth J. Glueck, Jr., Deputy Commandant, Combat Development and Integration, and Commanding General, Marine Corps Combat Development Command, and Thomas P. Dee, Deputy Assistant Secretary of the Navy, Expeditionary Programs and Logistics Management, "Marine Corps Modernization," statement before the Subcommittee on Seapower, Committee on Armed Services, U.S. Senate, March 11, 2015, p.10, http://www.armed-services.senate.gov/imo/media/doc/Glueck-Dee_03-11-15.pdf (accessed August 29, 2016).
57. Andrew Feickert, "Joint Light Tactical Vehicle (JLTV): Background and Issues for Congress," Congressional Research Service *Report for Members and Committees of Congress*, August 6, 2014, p. 4, https://www.hsdl.org/?view&did=756661 (accessed August 29, 2016).
58. Feickert, "Joint Light Tactical Vehicle (JLTV)," February 18, 2016, p. 1.
59. Glueck and Dee, "Marine Corps Modernization," p. 10.
60. Joe Gould, "Oshkosh Awaits Protest After JLTV Win," *Defense News*, August 29, 2015, http://www.defensenews.com/story/defense/land/vehicles/2015/08/29/oshkosh-awaits-protests-jltv-win/71325838 (accessed September 21, 2015).
61. U.S. Department of Defense, *Selected Acquisition Report (SAR): Joint Light Tactical Vehicle (JLTV) As of FY 2017 President's Budget*, p. 27.
62. Andrew Feickert, "Joint Light Tactical Vehicle (JLTV): Background and Issues for Congress," Congressional Research Service *Report for Members and Committees of Congress*, March 9, 2015, p. 6, http://digital.library.unt.edu/ark:/67531/metadc503674/m1/1/high_res_d/RS22942_2015Mar09.pdf (accessed August 29, 2016).
63. Dunford statement on Marine Corps readiness, February 26, 2015, p. 13.
64. Andrew Feickert, "Marine Corps Amphibious Combat Vehicle (ACV) and Marine Personnel Carrier (MPC): Background and Issues for Congress," Congressional Research Service *Report for Members and Committees of Congress*, February 26, 2016, p. 7, https://www.fas.org/sgp/crs/weapons/R42723.pdf (accessed August 29, 2016).

65. U.S. Department of Defense, *United States Department of Defense Fiscal Year 2017 Budget Request: Program Acquisition Cost by Weapon System*, p. 3-9.
66. Ibid.
67. Feickert, "Marine Corps Amphibious Combat Vehicle (ACV) and Marine Personnel Carrier (MPC)," pp. 1–2.
68. Glueck and Dee, "Marine Corps Modernization," pp. 7–9.
69. In regard to this overall requirement—armored lift for 10 battalions of infantry—the AAV Survivability Upgrade Program would provide for four battalions, and ACV 1.1 and ACV 1.2 would account for six battalions. Ibid., pp. 27–28.
70. Lieutenant General Robert Walsh, Deputy Commandant for Combat Development and Integration; Brigadier General Joseph Shrader, Commander, Marine Corps Systems Command; and William Taylor, Program Executive Officer, Marine Corps Land Systems, "Marine Corps Ground Forces Modernization, Modernization Programs," statement before the Subcommittee on Tactical Air and Land Forces, Committee on Armed Services, U.S. House of Representatives, March 2, 2016, p. 5, http://docs.house.gov/meetings/AS/AS25/20160302/104554/HHRG-114-AS25-Wstate-WalshR-20160302.pdf (accessed August 30, 2016).
71. Sam LaGrone, "WEST: Marines Plan to Issue Amphibious Combat Vehicle Request for Proposal in March," USNI News, February 12, 2015, http://news.usni.org/2015/02/12/west-marines-plan-issue-amphibious-combat-vehicle-request-proposal-march (accessed August 23, 2016).
72. Feickert, "Marine Corps Amphibious Combat Vehicle (ACV) and Marine Personnel Carrier (MPC)."
73. Dunford statement on Marine Corps readiness, February 26, 2015, p. 28.
74. Neller, "Navy and Marine Corps FY17 Budget Request," p. 13.
75. James K. Sanborn, "Marine Corps Releases ACV 1.1 Solicitation," *Marine Corps Times*, April 2, 2015, https://www.marinecorpstimes.com/story/military/tech/2015/04/02/marine-corps-releases-acv-solicitation/70838230/ (accessed August 23, 2016).
76. Grosklags, Davis, and Manazir, "Department of the Navy's Aviation Programs," April 20, 2016, p. 7.
77. Ibid, p. 3.
78. Vice Admiral Paul Grosklags, Principal Military Deputy, Assistant Secretary of the Navy (Research, Development and Acquisition); Rear Admiral Michael C. Manazir, Director, Air Warfare; and Lieutenant General Jon Davis, Deputy Commandant for Aviation, "Department of the Navy's Aviation Programs," statement before the Subcommittee on Seapower, Committee on Armed Services, U.S. Senate, March 25, 2015, p. 10, http://www.armed-services.senate.gov/imo/media/doc/Grosklags_Manazir_Davis_03-25-15.pdf (accessed August 30, 2016).
79. Neller, "Navy and Marine Corps FY17 Budget Request," p. 8.
80. Stephen Trimble, "US Military Unveils Possible F-35B Redesign in Sweeping Budget Reforms," FlightGlobal, January 6, 2011, https://www.flightglobal.com/news/articles/us-military-unveils-possible-f-35b-redesign-in-sweep-351600/ (accessed August 30, 2016).
81. Eckstein, "Marines Declare Initial Operational Capability on F-35B Joint Strike Fighter."
82. U.S. Department of Defense, *Selected Acquisition Report (SAR): V-22 Osprey Joint Services Advanced Vertical Lift Aircraft As of FY 2017 President's Budget*, December 22, 2015, p. 61, http://www.dod.mil/pubs/foi/Reading_Room/Selected_Acquisition_Reports/16-F-0402_DOC_64_V-22_DEC_2015_SAR.pdf (accessed August 30, 2016).
83. Grosklags, Davis, and Manazir, "Department of the Navy's Aviation Programs," April 20, 2016, p. 19.
84. Gidget Fuentes, "Marines Bid 'Phrog' Farewell to Last Active CH-46E Sea Knight Squadron," USNI News, April 10, 2015, http://news.usni.org/2015/04/10/marines-bid-phrog-farewell-to-last-active-ch-46e-sea-knight-squadron (accessed August 23, 2016).
85. Grosklags, Davis, and Manazir, "Department of the Navy's Aviation Programs," April 20, 2016, p. 19.; International Institute for Strategic Studies, *The Military Balance 2016*, p. 45.
86. Grosklags, Manazir, and Davis, "Department of the Navy's Aviation Programs," March 25, 2015, p. 16.
87. Ibid.
88. Grosklags, Davis, and Manazir, "Department of the Navy's Aviation Programs," April 20, 2016, p. 21.
89. U.S. Government Accountability Office, *Defense Acquisitions: Assessments of Selected Weapons Programs*, GAO-16-329SP, March 31, 2016, p. 93, http://www.gao.gov/assets/680/676281.pdf (accessed August 30, 2016).
90. Ibid., p. 93.

91. Lieutenant General Jon M. Davis, Deputy Commandant for Aviation, "Aviation Readiness and Safety," statement before the Subcommittee on Readiness, Committee on Armed Services, U.S. House of Representatives, July 6, 2016, p. [5], http://docs.house.gov/meetings/AS/AS03/20160706/105159/HHRG-114-AS03-Wstate-DavisJ-20160706.pdf (accessed August 30, 2016).
92. Ibid., p. 10.
93. U.S. Department of Defense, *Selected Acquisition Report (SAR): CH-53K Heavy Lift Replacement Helicopter (CH-53K) As of FY 2017 President's Budget*, December 31, 2015, p. 13, http://www.dod.mil/pubs/foi/Reading_Room/Selected_Acquisition_Reports/16-F-0402_DOC_49_CH-53K_DEC_2015_SAR.pdf (accessed August 30, 2016); U.S. Department of Defense, Office of the Under Secretary of Defense (Comptroller)/Chief Financial Officer, *United States Department of Defense Fiscal Year 2017 Budget Request: Program Acquisition Cost by Weapon System*, February 2016, p. 1-15, http://comptroller.defense.gov/Portals/45/Documents/defbudget/fy2017/FY2017_Weapons.pdf (accessed August 31, 2016).
94. Dunford statement on Marine Corps readiness, February 26, 2015, p. 20.
95. Ibid.
96. Congressional Quarterly, "Senate Armed Services Subcommittee on Readiness and Management Support Holds Hearing on U.S. Force Readiness," CQ Congressional Transcripts, March 15, 2016, http://www.cq.com/doc/congressionaltranscripts-4853577?2&search=0PXw7gtv (accessed August 30, 2016).
97. Dunford statement on Marine Corps readiness, February 26, 2015, p. 24.
98. Paxton, "U.S. Marine Corps Readiness," March 15, 2016, p. 9.
99. Ibid., pp. 6 and 9.
100. Ibid., p.
101. Davis, "Aviation Readiness and Safety," p. [1].
102. Ibid., p. [3].
103. Congressional Quarterly transcript of Senate Armed Services Subcommittee on Readiness and Management Support hearing, March 15, 2016.
104. Davis, "Aviation Readiness and Safety," p. 2.
105. U.S. Department of Defense, Office of the Under Secretary of Defense (Comptroller)/Chief Financial Officer, *Highlights of the Department of the Navy FY 2017 Budget*, February 2016, p. 3-13, http://www.secnav.navy.mil/fmc/fmb/Documents/17pres/Highlights_book.pdf (accessed June 27, 2016).
106. Paxton, "U.S. Marine Corps Readiness," March 15, 2016, p. 7.
107. Ibid., p. 13.
108. This count is based on an average number of 1.5 divisions deployed to major wars (see Table 6, p. 226) and an average of 10–11 battalions per division.

U.S. Nuclear Weapons Capability

Assessing the state of U.S. nuclear weapons capabilities presents several challenges.

First, the U.S. has elected to maintain nuclear warheads—based on designs from the 1960s and 1970s—that were in the stockpile when the Cold War ended rather than take advantage of technological developments to field new warheads that could be designed to be safer and more secure and could give the United States improved options for guaranteeing a credible deterrent.

Second, the lack of detailed publicly available data about the readiness of nuclear forces, their capabilities, and weapon reliability makes analysis difficult.

Third, the U.S. nuclear enterprise is composed of many components, some of which are also involved in supporting conventional missions. For example, dual-capable bombers do not fly airborne alert with nuclear weapons today, although they did so routinely during the 1960s (and are capable of doing so again if the decision should ever be made to resume this practice). Additionally, the national security laboratories do not focus solely on the nuclear weapons mission; they also perform a variety of functions related to nuclear nonproliferation, medical research, threat reduction, and countering nuclear terrorism, including nuclear detection.

Thus, assessing the extent to which any one piece of the nuclear enterprise is sufficiently funded, focused, and effective with regard to the nuclear mission is problematic.

In today's rapidly changing world, the U.S. nuclear weapons enterprise should be flexible and resilient to underpin the U.S. nuclear deterrent. If the U.S. detects a game-changing nuclear weapons development in another country, the ability of the U.S. nuclear weapons complex to provide a timely response is important.

The U.S. maintains an inactive stockpile that includes near-term hedge warheads that can be put back into operational status within six to 24 months.[1] Extended hedge warheads are said to be ready within 24 to 60 months.[2] The U.S. preserves significant upload capability on its strategic delivery vehicles, which means that the nation can increase the number of nuclear warheads on each type of its delivery vehicles if contingencies warrant. For example, the U.S. Minuteman III intercontinental ballistic missile (ICBM) can carry up to three nuclear warheads, though it is currently deployed with only one.[3]

Presidential Decision Directive-15 (PDD-15) requires the U.S. to maintain the ability to conduct a nuclear test within 24 to 36 months of a presidential decision to do so.[4] However, successive governmental reports have noted the continued deterioration of technical and diagnostics equipment and the inability to fill technical positions supporting nuclear testing readiness.[5] A lack of congressional support for improving technical readiness further undermines efforts by the National Nuclear Security Administration (NNSA) to comply with the directive.

The weapons labs are beset by demographic challenges of their own. Thomas D'Agostino, former Under Secretary of Energy for Nuclear Security and Administrator of the NNSA, has stated that it is quite plausible

that by 2017, the United States will not have a single active engineer who had "a key hand in the design of a warhead that's in the existing stockpile and who was responsible for that particular design when it was tested back in the early 1990s."[6] This is a significant problem because for the first time since the dawn of the nuclear age, the U.S. will have to rely on the scientific judgment of people who were not directly involved in nuclear tests of weapons that they designed, developed, and are certifying.

Not all of the existing inactive stockpile will go through the life-extension program. Hence, our ability to respond to contingencies by uploading weapons kept in an inactive status could decline with the passage of time.

The shift of focus away from the nuclear mission after the end of the Cold War caused the NNSA laboratories to lose their sense of purpose and to feel compelled to reorient and broaden their mission focus. According to a number of studies, their relationship with the government also evolved in ways that reduce output and increase costs. The NNSA was supposed to address these problems but has largely failed in this task, partly because "the relationship with the NNSA and the National security labs appears to be broken."[7]

In 1999, the Commission on Maintaining U.S. Nuclear Weapons Expertise concluded that 34 percent of the employees supplying critical skills to the weapons program were more than 50 years old. The number increased to 40 percent in 2009.[8] The U.S. high-technology industry, on average, has a more balanced employee age distribution.[9] In 2012, a number of the Los Alamos National Laboratory's employees were laid off in anticipation of a $300 million shortfall.[10]

Both the lack of resources and the lack of sound consistent policy guidance have undermined the morale of the workforce. The Congressional Advisory Panel on the Governance of the Nuclear Security Enterprise recommended fundamental changes in the nuclear weapons enterprise's culture, business practices, project management, and organization. Others proposed moving the NNSA to the Department of Defense.[11]

Another important indication of the health of the overall force is the readiness of forces that actually operate U.S. nuclear systems. In 2006, the Air Force mistakenly shipped non-nuclear warhead components to Taiwan.[12] A year later, the Air Force transported nuclear-armed cruise missiles across the U.S. without authorization (or apparently even awareness that it was doing so, mistaking them for conventional cruise missiles).[13] These serious incidents led to the establishment of a Task Force on DOD Nuclear Weapons Management, which found that "there has been an unambiguous, dramatic, and unacceptable decline in the Air Force's commitment to perform the nuclear mission and, until very recently, little has been done to reverse it" and that "the readiness of forces assigned the nuclear mission has seriously eroded."[14]

Following these incidents, the Air Force instituted broad changes to improve oversight and management of the nuclear mission and the inventory of nuclear weapons, including creating the Air Force Global Strike Command to organize, train, and equip intercontinental-range ballistic missile and nuclear-capable bomber crews as well as other personnel to fulfill a nuclear mission and implement a stringent inspections regime.

The success of these changes has been limited. In January 2014, the Air Force discovered widespread cheating on nuclear proficiency exams and charged over 100 officers with misconduct. The Navy had a similar problem, albeit on a smaller scale.[15] The Department of Defense conducted two nuclear enterprise reviews, one internal and one external. Both reviews identified a lack of leadership attention, a lack of resources to modernize the atrophied infrastructure, and unduly burdensome implementation of the personnel reliability program as some of the core challenges preventing a sole focus on accomplishing the nuclear mission.[16]

The ICBM Force Improvement Program was initiated and mostly implemented

throughout 2014 and into 2015, and the Air Force shifted over $160 million to address problems, modernize certain facilities, and generally improve morale. The Air Force has also seen an increase in badly needed manpower—but not nearly enough to alleviate manpower concerns. If changes in the nuclear enterprise are to be effective, leaders across the executive and legislative branches will have to continue to provide sufficient resources to mitigate readiness and morale issues within the force in the years ahead.

Fiscal uncertainty and a steady decline in resources for the nuclear weapons enterprise (trends that have begun to reverse in recent years) have negatively affected the nuclear deterrence mission. Admiral Cecil D. Haney, Commander, U.S. Strategic Command (STRATCOM), testified in March 2016 that:

> Much remains to be done to sustain and modernize the foundational nuclear deterrent force that we need to protect the Nation from existential threats in an increasingly uncertain and unpredictable environment. We must continue to meet critical investment timelines to ensure that aging platforms and weapons systems do not reach the point at which their viability becomes questionable.[17]

In recent years, the Administration has advanced a comprehensive modernization program for nuclear forces—warheads, delivery systems and command and control—and has robustly funded this program in its budget requests. At the same time, Congress in large part has funded the modernization program. Because such modernization activities require long-term funding commitments, it is important that a bipartisan approach continue this commitment in future years.

Implications for U.S. National Security

U.S. nuclear forces are not designed to shield the nation from all types of attacks from all adversaries. They are designed to deter large-scale conventional and nuclear attacks that threaten American sovereignty, forward-deployed troops, and allies.

U.S. nuclear forces play an important role in the global nonproliferation regime by providing U.S. assurances to NATO, Japan, and South Korea that lead these allies either to keep the number of their nuclear weapons lower than otherwise would be the case (France, the U.K.) or to forgo their development and deployment altogether. North Korea has proven that a country with very limited intellectual and financial resources can develop a nuclear weapon if it decides to do so. Iran continues to be on a path to obtaining a nuclear weapon, and the Joint Comprehensive Plan of Action might make reaching the goal easier by providing Iran with money and access to advanced technologies.

This makes U.S. nuclear assurances to allies and partners ever more important. Should the credibility of American nuclear forces continue to degrade, countries such as South Korea could pursue an independent nuclear option, which would raise several thorny issues including possible additional instability across the region.

Certain negative trends could undermine U.S. nuclear deterrence if problems are not addressed. There is no shortage of challenges on the horizon, from an aging nuclear weapons infrastructure and workforce to the need to recapitalize all three legs (land, air, and sea) of the nuclear triad, from the need to conduct life-extension programs while maintaining a self-imposed nuclear weapons test moratorium to limiting the spread of nuclear know-how and the means to deliver nuclear weapons. Additionally, the United States must take account of adversaries who are modernizing their nuclear forces, particularly Russia and China.

Deterrence is a complex interplay between U.S. conventional and nuclear forces and the psychology of both allies and adversaries that the U.S. would use these forces to defend both the interests of the U.S. and those of its allies. Nuclear deterrence must reflect the mindset of the adversary the U.S. seeks to deter. If an adversary believes that limited nuclear war can be fought and won, then the task for U.S. leaders is to convince the adversary otherwise

even if U.S. leaders think it is not possible to control escalation. The U.S. nuclear portfolio must be structured in terms of capacity, capability, variety, flexibility, and readiness to achieve this objective. In addition, military requirements and specifications for nuclear weapons will be different depending on who is being deterred, what he values, and what the U.S. seeks to deter him from doing.

Due to the complex interplay among strategy, policy, actions that states take in international relations, and other actors' perceptions of the world around them, it is quite possible that one might never know precisely if and when a nuclear or conventional deterrent provided by U.S. forces loses credibility. Nuclear weapons capabilities take years or decades to develop, as does the infrastructure supporting them—an infrastructure that the U.S. has neglected for decades. We can be reasonably certain that a robust, well-resourced, focused, and reliable nuclear enterprise is more likely to sustain its deterrent value than is an outdated and questionable one.

The U.S. is capable of incredible mobilization when danger materializes. The nuclear threat environment is dynamic and proliferating, with old and new actors developing advanced capabilities while the U.S. enterprise is relatively static, potentially leaving the United States at a technological disadvantage. This is worrisome because of its implications both for the security of the United States and for the security of its allies and the free world generally.

Scoring U.S. Nuclear Weapons Capabilities

The U.S. nuclear weapons enterprise is composed of several key elements that include warheads; delivery systems; nuclear command and control; intelligence, surveillance, and reconnaissance; aerial refueling; and the physical infrastructure that designs, manufactures, and maintains U.S. nuclear weapons. The complex also includes the talent of people from physicists to engineers, maintainers, and operators, without which the continuous maintenance of the nuclear infrastructure would not be possible.

The factors selected below are the most important elements of the nuclear weapons complex. They are judged on a five-grade scale, where "very strong" means that a sustainable, viable, and funded plan is in place and "very weak" means that the U.S. is not meeting its security requirements and has no program in place to redress the shortfall, which has the potential to damage vital national interests if the situation is not corrected.

Current U.S. Nuclear Stockpile Score: Strong

U.S. warheads must be safe, secure, effective, and reliable. The Department of Energy (DOE) defines reliability as "the ability of the weapon to perform its intended function at the intended time under environments considered to be normal"[18] and as "the probability of achieving the specified yield, at the target, across the Stockpile-to-Target Sequence of environments, throughout the weapon's lifetime, assuming proper inputs."[19] Since 1993, reliability has been determined through an intensive warhead surveillance program; non-nuclear experiments (that is, without the use of experiments producing nuclear yield); sophisticated calculations using high-performance computing; and related evaluations.

Nuclear warhead and delivery system reliability becomes more important as the number and diversity of nuclear weapons in the stockpile decreases, because fewer types of nuclear weapons leave a smaller margin of error should one type of a weapon be affected by a technical problem that requires either the repair or the decommissioning of a weapon type or its delivery system. Americans and allies must be confident that U.S. nuclear warheads will perform as expected.[20]

As warheads age, they become less able to perform their mission as expected, and this can

complicate military planning significantly. Despite creating impressive amounts of knowledge about nuclear weapons physics and materials chemistry, the U.S. may not be completely certain about the long-term effects of aging components that comprise a nuclear weapon. Former NNSA spokesman Bryan Wilkes said, "We know that plutonium pits have a limited lifetime."[21] A plutonium pit is a crucial component of a nuclear weapon,[22] and with life-extension programs introducing new components to warheads whose radiological effects are not fully known, the level of uncertainty has increased.

The United States has the world's safest and most secure stockpile, but security of long-term storage sites including overseas sites, potential problems introduced by improper handling, or unanticipated effects stemming from long-term handling could compromise the integrity of U.S. warheads. The nuclear warheads themselves contain security measures that are designed to make it difficult, if not impossible, to detonate a weapon absent a proper authorization.

Grade: The Department of Energy and Department of Defense are required to assess the reliability of the nuclear stockpile annually. This assessment does not include delivery systems, although the U.S. Strategic Command does assess overall weapons system reliability, which includes both the warhead and delivery platforms.

Absent nuclear weapons testing, the assessment of weapons reliability becomes more subjective, albeit based on experience and non-nuclear tests rather than fact. While certainly an educated opinion, it is not a substitute for the type of objective data obtained through nuclear testing. Testing was used to diagnose potential problems and to certify the effectiveness of fixes to those problems. Given that modern simulation is based on nuclear tests that were conducted primarily in the 1950s and 1960s, using testing equipment of that era, there is a great deal that modern testing equipment and computer capability could teach about nuclear physics.

According to the late Major General Robert Smolen, some of the nuclear weapon problems the U.S. now faces "in the past would have [been] resolved with nuclear tests."[23] By 2005, a consensus emerged in the NNSA, informed by the nuclear weapons labs, that it would "be increasingly difficult and risky to attempt to replicate exactly existing warheads without nuclear testing and that creating a reliable replacement warhead should be explored."[24] When the U.S. did conduct nuclear tests, it was frequently found that small changes in a weapon's tested configuration had a dramatic impact on weapons performance. In fact, the 1958–1961 testing moratorium resulted in weapons with serious problems being introduced into the U.S. stockpile.[25]

In fiscal year (FY) 2015, the NNSA assessed that it met its goal of maintaining a safe, secure, and effective stockpile.[26]

The lack of nuclear weapons testing creates some uncertainty concerning the adequacy of fixes to the stockpile when problems are found. This includes updates made in order to correct problems that were found in the weapons or changes in the weapons resulting from life-extension programs. It is simply impossible to duplicate exactly weapons that were designed and built many decades ago. According to former Defense Threat Reduction Agency Director Dr. Stephen Younger, we have had "a number of problems that were never anticipated" and had to fix them by using "similar but not quite identical parts."[27] The high costs of having to certify weapons without nuclear testing are resulting in fewer types of weapons and, as a consequence, a greater impact across the inventory if there is an error in the certification process.

Secretary of Defense Robert Gates warned in October 2008 that, "[t]o be blunt, there is absolutely no way we can maintain a credible deterrent and reduce the number of weapons in our stockpile without either resorting to testing our stockpile or pursuing a modernization program."[28] The U.S. is pursuing warhead life-extension programs that replace aging components before they can cause reliability problems. However, the national commitment to this modernization program, including the necessary funding over the long term, continues to be uncertain.

In light of our overall assessment, we grade the U.S. stockpile as "strong."

Reliability of U.S. Delivery Platforms Score: Strong

Reliability encompasses not only the warhead, but the strategic delivery vehicles as well. This includes a successful missile launch, the separation of missile boost stages, the performance of the missile guidance system, the separation of the multiple re-entry vehicle warheads from the missile post-boost vehicle, and the accuracy of the final re-entry vehicle in reaching its target.[29]

The U.S. conducts ICBM and submarine launched ballistic missile (SLBM) flight tests every year to ensure the reliability of its systems. Anything from electrical wiring to faulty booster separations could degrade the efficiency and safety of the U.S. strategic deterrent if it were to malfunction. U.S. strategic, long-range bombers regularly conduct intercontinental training and receive upgrades in order to sustain a high level of combat readiness. However, potential challenges are on the horizon.

Grade: U.S. ICBMs and SLBMs are flight tested annually, and these tests were successful in 2015. To the extent that data from these tests are publicly available, they provide objective evidence of the delivery systems' reliability and send a message to U.S. adversaries that the system works. The aged systems, however, occasionally have reliability problems.[30] Overall, this factor earns a grade of "strong."

Nuclear Warhead Modernization Score: Weak

During the Cold War, the United States maintained a strong focus on designing and developing new nuclear warhead designs in order to counter Soviet advances and modernization efforts and to leverage advances in understanding the physics, chemistry, and design of nuclear weapons. Today, the United States is focused on sustaining the existing stockpile, not on developing new warheads, even though all of its nuclear-armed adversaries are developing new nuclear warheads and capabilities and accruing new knowledge in which the U.S. used to lead. Since the collapse of the Soviet Union, nuclear weapons and delivery vehicles have not been replaced despite being well beyond their designed service life. This may increase the risk of failure due to aging components and signal to adversaries that the United States is less committed to nuclear deterrence.

New weapon designs could allow American engineers and scientists to improve previous designs and address more effective means to address existing military requirements (for example, the need to destroy deeply buried and hardened targets) that have emerged in recent years. With new warheads, the safety and security of American weapons could also be enhanced in ways that may not be possible today without nuclear testing.

An ability to work on new weapon designs would also help American experts to remain engaged and knowledgeable, would help to attract the best talent to the nuclear enterprise, and could help the nation to gain additional insights into foreign nations' nuclear weapon programs. As the Panel to Assess the Reliability, Safety, and Security of the United States Nuclear Stockpile noted, "Only through work on advanced designs will it be possible to train the next generation of weapon designers and producers. Such efforts are also needed to exercise the DoD/NNSA weapon development interface."[31] Other nations maintain their levels of proficiency by having their scientists work on new nuclear warheads and

possibly conducting very low-yield nuclear weapons tests.

Grade: The lack of plans to modernize nuclear weapons—life-extension programs are not modernization—and the restrictions on thinking about new designs that might be able to accomplish the deterrence mission in the 21st century more effectively earn nuclear warhead modernization a grade of "weak."

Nuclear Delivery Systems Modernization Score: Marginal

Today the United States fields a triad of nuclear forces with delivery systems that are safe and reliable. That said, as these systems age, there is increased risk of significant negative impact on operational capabilities. The older weapons are, the more at risk they are from faulty components or malfunctioning equipment. Age can degrade reliability by increasing the potential for systems to break down or fail to respond correctly. Corrupted systems, defective electronics, or performance degradation due to long-term storage defects (in the case of nuclear warheads as well) can have serious implications for American deterrence and assurance. If a strategic delivery vehicle cannot be counted on to operate at all times, its deterrence and assurance value is significantly reduced.

While the U.S. Air Force and U.S. Navy have plans to modernize or replace each leg of the nuclear triad in the next several decades, fiscal constraints are likely to make such efforts difficult. The Navy is fully funding its programs to replace the *Ohio*-class submarine and to life extend and eventually replace the Trident SLBM, but existing ICBMs and SLBMs are expected to remain in service until 2032 and 2042, respectively, and new bombers are not planned to enter into service until 2023 at the earliest. Budgetary shortfalls are leading to uncertainty as to whether the nation will be able to modernize all three legs of the nuclear triad. Yet a triad is a "requirement" according to the U.S. Strategic Command.[32] This requirement, which has been validated by all U.S. Nuclear Posture Reviews since the end of the Cold War, provides U.S. leadership with credibility and flexibility, attributes that are necessary for any future deterrence scenarios.

Maintenance issues caused by the aging of American SSBNs and long-range bombers could make it difficult to deploy units overseas for long periods of time or remain stealthy in enemy hotspots. The United States can already send only a limited number of bombers on missions at any one time. As Bradley Thayer and Thomas Skypek have noted, "Using 2009 as a baseline, the ages of the current systems of the nuclear triad are 39 years for the *Minuteman III*, 19 years for the *Trident II* D-5 SLBM, 48 years for the B-52H, 12 years for the B-2, and 28 years for the *Ohio* Class SSBNs."[33] Remanufacturing some weapon parts is difficult and expensive because some of the manufacturers are no longer in business or the materials that constituted the original weapons are no longer available (for example, due to environmental restrictions). The ability of the U.S. to produce solid-fuel rocket engines and possible U.S. dependence on Russia as a source for such engines are other long-range concerns.[34]

Grade: U.S. nuclear platforms are in dire need of recapitalization. The U.S. has put into place plans for nuclear triad modernization, and despite some delays, funding for these programs has been sustained by Congress notwithstanding difficulties caused by sequestration. At the same time, there is uncertainty regarding when the new platforms will enter into force and be nuclear-certified and uncertainty regarding U.S. future stockpile strategy. These considerations earn this indicator a grade of "marginal."

Nuclear Weapons Complex Score: Weak

A large part of maintaining a reliable and effective nuclear stockpile depends on the facilities where U.S. devices and components are developed, tested, and produced. These facilities constitute the foundation of our strategic arsenal and include the:

- Los Alamos National Laboratories,
- Lawrence Livermore National Laboratories,
- Sandia National Laboratory,
- Nevada National Security Site,
- Pantex Plant,
- Kansas City Plant,
- Savannah River Site, and
- Y-12 National Security Complex.

In addition to these government sites, the defense industrial base supports the development and maintenance of American delivery platforms.

These complexes design, develop, test, and produce the weapons in the U.S. nuclear arsenal. Their maintenance is of critical importance. As the 2010 Nuclear Posture Review (NPR) stated:

> In order to remain safe, secure, and effective, the U.S. nuclear stockpile must be supported by a modern physical infrastructure—comprised of the national security laboratories and a complex of supporting facilities—and a highly capable workforce with the specialized skills needed to sustain the nuclear deterrent.[35]

A flexible and resilient infrastructure is an essential hedge in the event that components fail or the U.S. is surprised by the nuclear weapon capabilities of potential adversaries.[36] U.S. research and development efforts and the industrial base that supports modernization of delivery systems are an important part of this indicator.

Maintaining a safe, secure, effective, and reliable nuclear stockpile requires modern facilities, technical expertise, and tools both to repair any malfunctions quickly, safely, and securely and to produce new nuclear weapons if required. The existing nuclear weapons complex is not fully functional. The U.S. cannot produce more than a few new warheads per year. There are limits on the ability to conduct life-extension programs. Dr. John Foster has reported that the U.S. no longer can "serially produce many crucial components of our nuclear weapons."[37]

If the facilities are not properly funded, the U.S. will gradually lose the ability to conduct high-quality experiments. Obsolete facilities and poor working environments make maintaining a safe, secure, reliable, and militarily effective nuclear stockpile exceedingly difficult, in addition to demoralizing the workforce and hampering further recruitment. The NNSA's facilities are old: More than 50 percent are more over 40 years old, nearly 30 percent date to the Manhattan Project of the 1940s, and 12 percent are considered excess or no longer needed.[38] As a consequence, the NNSA had about $3.7 billion in deferred maintenance at the end of FY 2015.

Since 1993, the DOE has not had a facility dedicated to production of plutonium pits, one of the main components of America's nuclear warheads. The U.S. currently keeps about 5,000 plutonium pits in strategic reserve. There are significant disagreements as to the effect of aging on pits and whether the U.S. will be able to maintain them indefinitely without nuclear weapons testing. Currently, the U.S. can produce no more than about 10 plutonium pits a year at the Los Alamos PF-4 facility. Infrastructure modernization plans for PF-4, if funded, will boost that number to about 20 by the middle of the next decade and to between 50 and 80 by the end of the next decade. Russia can produce around 2,000 pits a year.[39]

Manufacturing non-nuclear components can be extremely challenging either because some materials may no longer exist or because manufacturing processes have been forgotten and must be retrieved. There is a certain element of art to the process of building a nuclear weapon, and such a skill can be acquired and maintained only through actual hands-on experience.

Grade: On one hand, the U.S. maintains some of the world's most advanced nuclear facilities. On the other, some parts of the complex—most importantly, parts of the plutonium and highly enriched uranium component manufacturing infrastructure—have not been modernized since the 1950s, and plans for long-term infrastructure recapitalization remain uncertain. The infrastructure therefore receives a grade of "weak."

Quality of People Working in the National Nuclear Laboratories Score: Marginal

Combined with nuclear facilities, U.S. nuclear weapons scientists and engineers are critical to the health of the complex and the stockpile. The 2010 NPR emphasizes that:

> [A] highly skilled workforce [is] needed to ensure the long-term safety, security, and effectiveness of our nuclear arsenal and to support the full range of nuclear security work to include non-proliferation, nuclear forensics, nuclear, counter-terrorism, emergency management, intelligence analysis and treaty verification.[40]

The ability to maintain and attract a high-quality workforce is critical to assuring the future of the American nuclear deterrent. Today's weapons designers and engineers are first-rate, but they also are aging and retiring, and their knowledge must be passed on to the next generation that will take on this mission. To do that, young designers need challenging warhead design and development programs to hone their skills. No such challenging programs are in place today. The NNSA and its weapons labs understand this problem and are taking steps, with the support of Congress and despite significant challenges, to mentor the next generation.

The U.S. currently relies on non-yield-producing laboratory experiments, flight tests, and the judgment of experienced nuclear scientists and engineers to ensure continued confidence in the safety, security, effectiveness, and reliability of its nuclear deterrent. Without their experience, the nuclear weapons complex could not function. A basic problem is that few scientists or engineers at the NNSA weapons labs have had the experience of taking a warhead from initial concept to a "clean sheet" design, engineering development, and production. The complex must attract and retain the best and brightest. Between 2014 and 2016, the NNSA lost 106 people out of a total of 2,340 employed as of April 2016.[41] The average age of the workforce increased to 48.1 years.[42]

Grade: In addition to employing world-class experts, the NNSA labs have had recent success in attracting and retaining talent. The NNSA, however, has had less success in providing these people with challenging warhead design and development programs. Because many scientists and engineers with practical nuclear weapon design and testing experience are retired, nuclear warhead certifications will therefore rely on the judgments of people who have never tested or designed a nuclear weapon. Management challenges and a lack of focus on the nuclear weapon mission contribute to the lowering of morale in the NNSA complex. In light of these issues, which have to do more with policy than with the quality of people, the complex earns a score of "marginal."

Readiness of Forces Score: Marginal

The readiness of forces is a vital component of America's strategic forces. The military personnel operating the three legs of the nuclear triad must be properly trained and equipped. It is also essential that these systems be maintained in a high state of readiness.

During FY 2016, the services continue to align resources in order to preserve strategic capabilities in the short term, but long-term impacts remain uncertain. Continued decline in U.S. general purpose forces could eventually affect nuclear forces, especially the bomber leg of the nuclear triad. Changes prompted by the 2014 Navy and Air Force cheating scandals have begun to address some of the morale issues. A sustained attention to the situation in the nuclear enterprise is critical.

Grade: Uncertainty regarding the further potential impacts of budgetary shortfalls, as part of the overall assessment, earns this indicator a grade of "marginal."

Allied Assurance Score: Marginal

The number of weapons that U.S. allies keep is an important element when speaking about the credibility of America's extended deterrence. Allies that already have nuclear weapons can coordinate action with other powers or act independently. During the Cold War, the U.S. and the U.K. cooperated to the point where joint targeting was included.[43] France maintains its own independent nuclear arsenal, partly as a hedge against the uncertainty of American credibility. The U.S. also deploys nuclear gravity bombs in Europe as a visible manifestation of its commitment to its NATO allies.

The U.S., however, must concern itself not just with NATO, but with Asian allies as well. The United States provides nuclear assurances to Japan and South Korea, both of which are technologically advanced industrial economies facing nuclear-armed adversaries and potential adversaries. If they do not perceive U.S. assurances as credible, they have the capability and know-how to build their own nuclear weapons and to do so quickly. That would be a major setback for U.S. nonproliferation policies.

Grade: At this time, most U.S. allies are not seriously considering developing their own nuclear weapons. European members of NATO continue to express their commitment to and appreciation for NATO as a nuclear alliance. Doubts about the modernization of dual-capable aircraft and even about the weapons themselves, as well as NATO's lack of attention to the nuclear mission and its intellectual underpinning, preclude assigning a score of "very strong." Additionally, the perception among some that America has accepted Iran's nuclear program may encourage other countries in the Middle East region to seek similar capabilities. Thus, allied assurance remains "marginal."

Nuclear Test Readiness Score: Weak

Testing is one of the key elements of maintaining a safe, secure, effective, and reliable nuclear deterrent. While the U.S. is currently under a self-imposed nuclear testing moratorium, it maintains a low level of nuclear test readiness at the Nevada National Security Site (formerly Nevada Test Site). The approach is questionable with regard to its efficacy in assuring that the U.S. has the timely ability to conduct yield-producing experiments should it discover a flaw in one or more types of its nuclear weapons that requires experimentation to correct. The U.S. might need to test to develop a weapon with new characteristics that can be validated only by testing and to verify render-safe procedures. Yield-producing experiments can also play an important role if the U.S. needs to react strongly to other nations' nuclear weapons tests and communicate its resolve or to understand other countries' new nuclear weapons.

Current law requires that the U.S. be prepared to conduct a nuclear weapons test within a maximum of 36 months after a presidential decision to do so. The current state of test readiness is between 24 and 36 months, although both the NNSA and Congress required the NNSA to be ready within 18 months in the past.[44] The U.S. could meet the 18-month requirement only if certain domestic regulations, agreements, and laws were to be waived.[45]

"Test readiness" refers to a single test or a very short series of tests, not a sustained nuclear testing program. Because of a shortage of resources, the NNSA has been unable to achieve this goal. The test readiness program is supported by experimental programs at the Nevada National Security Site, nuclear laboratory experiments, and advanced diagnostics development.[46]

Grade: As noted, the U.S. can meet the readiness requirement mandated by the law only if certain domestic regulations, agreements, and laws are waived. In addition, the U.S. is not prepared to sustain testing activities beyond a few limited experiments, which

certain scenarios might require. Thus, testing readiness earns a grade of "weak."

Overall U.S. Nuclear Weapons Capability Score: Marginal

Though modernization programs for warheads and delivery systems are quite uncertain, the infrastructure supporting nuclear programs is aged, and nuclear test readiness has revealed troubling problems within the forces, those weak spots are offset by strong delivery platform reliability and allies who remain confident in the U.S. nuclear umbrella. Averaging the subscores across the nuclear enterprise therefore results in an overall score of "marginal."

U.S. Military Power: Nuclear

	VERY WEAK	WEAK	MARGINAL	STRONG	VERY STRONG
Warhead Surety				✓	
Delivery Platform Reliability				✓	
Warhead Modernization		✓			
Delivery Systems Modernization			✓		
Nuclear Weapons Complex		✓			
National Labs Talent			✓		
Force Readiness			✓		
Allied Assurance			✓		
Nuclear Test Readiness		✓			
OVERALL			✓		

Endnotes:

1. Chapter 3, "U.S. Nuclear Forces," in U.S. Department of Defense, Office of the Secretary of Defense, Office of the Assistant Secretary of Defense for Nuclear, Chemical, and Biological Programs, *The Nuclear Matters Handbook, Expanded Edition*, 2011, http://www.acq.osd.mil/ncbdp/nm/nm_book_5_11/chapter_3.htm (accessed September 17, 2014).
2. Ibid.
3. George C. Marshall Institute, "LGM-30G Minuteman III," Missile Threat website, http://missilethreat.com/missiles/lgm-30g-minuteman-iii/ (accessed September 30, 2014).
4. "Test Readiness," in Chapter 1, "Safety, Security, and Reliability of the U.S. Nuclear Weapons Stockpile," in National Research Council, Committee on Reviewing and Updating Technical Issues Related to the Comprehensive Nuclear Test Ban Treaty, *The Comprehensive Nuclear Test Ban Treaty: Technical Issues for the United States* (Washington: National Academies Press, 2012), http://www.nap.edu/openbook.php?record_id=12849&page=30 (accessed September 17, 2014).
5. U.S. Department of Energy, Office of Inspector General, Memorandum, "Report on the 'Follow-up Audit of the Test Readiness at the Nevada Test Site,'" Audit Report No. OAS-L-10-02, October 21, 2009, http://energy.gov/sites/prod/files/igprod/documents/OAS-L-10-02.pdf (accessed September 17, 2014).
6. Kate Brannen, "Nuke Expert Pool Shrinking," *Defense News*, April 14, 2012, http://www.defensenews.com/article/20120414/DEFREG02/304140002/Nuke-Expert-Pool-Shrinking/ (accessed September 17, 2014).
7. Statement of Dr. Charles V. Shank, Senior Fellow, Howard Hughes Medical Institute, and Co-chair, National Research Council Committee on Review of the Quality of the Management and of the Science and Engineering Research at the DOE's National Security Laboratories–Phase 1, *Hearing to Receive Testimony on National Nuclear Security Administration Management of Its National Security Laboratories*, Subcommittee on Strategic Forces, Committee on Armed Services, U.S. Senate, April 18, 2012, p, 5, http://www.armed-services.senate.gov/imo/media/doc/12-28%20-%204-18-12.pdf (accessed September 30, 2014).
8. Task Force on Leveraging the Scientific and Technological Capabilities of the NNSA National Laboratories for 21st Century National Security, *Leveraging Science for Security: A Strategy for the Nuclear Weapons Laboratories in the 21st Century*, Henry L. Stimson Center *Report* No. 71, March 2009, p. 11, http://www.stimson.org/images/uploads/research-pdfs/Leveraging_Science_for_Security_FINAL.pdf (accessed September 17, 2014).
9. Ibid.
10. Ambassador C. Paul Robinson, John Foster, and Thomas Scheber, "The Comprehensive Test Ban Treaty: Questions and Challenges," Heritage Foundation *Lecture* No. 1218, November 7, 2012, http://www.heritage.org/research/lecture/2012/11/the-comprehensive-test-ban-treaty-questions-and-challenges.
11. The report also recommends that the Department of Energy be renamed the "Department of Energy and Nuclear Security" to "highlight the prominence and importance of the Department's nuclear security mission." Congressional Advisory Panel on the Governance of the Nuclear Security Enterprise, *A New Foundation for the Nuclear Enterprise: Report of the Congressional Advisory Panel on the Governance of the Nuclear Security Enterprise*, November 2014, p. xii, http://cdn.knoxblogs.com/atomiccity/wp-content/uploads/sites/11/2014/12/Governance.pdf?_ga=1.83182294.1320535883.1415285934 (accessed May 11, 2015).
12. Associated Press, "US Mistakenly Ships ICBM Parts to Taiwan," March 25, 2008, http::://www.military.com/NewsContent/0,13319,164694,00.html (accessed September 17, 2014).
13. Associated Press, "Air Force Official Fired After 6 Nukes Fly Over US," updated September 5, 2007, http://www.nbcnews.com/id/20427730/ns/us_news-military/t/air-force-official-fired-after-nukes-fly-over us/#.U5iNS1_D9Fo (accessed September 17, 2014).
14. U.S. Department of Defense, Secretary of Defense Task Force on DoD Nuclear Weapons Management, *Report of the Secretary of Defense Task Force on DoD Nuclear Weapons Management: Phase I: The Air Force's Nuclear Mission*, September 2008, http://www.defense.gov/Portals/1/Documents/pubs/Phase_I_Report_Sept_10.pdf (accessed September 17, 2014).
15. Adam Lowther, "A Year Later: Responding to Problems in the ICBM Force," *Bulletin of the Atomic Scientists*, February 12, 2015, http://thebulletin.org/year-later-responding-problems-icbm-force7984 (accessed May 11, 2015).
16. U.S. Department of Defense, *Independent Review of the Department of Defense Nuclear Enterprise*, June 2, 2014, http://www.defense.gov/pubs/Independent-Nuclear-Enterprise-Review-Report-30-June-2014.pdf (accessed May 11, 2015).
17. Admiral C. D. Haney, Commander, United States Strategic Command, statement before the Committee on Armed Services, U.S. Senate, March 10, 2016, p. 3, http://www.armed-services.senate.gov/imo/media/doc/Haney_03-10-16.pdf (accessed May 26, 2016).

18. R. L. Bierbaum, J. J. Cashen, T. J. Kerschen, J. M. Sjulin, and D. L. Wright, "DOE Nuclear Weapon Reliability Definition: History, Description, and Implementation," Sandia National Laboratories, *Sandia Report* No. SAND99-8240, April 1999, http://www.wslfweb.org/docs/usg/reli99.pdf (accessed September 17, 2014).
19. Ibid.
20. U.S. Department of Defense, *Nuclear Posture Review Report*, April 2010, http://www.defense.gov/npr/docs/2010%20nuclear%20posture%20review%20report.pdf (accessed September 17, 2014).
21. "Test Site Is Finalist for Nuke Bomb Plant," *Las Vegas Sun*, September 27, 2002, http://lasvegassun.com/news/2002/sep/27/test-site-is-finalist-for-nuke-bomb-plant/ (accessed September 17, 2014).
22. Jonathan E. Medalia, "U.S. Nuclear Weapon 'Pit' Production Options for Congress," Congressional Research Service *Report for Members and Committees of Congress*, February 21, 2014, http://fas.org/sgp/crs/nuke/R43406.pdf (accessed September 17, 2014).
23. Major General Robert Smolen, USAF (Ret.), Deputy Administrator for Defense Programs, U.S. Department of Energy, National Nuclear Security Administration, remarks at AIAA Strategic and Tactical Missile Systems Conference, January 23, 2008, https://www.aiaa.org/uploadedFiles/About-AIAA/Press_Room/Key_Speeches-Reports-and-Presentations/Smolen.pdf (accessed September 18, 2014).
24. Thomas Scheber, *Reliable Replacement Warheads: Perspectives and Issues*, United States Nuclear Strategy Forum Publication No. 0005 (Fairfax, VA: National Institute Press, 2007), p. 2, http://www.nipp.org/National%20Institute%20Press/Current%20Publications/PDF/RRW%20final%20with%20foreword%207.30.07.pdf (accessed September 17, 2014); Thomas D'Agostino, "Presented at the Woodrow Wilson International Center for Scholars—The Reliable Replacement Warhead Program," June 15, 2007, http://nnsa.energy.gov/mediaroom/speeches/06.15.2007 (accessed September 17, 2014).
25. National Institute for Public Policy, *The Comprehensive Test Ban Treaty: An Assessment of the Benefits, Costs, and Risks* (Fairfax, VA: National Institute Press, 2009), pp. 24–25, http://www.nipp.org/CTBT%203.11.11%20electronic%20version.pdf (accessed September 17, 2014).
26. U.S. Department of Energy, National Nuclear Security Administration, "Progress Update," https://www.performance.gov/content/maintain-and-modernize-us-nuclear-weapons-stockpile-and-dismantle-excess-nuclear-weapons-1?view=public#progressUpdate (accessed July 26, 2016).
27. Stephen M. Younger, *The Bomb: A New History* (New York: HarperCollins, 2009), p. 192.
28. Robert M. Gates, Speech at the Carnegie Endowment for International Peace, Washington, D.C., October 28, 2007, http://www.defenselink.mil/speeches/speech.aspx?speechid=1305 (accessed September 17, 2016); GlobalSecurity.org, "Robust Nuclear Earth Penetrator," http://www.globalsecurity.org/wmd/systems/rnep.htm (accessed September 17, 2014).
29. Robert W. Nelson, "What Does Reliability Mean?" in "If It Ain't Broke: The Already Reliable U.S. Nuclear Arsenal," Arms Control Association, April 1, 2006, http://www.armscontrol.org/print/2026 (accessed September 17, 2014).
30. For example, the U.S. lost contact with 50 intercontinental-range ballistic missiles in October 2010. For more information, see NTI Global Security Newswire, "Air Force Loses Contact With 50 ICBMs at Wyoming Base," October 27, 2010, http://www.nti.org/gsn/article/air-force-loses-contact-with-50-icbms-at-wyoming-base/ (accessed September 17, 2014).
31. Panel to Assess the Reliability, Safety, and Security of the United States Nuclear Stockpile, *Expectations for the U.S. Nuclear Stockpile Program: FY 2001 Report of the Panel to Assess the Reliability, Safety, and Security of the United States Nuclear Stockpile*, 2002, http://fas.org/programs/ssp/nukes/testing/fosterpnlrpt01.pdf (accessed September 17, 2014).
32. Statement of Admiral C. D. Haney, March 10, 2016.
33. Bradley A. Thayer and Thomas M. Skypek, "The Perilous Future of U.S. Strategic Forces," Petroleumworld`s Opinion Forum, May 2008, http://www.petroleumworld.com/sunopf09050301.htm (accessed September 17, 2014).
34. Sydney J. Freedberg, Jr., "Fading Solid Fuel Engine Biz Threatens Navy's Trident Missile," *Breaking Defense*, June 16, 2014, http://breakingdefense.com/2014/06/fading-solid-fuel-engine-biz-threatens-navys-trident-missile/ (accessed May 11, 2015).
35. U.S. Department of Defense, *Nuclear Posture Review Report*, April 2010, pp. xiv–xv.
36. Andrew C. Weber, Assistant Secretary of Defense for Nuclear, Chemical, and Biological Defense Programs, testimony in *Hearing to Receive Testimony on Nuclear Forces and Policies in Review of the Defense Authorization Request for Fiscal Year 2014 and the Future Years Defense Program*, Subcommittee on Strategic Forces, Committee on Armed Services, U.S. Senate, April 17, 2013, http://www.armed-services.senate.gov/imo/media/doc/13-22%20-%204-17-13.pdf (accessed September 17, 2014).
37. John S. Foster, Jr., "Nuclear Weapons and the New Triad," in conference proceedings, *Implementing the New Triad: Nuclear Security in Twenty-First Century Deterrence, Final Report*, Institute for Foreign Policy Analysis and International Security Studies Program of the Fletcher School, Tufts University, December 14–15, 2005, p. 69.

38. U.S. Department of Energy, National Nuclear Security Administration, *Prevent, Counter, and Respond—A Strategic Plan to Reduce Global Nuclear Threats, FY 2017–FY 2021*, March 2016, https://nnsa.energy.gov/sites/default/files/nnsa/inlinefiles/NPCR%20FINAL%203-31-16%20(with%20signatures).pdf (accessed July 26, 2016).
39. Robert G. Joseph, "Second to One," *National Review*, October 17, 2011, http://www.nationalreview.com/article/304310/second-one-robert-g-joseph (accessed May 22, 2015); Oleg Bukharin, "A Breakdown of Breakout: U.S. and Russian Warhead Production Capabilities," Arms Control Association, October 1, 2002, http://www.armscontrol.org/act/2002_10/bukharinoct02 (accessed May 22, 2015).
40. U.S. Department of Defense, *Nuclear Posture Review Report*, April 2010, p. 41.
41. U.S. Department of Energy, National Nuclear Security Administration, workforce data as of April 2, 2016, https://nnsa.energy.gov/sites/default/files/nnsa/multiplefiles/NNSA.pdf (accessed June 1, 2016).
42. Ibid.
43. U.K. House of Commons, Foreign Affairs Committee, *Global Security: UK–US Relations, Sixth Report of Session 2009–10* (London: The Stationery Office Limited, March 28, 2010), http://www.publications.parliament.uk/pa/cm200910/cmselect/cmfaff/114/114.pdf (accessed October 1, 2014).
44. Jonathan E. Medalia, "Comprehensive Nuclear-Test-Ban Treaty: Background and Current Developments," Congressional Research Service *Report for Members and Committees of Congress*, June 10, 2013, http://fas.org/sgp/crs/nuke/RL33548.pdf (accessed September 17, 2014).
45. National Research Council, *The Comprehensive Nuclear Test Ban Treaty: Technical Issues for the United States*, p. 30.
46. U.S. Department of Energy, National Nuclear Security Administration, Nevada Field Office, "Stockpile Stewardship Program," August 2013, http://www.nv.doe.gov/library/factsheets/DOENV_1017.pdf (accessed September 17, 2014).

Methodology

The assessment portion of the ***Index of U.S. Military Strength*** is composed of three major sections that address America's military power, the operating environments within or through which it must operate, and threats to U.S. vital national interests.

The authors of this study used a five-category scoring system that ranged from "very poor" to "excellent" or "very weak" to "very strong" as appropriate to each topic. This particular approach was selected to capture meaningful gradations while avoiding the appearance that a high level of precision was possible given the nature of the issues and the information that was publicly available.

Some factors are quantitative and lend themselves to discrete measurement; others are very qualitative in nature and can be assessed only through an informed understanding of the material that leads to a judgment call. Further, conditions in each of the areas assessed are changing throughout the year, so any measurement is based on the information at hand and must necessarily be viewed as a snapshot in time. While this is not entirely satisfactory when it comes to reaching conclusions on the status of a given matter, especially the adequacy of military power (and will be quite unsatisfactory for some readers), we understand that senior officials in decision-making positions will never have a comprehensive set of inarguable hard data on which to base a decision.

Purely quantitative measures alone tell only part of the story when it comes to the relevance, utility, and effectiveness of hard power. In fact, assessing military power or the nature of an operating environment using only quantitative metrics can lead to misinformed conclusions. Raw numbers are a very important component, but they tell only a part of the story of war. Similarly, experience and demonstrated proficiency are often decisive factors in war, but they are nearly impossible to measure.

This ***Index***'s assessment of the ***global operating environment*** focused on three key regions—Europe, the Middle East, and Asia—because of their importance relative to U.S. vital security interests.

For ***threats to U.S. vital interests***, the ***Index*** identifies the countries that pose the greatest current or potential threats to U.S. vital interests based on two overarching factors: their behavior and their capability. The classic definition of "threat" considers the combination of intent and capability, but intent cannot be clearly measured, so "observed behavior" is used as a reasonable surrogate since it is the clearest manifestation of intent. The selection of threat countries is based on their historical behavior and explicit policies or formal statements vis-à-vis U.S. interests, scoring them in two areas: the degree of provocative behavior that they exhibited during the year and their ability to pose a credible threat to U.S. interests irrespective of intent.

Finally, the ***status of U.S. military power*** is addressed in three areas: capability (or modernity), capacity, and readiness. All three are fundamental to success even if they are not de facto determinants of success, something we explain further in the section. Also addressed is the condition of the United States' nuclear

weapons capability, assessing it in areas that are unique to this military component and critical to understanding its real-world viability and effectiveness as a strategic deterrent.

Assessing the Global Operating Environment

Not all of the factors that characterize an operating environment are equal, but each contributes to the degree to which a particular operating environment is favorable or unfavorable to future U.S. military operations. Our assessment of the operating environment utilized a five-point scale, ranging from "very poor" to "excellent" conditions and covering four regional characteristics of greatest relevance to the conduct of military operations:

1. **Very Poor.** Significant hurdles exist for military operations. Physical infrastructure is insufficient or nonexistent, and the region is politically unstable. The U.S. military is poorly placed or absent, and alliances are nonexistent or diffuse.

2. **Unfavorable.** A challenging operating environment for military operations is marked by inadequate infrastructure, weak alliances, and recurring political instability. The U.S. military is inadequately placed in the region.

3. **Moderate.** A neutral to moderately favorable operating environment is characterized by adequate infrastructure, a moderate alliance structure, and acceptable levels of regional political stability. The U.S. military is adequately placed.

4. **Favorable.** A favorable operating environment includes good infrastructure, strong alliances, and a stable political environment. The U.S. military is well placed in the region for future operations.

5. **Excellent.** An extremely favorable operating environment includes well-established and well-maintained infrastructure; strong, capable allies; and a stable political environment. The U.S. military is exceptionally well placed to defend U.S. interests.

The key regional characteristics consisted of:

a. **Alliances.** Alliances are important for interoperability and collective defense as allies would be more likely to lend support to U.S. military operations. Various indicators provide insight into the strength or health of an alliance. These include whether the U.S. trains regularly with countries in the region, has good interoperability with the forces of an ally, and shares intelligence with nations in the region.

b. **Political Stability.** Political stability brings predictability for military planners when considering such things as transit, basing, and overflight rights for U.S. military operations. The overall degree of political stability indicates whether U.S. military actions would be hindered or enabled and considers, for example, whether transfers of power in the region are generally peaceful and whether there been any recent instances of political instability in the region.

c. **U.S. Military Positioning.** Having military forces based or equipment and supplies staged in a region greatly facilitates the ability of the United States to respond to crises and, presumably, achieve successes in critical "first battles" more quickly. Being routinely present in a region also assists in maintaining familiarity with its characteristics and the various actors that might try to assist or thwart U.S. actions. With this in mind, we assessed whether or not the U.S. military was well-positioned in the region. Again, indicators included bases, troop presence, prepositioned equipment, and recent examples of military operations

(including training and humanitarian) launched from the region.

d. **Infrastructure.** Modern, reliable, and suitable infrastructure is essential to military operations. Airfields, ports, rail lines, canals, and paved roads enable the U.S. to stage, launch operations from, and logistically sustain combat operations. We combined expert knowledge of regions with publicly available information on critical infrastructure to arrive at our overall assessment of this metric.

Assessing Threats to U.S. Vital Interests

To make the threats identified herein measurable and relatable to the challenges of operating environments and adequacy of American military power, ***Index*** staff and outside reviewers evaluated separately the threats according to their level of provocation (i.e., their observed behavior) and their actual capability to pose a credible threat to U.S. interests on a scale of 1 to 5, with 1 representing a very high threat capability or level of belligerency. This scale corresponds to the tone of the five-point scales used to score the operating environment and military capabilities in that 1 is bad for U.S. interests and 5 is very favorable.

Based on these evaluations, provocative behavior was characterized according to five descending categories: benign (5); assertive (4); testing (3); aggressive (2); and hostile (1). Staff also characterized the capabilities of a threat actor according to five categories: marginal (5); aspirational (4); capable (3); gathering (2); and formidable (1). Those characterizations—behavior and capability—form two halves of the overall threat level.

Assessing U.S. Military Power

Also assessed is the adequacy of the United States' defense posture as it pertains to a conventional understanding of "hard power," defined as the ability of American military forces to engage and defeat an enemy's forces in battle at a scale commensurate with the vital national interests of the U.S. The assessment draws on both quantitative and qualitative aspects of military forces, informed by an experience-based understanding of military operations and the expertise of the authors and internal and external reviewers.

It is important to note that military effectiveness is as much an art as it is a science. Specific military capabilities represented in weapons, platforms, and military units can be used individually to some effect. Practitioners of war, however, have learned that combining the tools of war in various ways and orchestrating their tactical employment in series or simultaneously can dramatically amplify the effectiveness of the force committed to battle.

The point is that a great number of factors make it possible for a military force to locate, close with, and destroy an enemy, but not many of them are easily measured. The scope of this specific project does not extend to analysis of everything that makes hard power possible; it focuses on the status of the hard power itself.

This ***Index*** assesses the state of military affairs for U.S. forces in three areas: capability, capacity, and readiness.

Capability. Capability is scored based on the current state of combat equipment. This involves four factors: the age of key platforms relative to their expected life span; whether the required capability is being met by legacy or modern equipment; the scope of improvement or replacement programs relative to the operational requirement; and the overall health and stability (financial and technological) of modernization programs.

This ***Index*** focused on primary combat units and combat platforms (e.g., tanks, ships, and airplanes) and elected not to include the array of system and component upgrades that keep an older platform viable over time, such as a new radar, missile, or communications suite. New technologies grafted onto aging platforms ensure that U.S. military forces keep pace with technological innovations relevant to the modern battlefield, but at some point, the platforms themselves are no longer viable and must be replaced. Modernized

sub-systems and components do not entirely substitute for aging platforms, and it is the platform itself that is usually the more challenging item to field. In this sense, primary combat platforms serve as representative measures of force modernity just as combat forces are a useful surrogate measure for the overall military that includes a range of support units, systems, and infrastructure.

In addition, it is assumed that modernization programs should replace current capacity at a one-to-one ratio; less than a one-to-one replacement assumes risk, because even if the newer system is presumably better than the older, until it is proven in actual combat, having fewer systems lessens the capacity of the force, which is an important factor if combat against a peer competitor carries with it the likelihood of attrition. For modernization programs, only Major Defense Acquisition Programs (MDAPs) are scored.

The capability score uses a five-grade scale. Each service receives one capability score that is a non-weighted aggregate of scores for four categories: (1) Age of Equipment, (2) Modernity of Capability, (3) Size of Modernization Program, and (4) Health of Modernization Program. General criteria for the capability categories are:

Age of Equipment

- **Very Weak:** Equipment age is past 80 percent of expected life span.
- **Weak:** Equipment age is 61 percent–80 percent of expected life span.
- **Marginal:** Equipment age is 41 percent–60 percent of expected life span.
- **Strong:** Equipment age is 21 percent–40 percent of expected life span.
- **Very Strong:** Equipment age is 20 percent or less of expected life span.

Capability of Equipment

- **Very Weak:** Majority (over 80 percent) of capability relies on legacy platforms.
- **Weak:** 60 percent–79 percent of capability relies on legacy platforms.
- **Marginal:** 40 percent–59 percent of capability is legacy platforms.
- **Strong:** 20 percent–39 percent of capability is legacy platforms.
- **Very Strong:** Less than 20 percent of capability is legacy platforms.

Size of Modernization Program

- **Very Weak:** Modernization program is significantly too small or inappropriate to sustain current capability or program in place.
- **Weak:** Modernization programs are smaller than current capability size.
- **Marginal:** Modernization programs are appropriate to sustain current capability size.
- **Strong:** Modernization programs will increase current capability size.
- **Very Strong:** Modernization programs will vastly expand capability size.

Health of Modernization Program

- **Very Weak:** Modernization programs facing significant problems; too far behind schedule (five-plus years); cannot replace current capability before retirement; lacking sufficient investment to advance; cost overruns including Nunn–McCurdy breach. (A Nunn–McCurdy breach occurs when the cost of a new item exceeds the most recently approved amount by 25 percent or more or if it exceeds the originally approved amount by 50 percent or more. See Title 10, U.S.C. § 2433, Unit Cost Reports (UCRs).)

- **Weak:** Facing procurement problems; behind schedule (three–five years); difficult to replace current equipment on time or insufficient funding; cost overruns enough to trigger an Acquisition Program Baseline (APB) breach.

- **Marginal:** Facing few problems; behind schedule by one–two years but can replace equipment with some delay or experienced some funding cuts; some cost growth but not within objectives.

- **Strong:** Facing no procurement problems; can replace equipment with no delays; within cost estimates.

- **Very Strong:** Performing better than DOD plans, including lower actual costs.

Capacity. To score capacity, the service's size (be it end strength or number of platforms) is compared to the force size required to meet a simultaneous or nearly simultaneous two-war or two–major regional contingency (MRC) benchmark. This benchmark consists of the force needed to fight and win two MRCs and a 20 percent margin that serves as a strategic reserve. A strategic reserve is necessary because deployment of 100 percent of the force at any one time is highly unlikely. Not only do ongoing requirements like training or sustainment and maintenance of equipment make it infeasible for the entirety of the force to be available for deployment, but committing 100 percent of the force would leave no resources available to handle unexpected situations.

Thus, a "marginal" capacity score would exactly meet a two-MRC force size, a "strong" capacity score would equate to a plus-10 percent margin for strategic reserve, and a "very strong" score would equate to a 20 percent margin.

Capacity Score Definitions

- **Very Weak:** 0 percent–37 percent of the two-MRC benchmark.

- **Weak:** 38 percent–74 percent of the two-MRC benchmark.

- **Marginal:** 75 percent–82 percent of the two-MRC benchmark.

- **Strong:** 83 percent–91 percent of the two-MRC benchmark.

- **Very Strong:** 92 percent–100 percent of the two-MRC benchmark.

Readiness. The readiness scores are from the military services' own assessments of readiness based on their requirements. These are not comprehensive reviews of all readiness input factors, but rather rely on the public statements of the military services regarding the state of their readiness.

It should be noted that even a "strong" or "very strong" score does not indicate that 100 percent of the force is ready; it simply indicates that the service is meeting 100 percent of its own readiness requirements. Often, these requirements assume that a percentage of the military at any one time will not be fit for deployment. Because of this, even if readiness is graded as "strong" or "marginal," there is still a gap in readiness that will have significant implications for immediate combat effectiveness and the ability to deploy quickly. Thus, anything short of meeting 100 percent of readiness requirements assumes risk and is therefore problematic.

Further, a service's assessment of its readiness occurs within its size or capacity at that time and as dictated by the Defense Strategic Guidance, National Military Strategy, and related top-level documents generated by the Administration and senior Defense officials. It does not account for the size-related "readiness" of the force to meet national security requirements assessed as needed by this ***Index***. Thus, for a service to be assessed as "very strong" would mean that 80 percent–100 percent of the existing force in a service meets that service's requirements for being "ready" even if the size of the service is less than that

required to meet the two-MRC benchmark. Therefore, it is important for the reader to keep this in mind when considering the actual readiness of the force to protect U.S. national security interests against the challenges presented by threats around the world.

Readiness Score Definitions

- **Very Weak:** 0 percent–19 percent of service's requirements.
- **Weak:** 20 percent–39 percent of service's requirements.
- **Marginal:** 40 percent–59 percent of service's requirements.
- **Strong:** 60 percent–79 percent of service's requirements.
- **Very Strong:** 80 percent–100 percent of service's requirements.

Glossary of Abbreviations

A

A2/AD	anti-access/area-denial
AAMDS	Aegis Ashore Missile Defense System
AAV	Amphibious Assault Vehicle
ABM	Ansar Bayt al-Maqdis
ACF	Army contingency force
ACV	Amphibious Combat Vehicle
ADIZ	Air Defense Identification Zone
AEHF	Advanced Extremely High Frequency (satellite system)
AEW	airborne early warning
AFAFRICA	U.S. Air Forces Africa
AFP	Armed Forces of the Philippines
AFRICOM	U.S. Africa Command
AFSOC	U.S. Air Force Special Operations Command
AIP	Air Independent Propulsion
AIT	American Institute in Taiwan
AMDR	Air and Missile Defense Radar
AMPV	Armored Multipurpose Vehicle
ANSF	Afghan National Security Forces
AN/TPY-2	Army Navy/Transportable Radar Surveillance
ANZUS	Australia–New Zealand–U.S. Security Treaty
AUSMIN	Australia–United States Ministerial
AOR	area of responsibility
APC	armored personnel carrier
APS	Army Prepositioned Stocks
AQAP	Al-Qaeda in the Arabian Peninsula
AQI	Al-Qaeda in Iraq
AQIM	Al-Qaeda in the Islamic Maghreb
ARG	amphibious ready group
ASBM	Anti-ship ballistic missile
ASEAN	Association of Southeast Asian Nations
ASW	anti-submarine warfare
ASUW	anti-surface warfare
AW	air warfare

B

BBA	Bipartisan Budget Act of 2015
BCA	Budget Control Act of 2011
BCT	brigade combat team
BDCA	border defense cooperation agreement
BJP	Bharatiya Janata Party
BMD	ballistic missile defense
BUR	Bottom-Up Review
BVR	beyond visual recognition

C

C2	command and control
C4ISR	command, control, communications, computers, intelligence, surveillance, and reconnaissance
CA	civil affairs
CAB	combat aviation brigade
CBO	Congressional Budget Office
CCT	Combat Controller
CELAC	Community of Latin American and Caribbean States
CENTCOM	U.S. Central Command
CFC	Combined Forces Command (South Korea–U.S.)
CIA	Central Intelligence Agency
CJTF-HOA	Combined Joint Task Force–Horn of Africa
CLF	Combat Logistics Force
CMRR	Chemistry and Metallurgy Research Replacement
CMT	combat mission team
COCOM	Combatant Command
CONUS	continental United States
CPMIEC	China Precision Machinery Import–Export Corporation
CPT	Cyber Protection Team
CSF	coalition support funds
CSG	carrier strike group
CSO	Critical Skills Operator
CT	counterterrorism
CTC	Combat Training Centers
CTF	Combined Task Force
CTIC	Counter Terrorism Information Center
CVN	Aircraft Carriers

CVW	carrier air wing
CW	chemical warfare
CYBERCOM	U.S. Cyber Command

D

D2D	deployment-to-dwell
DA-KKV	direct-ascent kinetic-kill vehicle
DDPR	Deterrence and Defense Posture Review
DIME	diplomatic, informational, military, and economic
DMZ	demilitarized zone
DNI	Director of National Intelligence
DOD	U.S. Department of Defense
DOE	U.S. Department of Energy
DOS	denial of service
DDOS	distributed denial of service
DPRK	Democratic People's Republic of Korea (North Korea)
DTTI	Defense Trade and Technology Initiative
DSG	Defense Strategic Guidance
DSR	Defense Strategic Review

E

EAS	European Activity Set
EBO	effects-based operations
ECP	engineering change proposal
EDCA	Enhanced Defense Cooperation Agreement
EEZ	exclusive economic zone
EFV	Expeditionary Fighting Vehicle
EOD	explosive ordinance disposal
EMD	engineering and manufacturing development
EMP	electromagnetic pulse
ERI	European Reassurance Initiative
ESG	Expeditionary Strike Group
EUCOM	U.S. European Command
EW	electronic warfare

F

FATA	Federally Administered Tribal Areas
FCS	Future Combat Systems
FOC	full operational capability
FONOPS	freedom of navigation exercises
FTA	free trade agreement

G

GAO	Government Accountability Office (formerly General Accounting Office)
GATOR	Ground/Air Task Oriented Radar
GCC	geographic combatant commander
GCC	Gulf Cooperation Council
GCV	Ground Combat Vehicle
GDP	Gross Domestic Product
GFMAP	Global Force Management Allocation Plan
GEO	geosynchronous orbit
GPF	general purpose forces
GPS	Global Positioning System

H

HA/DR	humanitarian assistance/disaster relief
HEO	highly elliptical orbit
HMMWV	High Mobility Multipurpose Wheeled Vehicle (“HUMVEE”)
HVE	homegrown violent extremist

I

ICBM	intercontinental ballistic missile
ICS	industrial control systems
IDF	Israel Defense Forces
IED	Improvised Explosive Device
IFV	infantry fighting vehicle
IMF	International Monetary Fund
INEW	Integrated Network Electronic Warfare
INF	Intermediate-Range Nuclear Forces (treaty)
IOC	initial operating capability

IRGC	Islamic Revolutionary Guard Corps
ISAF	International Security Assistance Force
ISIL	Islamic State of Iraq and the Levant
ISIS	Islamic State of Iraq and Syria
ISR	intelligence, surveillance, and reconnaissance

J

JOAC	Joint Operational Access Concept
JeM	Jaish-e-Mohammed
JP	joint publication
JSF	Joint Strike Fighter (F-35 Lightning II)
JSOC	Joint Special Operations Command
JSTAR	Joint Surveillance and Target Attack Radar System
JLTV	Joint Light Tactical Vehicle
JTF North	Joint Task Force North
JuD	Jamaat-ud-Dawa

K

KATUSA	Korean Augmentees to the United States Army

L

LAC	Line of Actual Control
LAF	Lebanese Armed Forces
LAV	Light Armored Vehicle
LCAC	Landing Craft Air Cushion Vehicle
LCS	Littoral Combat Ship
LeT	Lashkar-e-Taiba
LHA	landing helicopter assault (amphibious ship)
LHD	landing helicopter dock (amphibious ship)
LNG	liquefied natural gas
LoC	Line of Control
LPD	landing platform/dock or amphibious transport dock (amphibious ship)
LRA	Lord's Resistance Army
LRS-B	Long-Range Strike Bomber
LRIP	Low-Rate Initial Production
LSD	landing ship, dock (amphibious ship)

M

MAGTF	Marine Air-Ground Task Force
MANPADS	man-portable air-defense systems
MARCENT	U.S. Marine Corps Forces Central Command
MARFORAF	U.S. Marine Corps Forces Africa
MARFOREUR	U.S. Marine Corps Forces Europe and Africa
MARFORPAC	U.S. Marine Corps Forces, Pacific
MARSOC	U.S. Marine Corps Special Operations Command
MCM	mine countermeasure (ship)
MCO	major combat operation (see MRC, MTW)
MCMV	mine countermeasure vessel (ship)
MDAP	Major Defense Acquisition Program
MEB	Marine Expeditionary Brigade
MEF	Marine Expeditionary Force
MISO	Military Information Special Operations
MNLA	National Movement for the Liberation of Azawad
MNLF	Moro National Liberation Front
MNNA	major non-NATO ally
MOJWA	Movement for Oneness and Jihad in West Africa
MPC	Marine Personnel Carrier
MPS	Maritime Prepositioning Ships
MRC	major regional conflict (see MTW, MCO)
MRAP	Mine-Resistant Ambush-Protected (vehicle)
MRBM	medium-range ballistic missile
MRF	Marine Rotational Force
MTW	major theater war (see MCO, MRC)

N

NAP	National Action Plan
NATO	North Atlantic Treaty Organization
NAVAF	U.S. Naval Forces Africa
NAVEUR	U.S. Naval Forces Europe
NDN	Northern Distribution Network
NDAA	National Defense Authorization Act
NDP	National Defense Panel
New START	New Strategic Arms Reduction Treaty
NNSA	National Nuclear Security Administration

NPR	Nuclear Posture Review
NPRIS	Nuclear Posture Review Implementation Study
NSC	National Security Council
NSR	Northern Sea Route
NSWC	Naval Special Warfare Command

O

OAS	Organization of American States
OCO	overseas contingency operations
OEF	Operation Enduring Freedom
OIF	Operation Iraqi Freedom
O-FRP	Optimized Fleet Response Plan
ONA	Office of Net Assessment
ONE	Operation Noble Eagle
OPCON	operational control
OPLAN	operational plan
OPTEMPO	operational tempo
OSCE	Organization for Security and Co-operation In Europe

P

PACAF	U.S. Pacific Air Forces
PACFLT	U.S. Pacific Fleet
PACOM	U.S. Pacific Command
PAF	Philippine Air Force
PDD-15	Presidential Decision Directive-15
PIM	Paladin Integrated Management
PLFP	Popular Front for the Liberation of Palestine
PLFP-GC	Popular Front for the Liberation of Palestine–General Command
PKO	peacekeeping operation
PLA	People's Liberation Army
PLAAF	People's Liberation Army Air Force
PLAN	People's Liberation Army Navy
PLO	Palestine Liberation Organization
PNI	Presidential Nuclear Initiative
PNT	positioning, navigation, and timing
PRC	People's Republic of China

PRT	Provisional Reconstruction Team
PSA	Port of Singapore Authority
PSF	Peninsula Shield Force

Q

QDR	Quadrennial Defense Review
QNSTR	Quadrennial National Security Threats and Trends

R

RAF	Royal Air Force
RBA	Ready Basic Aircraft
RCOH	refueling and complex overhaul (nuclear-powered ship)
RDJTF	Rapid Deployment Joint Task Force
RFP	Request for Proposals
RMA	revolution In military affairs
ROK	Republic of Korea (South Korea)
RP	Republic of the Philippines

S

SAARC	South Asia Association of Regional Cooperation
SAM	surface-to-air missile
SAR	search and rescue
SBIRS	Space-Based Infrared System (satellite system)
SCN	Shipbuilding and Conversion, Navy (budget category)
SEAL	Sea Air Land operator (Navy)
SEATO	Southeast Asia Treaty Organization
SFA	Strategic Framework Agreement
SIGINT	signals intelligence
SLBM	submarine-launched ballistic missile
SMU	special mission unit
SOCAFRICA	U.S. Special Operations Command Africa
SOCCENT	U.S. Special Operations Command Central
SOCEUR	U.S. Special Operations Command Europe
SOCPAC	U.S. Special Operations Command Pacific
SOF	U.S. Special Operations Forces
SOP	Standard Operating Procedure

SORT	Strategic Offensive Reductions Treaty
SOTFE	Support Operations Task Force Europe
SPE	Sony Pictures Entertainment
SPMAGTF	Special-Purpose Marine Air–Ground Task Force–Crisis Response–Africa
SRBM	short-range ballistic missile
SSBN	ballistic missile submarine, nuclear-powered
SSGN	guided missile submarine, nuclear-powered
SSN	attack submarine, nuclear-powered
SSP	Stockpile Stewardship Program
STRATCOM	U.S. Strategic Command
SUW	surface warfare

T

TACAIR	tactical air
TAI	total active inventory
TANAP	Trans-Anatolian Natural Gas Pipeline
TAP	Trans-Adriatic Pipeline
TCO	transnational criminal organization
TPP	Trans-Pacific Partnership
TTP	Tehrik-e-Taliban Pakistan
TLAM/N	Tomahawk Land Attack Missile/Nuclear
TMP	technical modernization program
TNW	tactical nuclear weapon
TRA	Taiwan Relations Act
TRANSCOM	U.S. Transportation Command
TSOC	Theater Special Operations Command

U

UAV	unmanned aerial vehicle
UAE	United Arab Emirates
UCLASS	Unmanned Carrier-Launched Airborne Surveillance and Strike
UNASUR	Unión de Naciones Suramericanas (Union of South American Nations)
UNC	United Nations Council
USAF	U.S. Air Force
USAFCENT	U.S. Air Forces Central
USAFE	U.S. Air Forces Europe
USARAF	U.S. Army Africa

USARCENT	U.S. Army Central
USARPAC	U.S. Army Pacific
USAREUR	U.S. Army Europe
USASOC	U.S. Army Special Operations Command
USFJ	U.S. Forces Japan
USFK	U.S. Forces Korea
USNAVCENT	U.S. Naval Forces Central
USNORTHCOM	U.S. Northern Command
USSOCOM	U.S. Special Operations Command
USSOUTHCOM	U.S. Southern Command
USW	undersea warfare

V

VEO	violent extremist organizations
VLS	vertical launching system

W

WGS	Wideband Global SATCOM (satellite system)
WMD	weapons of mass destruction
WRM	wartime readiness materials
WWTA	Worldwide Threat Assessment

Appendix:
Military Capabilities and Corresponding Modernization Program

ARMY SCORES

1 2 3 4 5
Weakest ⟷ Strongest

Procurement and Spending ■ Through FY 2016 ■ Pending

Main Battle Tank

PLATFORM	Age Score	Capability Score	MODERNIZATION PROGRAM	Size Score	Health Score
M1A1/2 Abrams Inventory: **2,384** Fleet age: **5.5** Date: **1980** The Abrams is the main battle tank used by the Army in its armored brigade combat teams (BCTs). The Abrams went through a remanufacture program to extend its life to 2045.	5	5	None		

Infantry Fighting Vehicle

PLATFORM	Age Score	Capability Score	MODERNIZATION PROGRAM	Size Score	Health Score
M2 Bradley Inventory: **6,547** Fleet age: **11** Date: **1981** The Bradley is a tracked infantry fighting vehicle (IFV) meant to transport infantry and provide covering fire. The Bradley complements the Abrams tank in armored BCTs. Originally intended to be replaced by the Ground Combat Vehicle (now canceled), the Bradley underwent a remanufacture program to extend the life of the platform. The Army plans to keep the Bradley in service until 2045.	4	1	Ground Combat Vehicle (GCV) was cancelled. Concept design contracts were awarded in May 2015 for a Future Fighting Vehicle.		

Armored Fighting Vehicle

PLATFORM	Age Score	Capability Score	MODERNIZATION PROGRAM	Size Score	Health Score
Stryker Inventory: **3,604** Fleet age: **10** Date: **2002** The Stryker is a wheeled armored fighting vehicle that makes up the Stryker BCTs. The program was considered an interim vehicle to serve until the arrival of the Future Combat System (FCS), but that program was cancelled due to technology and cost hurdles. The Stryker is undergoing modifications to receive a double-v hull (DVH) to increase survivability. The Stryker is expected to remain in service for 30 years.	4	3	None		

See Methodology for descriptions of scores. Fleet age—Average age of fleet Date—Year fleet first entered service

ARMY SCORES

1 2 3 4 5
Weakest ⟷ Strongest

Procurement and Spending ■ Through FY 2016 ■ Pending

Armored Personnel Carrier

PLATFORM	Age Score	Capability Score	MODERNIZATION PROGRAM	Size Score	Health Score
M113 Armored Personnel Carrier Inventory: **3,000** Fleet age: **17** Date: **1960** The M113 is a tracked APC that plays a supporting role for armored BCTs and infantry BCTs. The APC was also to be replaced by the GCV. Plans are to use the platforms to 2045.	4	1	**Armored Multi-Purpose Vehicle (AMPV)** Timeline: **2018–2035** The AMPV will be adapted from an existing vehicle design that allowed the program to bypass the technology development phase. An engineering and manufacturing development contract was awarded to BAE Systems for the integration and assembly of 29 prototype vehicles. IOC is not expected until 2022.	2	5

PROCUREMENT
2,897

SPENDING *($ millions)*
$381 $13,461

Light Wheeled Vehicle

PLATFORM	Age Score	Capability Score	MODERNIZATION PROGRAM	Size Score	Health Score
HMMWV Inventory: **150,000** Fleet age: **21** Date: **1985** The HMMWV is a light wheeled vehicle used to transport troops under some level of protection. The expected life span of the HMMWV is 15 years. Some HMMWVs will be replaced by the Joint Light Tactical Vehicle (JLTV).	1	1	**Joint Light Tactical Vehicle (JLTV)** Timeline: **2015–2035** Currently in development, the JLTV is a vehicle program meant to replace some of the HMMWVs and improve reliability and survivability of vehicles. So far, the program has experienced a one-year delay due to changes in vehicle requirements. This is a joint program with USMC. Low rate initial production was awarded to a single contractor in August 2015.	1	4

PROCUREMENT
1,021 48,078

SPENDING *($ millions)*
$901 $21,186

See Methodology for descriptions of scores. Fleet age—Average age of fleet Date—Year fleet first entered service

ARMY SCORES

1 2 3 4 5
Weakest ⟷ Strongest

Procurement and Spending ■ Through FY 2016 ■ Pending

Attack Helicopter

PLATFORM	Age Score	Capability Score	MODERNIZATION PROGRAM	Size Score	Health Score
AH-64 A-D Apache Inventory: **600** Fleet age: **15** Date: **1984** The Apache is an attack helicopter that makes up the Army Combat Aviation Brigades. There are currently two variants, the AH-64A and AH-64D. The AH-64A is being retired. AH-64D makes up 82 percent of the inventory and entered service in 1998. The expected life cycle is about 20 years.	2	1	**AH-64E Reman** Timeline: **2010–2024** The AH-64E Reman is a program to remanufacture old Apache helicopters into the more advanced AH-64E version. The AH-64E will have more modern and interoperable systems and be able to carry modern munitions. The overwhelming majority of AH-64Es will be from remanufacture. **PROCUREMENT** 235 399 **SPENDING** *($ millions)* $6,580 $8,017	2	4
AH-64E Inventory: **130** Fleet age: **2** Date: **2013** The AH-64E variant of the Apache is a remanufactured version with substantial upgrades in powerplant, avionics, communications, and weapons capabilities. The expected life cycle is about 20 years.	5		**AH-64E New Build** Timeline: **2013–2026** The AH-64E New Build pays for the production of new Apaches. The program is meant to modernize and sustain the current Apache inventory. The AH-64E will have more modern and interoperable systems and be able to carry modern munitions. Very few AH-64Es are being built compared with the remanufactured variant. **PROCUREMENT** 17 46 **SPENDING** *($ millions)* $539 $1,984	2	4

Medium Lift

PLATFORM	Age Score	Capability Score	MODERNIZATION PROGRAM	Size Score	Health Score
UH-60A Black Hawk Inventory: **802** Fleet age: **24** Date: **1979** The Black Hawk UH-60A is a medium-lift utility helicopter. The expected life span is about 25 years. This variant of the Black Hawk is now being replaced by the newer UH-60M variant.	1	3	**UH-60M Black Hawk** Timeline: **2005–2026** Currently in production, the purchases of the UH-60Ms are intended to modernize and replace current Black Hawk inventories. The newer M variant will improve the Black Hawk's range and lift by upgrading the rotor blades, engine, and computers. **PROCUREMENT** 873 494 **SPENDING** *($ millions)* $15,844 $10,817	5	4
UH/HH-60M Black Hawk Inventory: **700** Fleet age: **9** Date: **2006** The Black Hawk UH-60M is a medium-lift utility helicopter that is a follow-on to the UH-60A. As the UH-60A is retired, the M variant will be the main medium-lift rotorcraft used by the Army. Expected to remain in service until 2030.	4				

See Methodology for descriptions of scores. Fleet age—Average age of fleet Date—Year fleet first entered service

ARMY SCORES

1 2 3 4 5
Weakest ⟷ Strongest

Procurement and Spending ■ Through FY 2016 ■ Pending

Heavy Lift

PLATFORM	Age Score	Capability Score	MODERNIZATION PROGRAM	Size Score	Health Score
CH-47D Chinook Inventory: **75** Fleet age: **27** Date: **1962** The Chinook is a heavy-lift helicopter. It has an expected life cycle of 20 years. The CH-47Ds were originally upgraded from earlier variants of the CH-47s.	1	5	**CH-47F** Timeline: **2003–2018** Currently in production, the CH-47F program is intended to keep the fleet of heavy-lift rotorcraft healthy as older variants of the CH-47 are retired. The program includes both remanufactured and new builds of CH-47s. The F variant has engine and airframe upgrades to lower the maintenance requirements. Total procurement numbers include the MH-47G configuration for U.S. Special Operations Command (67 total). **PROCUREMENT** 512 31 **SPENDING** *($ millions)* $13,966 $908	5	4
CH-47F Chinook Inventory: **325** Fleet age: **4.4** Date: **2001** CH-47F is "a remanufactured version of the CH-47D with a new digital cockpit and modified airframe to reduce vibrations." It also includes a common aviation architecture cockpit and advanced cargo-handling capabilities. The expected life span is 35 years.	5				

Intelligence, Surveillance, and Reconnaissance (ISR)

PLATFORM	Age Score	Capability Score	MODERNIZATION PROGRAM	Size Score	Health Score
MQ-1C Gray Eagle Inventory: **90** Fleet age: **3** Date: **2009** The Gray Eagle is a medium-altitude long-endurance (MALE) UAV used to conduct ISR missions. The use of MALE UAVs is a new capability for the Army. The Gray Eagle is currently in production.	5	5	**MQ-1C Gray Eagle** Timeline: **2010–2016** The MQ-1C UAV provides Army reconnaissance, surveillance, and target acquisition capabilities. Procurement of the MQ-1C program is complete. The Army approved an additional 15 aircraft in FY 2016. **PROCUREMENT** 167 **SPENDING** *($ millions)* $4,963 $159	5	4

SOURCE: Heritage Foundation research using data from government documents and websites. See also Dakota L. Wood, ed., *2016 Index of U.S. Military Strength* (Washington, DC: The Heritage Foundation, 2016), http://index.heritage.org/militarystrength/.

See Methodology for descriptions of scores. Fleet age—Average age of fleet Date—Year fleet first entered service

NAVY SCORES

1 2 3 4 5
Weakest ⟷ Strongest

Procurement and Spending ■ Through FY 2016 ■ Pending

Aircraft Carrier

PLATFORM	Age Score	Capability Score	MODERNIZATION PROGRAM	Size Score	Health Score
***Nimitz*-Class Aircraft Carrier (CVN-68)** Inventory: **10** Fleet age: **24.5** Date: **1975** The expected life of the *Nimitz*-class nuclear aircraft carrier is 50 years. The class will start retiring in the mid-2020s and will be replaced by the *Ford*-class carriers.	3	1	***Ford*-Class Aircraft Carrier (CVN-78)** Timeline: **2008–2018** Currently in production, the *Ford*-class will replace the current *Nimitz*-class aircraft carriers. The acquisition program has had some delays due to development issues. The delivery of the first *Ford*-class was delayed a year, causing the carrier fleet to drop to 10. The program has also experienced significant growth in lead ship procurement costs. The *Ford*-class will increase aircraft sorties by 25 percent, require a crew of several hundred fewer sailors, and be able to handle more advanced weapon systems. **PROCUREMENT** 2 1 **SPENDING** *($ millions)* $25,721 $18,101	1	2

Large Surface Combatant

PLATFORM	Age Score	Capability Score	MODERNIZATION PROGRAM	Size Score	Health Score
***Ticonderoga*-Class Cruiser (CG-47)** Inventory: **20** Fleet age: **25.2** Date: **1983** The *Ticonderoga*-class guided missile cruiser has a life expectancy of 35 years. There are plans to lay up half of the cruiser fleet to modernize it and extend its life into the 2030s. Two cruisers began modernization in FY 2015. There are no replacements currently planned.	2	4	***Zumwalt*-Class Destroyer (DDG-1000)** Timeline: **2007–2009** The DDG-1000 was designed to be a new-generation destroyer capable of handling more advanced weapon systems with modern gun systems and a hull design aimed to reduce radar detectability. The DDG-1000 program was intended to produce a total of 32 ships, but this number has been reduced to three, essentially ending the acquisition program. The first DDG-1000 is expected to be commissioned in Fall 2016. **PROCUREMENT** 3 **SPENDING** *($ millions)* $21,471 $928	1	1
***Arleigh Burke*-Class Destroyer (DDG-51)** Inventory: **62** Fleet age: **14.4** Date: **1991** The *Arleigh Burke*-class guided missile destroyer is the only operating class of large surface combatant currently in production. The DDG-51 has a 35-year life expectancy.	3		***Arleigh Burke*-Class Destroyer (DDG-51)** Timeline: **1985–2022** The DDG-51 has been procured since 1985 but was restarted in FY 2013 to make up for the reduction in DDG-1000 acquisitions. Future DDG-51s will be upgraded to a Flight III design, which will include the Advanced Missile Defense Radar (AMDR), a more capable missile defense radar. The DDG-51 will make up the bulk of the Navy's large surface combatant requirement of 88. **PROCUREMENT** 74 12 **SPENDING** *($ millions)* $83,303 $23,544	4	4

See Methodology for descriptions of scores. Fleet age—Average age of fleet Date—Year fleet first entered service

NAVY SCORES

1 2 3 4 5
Weakest ⟷ Strongest

Procurement and Spending ■ Through FY 2016 ■ Pending

Small Surface Combatant

PLATFORM	Age Score	Capability Score	MODERNIZATION PROGRAM	Size Score	Health Score
Littoral Combat Ship (LCS) Inventory: **6** Fleet age: **4.6** Date: **2008** The Littoral Combat Ship includes two classes: the *Independence*-class and the *Freedom*-class, both of which are in the early phases of production. The ship is expected to have a service life of 25 years. The LCS is designed to meet multiple missions and make up the entirety of the small surface combatant requirement. LCS 7 will be commissioned in October 2016.	5	2	**Littoral Combat Ship (LCS)** Timeline: **2009–2025** The LCS program is in the early stages of production. The LCS is intended to fulfill the mine countermeasure, antisubmarine warfare, and surface warfare roles for the Navy. It will be the only small surface combatant in the fleet once the Navy's frigates and MCM ships retire in the coming years. The program is facing controversy due to cost growth, development issues, and requirements issues for survivability and strike. A modified LCS classified as a frigate was announced to fill out the remaining 20-ship small surface combatant requirement in late 2014. **PROCUREMENT** 26 14 **SPENDING** *($ millions)* $15,254 $18,236	2	1
***Avenger*-Class Mine Counter Measure (MCM-1)** Inventory: **11** Fleet age: **23.4** Date: **1987** Designed for mine sweeping and hunting/killing, 11 of the 14 *Avenger*-class ships built are still active. The class has a 30-year life span. The remaining MCMs are expected to be decommissioned throughout the 2020s. There is no replacement in production for this class of ship, but the Navy plans to fill its mine countermeasure role with the LCS.	2				

SSGN Cruise Missile Submarine

PLATFORM	Age Score	Capability Score	MODERNIZATION PROGRAM	Size Score	Health Score
***Ohio*-Class (SSGN-726)** Inventory: **4** Fleet age: **30.4** Date: **1981** Rather than retiring the four oldest *Ohio*-class ballistic missile submarines early, the Navy converted them to SSGN-726 guided missile submarines, equipping them with conventional Tomahawk cruise missiles rather than Trident ballistic missiles tipped with nuclear warheads. The SSGNs provide the Navy with a large stealthy strike capability. The conversion began in 2002 and was completed in 2007. Since the conversion, they are expected to be retired in the late 2020s. The Navy has no planned replacement for the SSGNs once they retire.	2	1	None		

See Methodology for descriptions of scores. Fleet age—Average age of fleet Date—Year fleet first entered service

NAVY SCORES

1 2 3 4 5
Weakest ⟷ Strongest

Procurement and Spending ■ Through FY 2016 ■ Pending

Attack Submarines

PLATFORM	Age Score	Capability Score
Seawolf-Class (SSN-21) Inventory: **3** Fleet age: **15.4** Date: **1997** Larger and equipped with more torpedo tubes than the U.S. Navy's other current nuclear-powered attack submarines, the class was cancelled after three submarines were purchased due to budget constraints in the 1990s. The *Seawolf*-class submarines are expected to be retired in 14 years. Meant to replace the *Los Angeles*-class, the *Seawolf* has been replaced by the *Virginia*-class attack submarine.	3	2
Los Angeles-Class (SSN-688) Inventory: **36** Fleet age: **26** Date: **1976** The *Los Angeles*-class comprises the largest portion of the Navy's attack submarine fleet. The class has a 30-year service life. Of the 62 built, 25 have been decommissioned and one was converted into a moored training ship. The last *Los Angeles*-class submarine is expected to retire in the late 2020s. The *Virginia*-class is replacing this submarine class.	1	
Virginia-Class (SSN-774) Inventory: **12** Fleet age: **6** Date: **2004** The *Virginia*-class is the U.S. Navy's next-generation attack submarine. The life expectancy of the *Virginia*-class is 33 years. The *Virginia*-class is in production and will replace the *Los Angeles*-class and *Seawolf*-class attack submarines as they are decommissioned.	5	

MODERNIZATION PROGRAM	Size Score	Health Score
Virginia-Class (SSN-774) Timeline: **1998–2021** The *Virginia*-class is on a production schedule of two per year. The program has been mostly successful. However, the current program of record purchases 33 total submarines, which is not enough to replace the decommissioning *Los Angeles*-class submarines and will create a shortfall in attack submarines. There are reportedly plans to restructure the program to increase the number of submarines in the SSN-774 class to 48.	2	4

PROCUREMENT

SPENDING *($ millions)*

See Methodology for descriptions of scores. Fleet age—Average age of fleet Date—Year fleet first entered service

NAVY SCORES

1 2 3 4 5
Weakest ⟷ Strongest

Procurement and Spending Through FY 2016 / Pending

SSBN Ballistic Missile Submarine

PLATFORM	Age Score	Capability Score	MODERNIZATION PROGRAM	Size Score	Health Score
***Ohio*-Class (SSBN)** Inventory: **14** Fleet age: **24.9** Date: **1984** The SSBN *Ohio*-class is one of the three legs of the U.S. military's nuclear triad. The *Ohio*-class's expected service life is 42 years. The *Ohio*-class fleet will begin retiring in 2027 at an estimated rate of one submarine per year until 2039. The Navy plans to replace the *Ohio*-class with the SSBN(X) or next-generation "Ohio replacement program."	3	1	N/A—SSBN(X) not yet a Major Defense Acquisition Program (MDAP)		

Amphibious Warfare Ship

PLATFORM	Age Score	Capability Score	MODERNIZATION PROGRAM	Size Score	Health Score
***Wasp*-Class Amphibious Assault Ship (LHD-1)** Inventory: **8** Fleet age: **18.6** Date: **1989** The *Wasp*-class is the Navy's current amphibious landing helicopter deck, meant to replace the *Tarawa*-class LHA. This ship has a 35-year life span. This class is no longer in production and will be replaced by the new *America*-class.	3	1	***America*-class (LHA-6)** Timeline: **2007–2017** The *America*-class is in production with two LHA-6s already procured. There has been significant cost growth in this program resulting in a Nunn–McCurdy cost breach. The program is also experiencing a 19-month delay because of design problems. One problem was caused by the level of heat from the F-35B STOVL's exhaust. The LHA-7 will follow designs from the LHA-6; however, the third and final LHA-6 is being redesigned to include a well deck that was removed to increase aviation support spaces. The requirements for this last ship have not yet been completed. **PROCUREMENT** 2 1 **SPENDING** *($ millions)* $7,398 $3,429	1	1
***America*-Class Amphibious Assault Ship (LHA-6)** Inventory: **1** Fleet age: **1.2** Date: **2014** The *America*-class, the Navy's new class of large-deck amphibious assault ships, is meant to replace the retiring *Wasp*-class LHDs. The lead ship was delivered in April 2014. The *America*-class is designed to accommodate the Marine Corps's F-35Bs.	5				

See Methodology for descriptions of scores. Fleet age—Average age of fleet Date—Year fleet first entered service

Amphibious Warfare Ship

PLATFORM	Age Score	Capability Score	MODERNIZATION PROGRAM	Size Score	Health Score
San Antonio-Class Amphibious Transport Dock (LPD-17) Inventory: **9** Fleet age: **5.6** Date: **2006** The *San Antonio*-class is the replacement for the *Austin*-class LPD and makes up most of the LPD inventory. The LPDs have well decks that allow the USMC to transfer the vehicles and supplies carried by the ship to the shore via landing craft. The LPD can also carry four CH-46s or two MV-22s. The class has a 40-year life expectancy.	5		**_San Antonio_-Class Amphibious Transport Dock (LPD-17)** Timeline: **1996–2016** The LPD-17s are replacements for the *San Antonio*-class LPDs. All 12 LPD-17s have been procured. **PROCUREMENT** 12 **SPENDING** *($ millions)* $20,567 $145	5	4
Whidbey Island-Class Dock Landing Ship (LSD-41) Inventory: **8** Fleet age: **26.8** Date: **1985** The *Whidbey Island*-class is a dock landing ship, which transports Marine Corps units, equipment, and supplies for amphibious operations through use of its large stowage and well decks. The *Whidbey Island*-class and *Harpers Ferry*-class ships are to be replaced by the LX(R) program, which is in early developmental stages.	3	3			
Harpers Ferry-Class Dock Landing Ships (LSD-49) Inventory: **4** Fleet age: **19.6** Date: **1995** A follow-on to the *Whidbey Island*-class, the *Harpers Ferry*-class LSDs have a larger well deck with more space for vehicle stowage and landing craft. Like the *Whidbey Island*-class, these ships should remain in service until 2038. The *Whidbey Island*-class and *Harpers Ferry*-class ships are planned to be replaced by the LX(R) program, which is in early developmental stages.	3		N/A—LX(R) not yet a Major Defense Acquisition Program (MDAP)		

See Methodology for descriptions of scores. Fleet age—Average age of fleet Date—Year fleet first entered service

NAVY SCORES

1 2 3 4 5
Weakest ⟷ Strongest

Procurement and Spending ■ Through FY 2016 ■ Pending

Airborne Early Warning

PLATFORM	Age Score	Capability Score	MODERNIZATION PROGRAM	Size Score	Health Score
E-2C Hawkeye Inventory: **57** Fleet age: **31** Date: **1964** The E-2C Hawkeye is a battle management and airborne early warning aircraft. While still operational, the E-2C is nearing the end of its service life and is being replaced by the E-2D Advanced Hawkeye. The E-2C fleet received a series of upgrades to mechanical and computer systems around the year 2000.	1	2	**E-2D Advanced Hawkeye** Timeline: **2009–2024** Meant to replace the E-2C, the E-2D Hawkeye is in production. The original plan was to purchase five per year until 2023. DOD plans to make up for the cut in FY 2017 by purchasing six units. **PROCUREMENT** 40 / 35 **SPENDING** *($ millions)* $12,498 / $9,391	5	4
E-2D Advanced Hawkeye Inventory: **19** Fleet age: **3.5** Date: **2013** A more advanced version of the E-2C, the E-2D provides improved battle management capabilities. The program recently started production.	5				

Electronic Attack Aircraft

PLATFORM	Age Score	Capability Score	MODERNIZATION PROGRAM	Size Score	Health Score
EA-18G Growler Inventory: **114** Fleet age: **3** Date: **2010** The EA-18G electronic warfare aircraft replaced the legacy EA-6B Prowlers. The platform is still in production and is relatively new.	5	5	**EA-18G Growler** Timeline: **2006–2016** The EA-18G Growler has been in production for several years, with few current acquisition problems. The program total of 160 is an increase from previous years, which estimated the Navy would purchase 88. All 160 have been procured. **PROCUREMENT** 160 **SPENDING** *($ millions)* $15,115 / $558	5	4

See Methodology for descriptions of scores. Fleet age—Average age of fleet Date—Year fleet first entered service

NAVY SCORES

1 2 3 4 5
Weakest ⟷ Strongest

Procurement and Spending ■ Through FY 2016 ■ Pending

Fighter/Attack Aircraft

PLATFORM	Age Score	Capability Score	MODERNIZATION PROGRAM	Size Score	Health Score
F/A-18 A-D Hornet Inventory: **328** Fleet age: **24.5** Date: **1983** The F/A-18 is the Navy's older carrier-based fighter and strike attack aircraft. The Navy has been trying to extend the life of the later variants (C-D) from 6,000 flight hours to potentially 10,000. However, some are being retired and eventually will be replaced by the F/A-18 E/F Super Hornet and F-35C variant.	1	3	**F-35C Joint Strike Fighter** Timeline: **2009–2033** The F-35C is the Navy's variant of the Joint Strike Fighter. The Joint Strike Fighter has faced many issues during its developmental stages, including engine problems, software development delays, cost overruns incurring a Nunn–McCurdy breach, and structural problems. The F-35C variant was always scheduled to be the last one to reach initial operational capability (IOC). Like the other variants, the IOC date was pushed back three years from March 2015 to late 2018. **PROCUREMENT** 65 195 **SPENDING** *($ millions)* $111,219 $267,823	1	1
F/A-18 E/F Super Hornet Inventory: **550** Fleet age: **13.4** Date: **2001** The F/A-18 E/F Super Hornet is a newer, more capable version of the Hornet. The Navy is aiming to have a combination of Super Hornets and F-35Cs make up their carrier-based strike capability. The F/A-18E-F has an expected service life of 20 years.	2				

NOTES: The total program dollar value reflects the full F–35 joint program, including engine procurement. The Navy is also procuring 67 F-35Cs for the Marine Corps. Age of fleet is calculated from date of commissioning to January 2016.
SOURCE: Heritage Foundation research using data from government documents and websites. See also Dakota L. Wood, ed., *2016 Index of U.S. Military Strength* (Washington, DC: The Heritage Foundation, 2016), http://index.heritage.org/militarystrength/.

See Methodology for descriptions of scores. Fleet age—Average age of fleet Date—Year fleet first entered service

Strategic Bomber

PLATFORM	Age Score	Capability Score	MODERNIZATION PROGRAM	Size Score	Health Score
B–52 Inventory: **58** Fleet age: **52.7** Date: **1955** The B-52, the oldest of the bombers, can provide global strike capabilities with conventional or nuclear payloads, although it largely has made up the core of the strategic bomber force. The aircraft entered service in 1955 and was in production until 1962.	1		None		
B–1 Inventory: **61** Fleet age: **28** Date: **1986** The B-1, originally designed to carry nuclear weapons, was reconfigured for conventional weapons in the early 1990s. The program entered service in 1986 and completed production in 1988. The B-1B will remain in service until 2040.	3	1			
B–2 Inventory: **20** Fleet age: **21.1** Date: **1997** The B-2 bomber provides the USAF with global strike capabilities. It can carry both nuclear and conventional payloads. Initially deployed in 1997, the aircraft communication modules are being upgraded. It is expected to remain in service until 2058.	4				

See Methodology for descriptions of scores. Fleet age—Average age of fleet Date—Year fleet first entered service

AIR FORCE SCORES

1 2 3 4 5
Weakest ⟷ Strongest

Procurement and Spending ■ Through FY 2016 ■ Pending

Ground Attack Aircraft

PLATFORM	Age Score	Capability Score	MODERNIZATION PROGRAM	Size Score	Health Score
A-10 Thunderbolt II Inventory: **143** Fleet age: **33** Date: **1977** The A-10 is the only USAF platform designed primarily for close air support and does so with a variety of conventional munitions. The USAF has proposed retiring the aircraft earlier than the planned 2028 date for budget reasons.	2	1	**F-35A** Timeline: **2007–2038** The F-35A is the Air Force variant of the Joint Strike Fighter program, a multirole fixed-wing aircraft. It is currently in early stages of production. The program has faced many issues including a Nunn–McCurdy cost breach during development, grounding due to engine problems, and software development problems. The F-35A achieved IOC on August 2, 2016. **PROCUREMENT** 178 1,585 **SPENDING** *($ millions)* $111,219 $267,823	5	1
F-16 Inventory: **570** Fleet age: **24.9** Date: **1978** The F-16 is a multirole aircraft that was built between 1976 and 1999. It has received various upgrade blocks over that time. The aircraft was expected to last about 30 years.	1	1			
F-35A Inventory: **102** Fleet age: **1.9** Date: **2016** See Ground Attack Modernization Program entry. The USAF has received a small portion of a projected 1,763 total aircraft for the program.	5				

Fighter Aircraft

PLATFORM	Age Score	Capability Score	MODERNIZATION PROGRAM	Size Score	Health Score
F-15 Inventory: **317** Fleet age: **27.7** Date: **1979** The F-15 is a legacy fighter that performs air superiority missions. It is no longer in production. The newer F-15E Strike Eagle variant is to operate until 2025 to supplement the F-22.	2	2	None		
F-22 Inventory: **165** Fleet age: **7.9** Date: **2005** The F-22 is the preeminent air superiority fighter aircraft. The stealth aircraft completed production in 2009 after a dramatic cut of its overall order from 750 to 187. It is currently being modified.	5				

See Methodology for descriptions of scores. Fleet age—Average age of fleet Date—Year fleet first entered service

AIR FORCE SCORES

1 2 3 4 5
Weakest ⟷ Strongest

Procurement and Spending ■ Through FY 2016 ■ Pending

Tanker

PLATFORM	Age Score	Capability Score	MODERNIZATION PROGRAM	Size Score	Health Score
KC-10 Inventory: **59** Fleet age: **30.6** Date: **1981** An aerial refueling tanker supporting the USAF's Mobility and Lift mission, the KC-10 was deployed in 1981. The aircraft was purchased to increase the number of tankers available, which the Air Force posited did not meet current requirements. The aircraft is no longer in production but is planned to remain in inventory until 2040.	3	1	**KC-46** Timeline: **2015–2027** The KC-46 is meant to replace the KC-135. The program entered low rate initial production in August 2016 after having been delayed by a year due to "design changes and late parts." This is a top program for the Air Force and has an aggressive development and test schedule that may be problematic. **PROCUREMENT** 23 / 156 **SPENDING** *($ millions)* $10,311 / $37,901	1	3
KC-135 Inventory: **156** Fleet age: **54** Date: **1956** The KC-135 supports the mobility and lift mission by providing the joint force aerial refueling capability. The KC-135 makes up the bulk of the aerial refueling capability. The aircraft was initially deployed in 1956, completing production in 1965. The aircraft has undergone several modifications, mainly engine upgrades to improve reliability. It is expected to be in service until 2040, but excessive usage has created many reliability issues due to problems from wear and tear, such as corrosion and fuel bladder leaks.	2				

Heavy Lift

PLATFORM	Age Score	Capability Score	MODERNIZATION PROGRAM	Size Score	Health Score
C-5 Inventory: **36** Fleet age: **35.5** Date: **1970** The C-5 is the USAF's largest mobility and lift aircraft, enabling it to transport a greater amount of cargo (270,000 pounds) compared with other transport aircraft. Originally deployed in 1970, the aircraft has undergone three modification cycles. The latest started in 2009 to upgrade the platform to a C-5M. The modification program is currently ongoing. The aircraft will remain in service until the 2030s.	3	2	**C-5 RERP** Timeline: **2008–2014** This program is modernizing the C-5 to improve "reliability, maintainability, and availability." The C-5 is having its engine replaced with the new F138. The new engine experienced several issues that are in the process of being mitigated. **PROCUREMENT** 52 **SPENDING** *($ millions)* $7,067	3	4

See Methodology for descriptions of scores. Fleet age—Average age of fleet Date—Year fleet first entered service

AIR FORCE SCORES

1 2 3 4 5
Weakest ⟷ Strongest

Procurement and Spending ■ Through FY 2016 ■ Pending

Heavy Lift

PLATFORM	Age Score	Capability Score	MODERNIZATION PROGRAM	Size Score	Health Score
C–17 Inventory: **170** Fleet age: **12** Date: **1993** The C-17 is a large fixed-wing transport aircraft in support of USAF's mobility and lift mission. The aircraft can lift 170,900 pounds and land on short runways. The aircraft entered service in 1995. The program was expanded from 120 aircraft to 223 aircraft. The procurement program for the C-17 was recently completed. The aircraft was originally planned to last 30 years, but more frequent usage may shorten that life span.	3	5	None		

Medium Lift

PLATFORM	Age Score	Capability Score	MODERNIZATION PROGRAM	Size Score	Health Score
C–130 H/J Inventory: **98** Fleet age: **22.9** Date: **1956** The family of C-130 aircraft supports the USAF's tactical mobility and lift capability. Unlike the other transport aircraft, the C-130 can land on rough dirt strips. It can carry about 42,000 pounds and is expected to last 25 years.	1	5	**C–130J** Timeline: **1994–2023** The program provides the Air Force with an upgraded medium-lift capability. The C-130J can lift over 40,000 pounds of cargo. The frame supports various other types of aircraft, such as the USMC tanker KC-130J. There are few issues with the current acquisition of C-130Js. **PROCUREMENT** 151 / 18 **SPENDING** *($ millions)* $12,288 / $3,797	4	3

See Methodology for descriptions of scores. Fleet age—Average age of fleet Date—Year fleet first entered service

Intelligence, Surveillance, and Reconnaissance (ISR)

PLATFORM	Age Score	Capability Score	MODERNIZATION PROGRAM	Size Score	Health Score
RQ-4 Global Hawk Inventory: **33** Fleet age: **5** Date: **2011** The RQ-4 is an unmanned aerial vehicle (UAV) that supports the USAF's ISR mission. Unlike the MQ-1 or MQ-9, the RQ-4 is a high-altitude, long-endurance (HALE) UAV, which in addition to higher altitude has a longer range than medium-altitude, long-endurance (MALE) UAVs. Originally deployed in 2011, the new Block 40 version is being procured. The life expectancy of the Global Hawk is 20 years.	5	3	**RQ-4** Timeline: **2002–2012** This program consists of Block 20, 30, and 40 RQ-4 UAVs. This program had a Nunn–McCurdy breach in 2010. The DOD proposed ending investment in the RQ-4 Block 30 but was rejected by Congress. The program procured 45 platforms, a reduction from 63. Block 40 (latest configuration) is still in development. **PROCUREMENT** 45 **SPENDING** *($ millions)* $8,133 / $996	4	1
MQ-1 Predator Inventory: **110** Fleet age: **8.4** Date: **2005** The MQ-1 Predator is a MALE UAV that supports the USAF's ISR mission. The MQ-1 is being replaced by the newer MQ-9. The expected life span of the MQ-1 is 20 years.	3		**MQ-9** Timeline: **2002–2017** The MQ-9 is in production. It has experienced delays due to manufacturing and testing problems. The program was reduced from 391 to 346 aircraft. **PROCUREMENT** 323 / 24 **SPENDING** *($ millions)* $7,811 / $4,204	5	3
MQ-9 A/B Inventory: **194** Fleet age: **5.1** Date: **2007** The MQ-9 Reaper is the replacement for the MQ-1 Predator, to fulfill the USAF's ISR mission. The UAV is in production. The expected life span of the MQ-1 is 20 years.	5				
RC-135 Rivet Joint Inventory: **22** Fleet age: **52** Date: **1964** The RC-135 is a manned ISR aircraft. It was originally fielded in 1964. The Air Force plans to keep the system in service until 2018.	1		None		
U-2 Inventory: **27** Fleet age: **32.6** Date: **1956** Initially deployed in 1956, this manned ISR aircraft can operate at high altitudes and long ranges. The U-2 has undergone a series of modification programs since 1967 to extend the life of the aircraft.	4				

See Methodology for descriptions of scores. Fleet age—Average age of fleet Date—Year fleet first entered service

AIR FORCE SCORES

1 2 3 4 5
Weakest ⟷ Strongest

Procurement and Spending ■ Through FY 2016 ■ Pending

Command and Control

PLATFORM	Age Score	Capability Score	MODERNIZATION PROGRAM	Size Score	Health Score
E-3 AWACS Inventory: **31** Fleet age: **37.1** Date: **1978** The E-3 is an airborne warning and control system (AWACS) that provides USAF with command and control and battle management capabilities. The aircraft entered service in 1978. No longer in production, the current inventory is undergoing modifications to upgrade computing systems. The fleet is currently intended to remain in service until 2025.	1	2	None		
E-8 JSTARS Inventory: **16** Fleet age: **14.7** Date: **1997** The E-8 is a newer command and control aircraft that provides battle management and C4ISR capabilities, mainly by providing ground surveillance to various air and ground commanders in theater. The aircraft first entered service in 1997 and is not currently in production. The Air Force plans to retire the JSTARs in the early 2030s.	3				

See Methodology for descriptions of scores. Fleet age—Average age of fleet Date—Year fleet first entered service

AIR FORCE SCORES

1 2 3 4 5
Weakest ⟷ Strongest

Procurement and Spending ■ Through FY 2016 ■ Pending

Space Superiority

PLATFORM	Age Score	Capability Score	MODERNIZATION PROGRAM	Size Score	Health Score
Global Positioning System (GPS) Inventory: **32** Fleet age: **30.6** Date: **1990** GPS satellites are part of USAF's air and space superiority mission and provide the joint force with navigation data. The GPS constellation was completed in 1995. It is currently being updated by the follow-on GPS III. These satellites have an average life span of 7.5 years, although the newest Block IIF has a 12–year life span.	1	3	**GPS III** Timeline: **2012–2014** GPS III is a more advanced GPS satellite to replace the legacy systems. It is expected to start launches in 2016. Technical issues during development led to a two-year delay. **PROCUREMENT** 8 **SPENDING** *($ millions)* $4,796 $761	5	3
Spaced-Based Infrared System (SBIRS) Inventory: **n/a** Fleet age: **n/a** Date: **2010** The SBIRS satellite system, part of air and space superiority mission, provides early missile warning for missile defense and battlespace awareness purposes.	5	3	**SBIRS High** Timeline: **2009–2013** The SBIRS High constellation is a multipurpose program that will fulfill the requirements not only of ballistic missile defense, but also of other general defense needs, such as space surveillance and battlefield awareness. The program is in production and struggling with recurring cost overruns. The program should be completed by 2019. **PROCUREMENT** 4 **SPENDING** *($ millions)* $15,213 $1,994	5	2

NOTE: The total program dollar value reflects the full F–35 joint program, including engine procurement.
SOURCE: Heritage Foundation research using data from government documents and websites. See also Dakota L. Wood, ed., *2016 Index of U.S. Military Strength* (Washington, DC: The Heritage Foundation, 2016), http://index.heritage.org/militarystrength/.

See Methodology for descriptions of scores. Fleet age—Average age of fleet Date—Year fleet first entered service

MARINE CORPS SCORES

1 2 3 4 5
Weakest ⟷ Strongest

Procurement and Spending ■ Through FY 2016 ■ Pending

Main Battle Tank

PLATFORM	Age Score	Capability Score	MODERNIZATION PROGRAM	Size Score	Health Score
M1A1 Abrams Inventory: **445** Fleet age: **26** Date: **1989** The M1A1 Abrams Main Battle Tank provides the Marine Corps with heavy-armor direct fire capabilities. It is expected to remain in service beyond 2028.	2	1	None		

Light Wheeled Vehicle

PLATFORM	Age Score	Capability Score	MODERNIZATION PROGRAM	Size Score	Health Score
HMMWV Inventory: **24,000** Fleet age: **21** Date: **1985** The HMMWV is a light wheeled vehicle used to transport troops with some measure of protection against light arms, blast, and fragmentation. The expected life span of the HMMWV is 15 years. Some HMMWVs will be replaced by the Joint Light Tactical Vehicle (JLTV).	1	1	**Joint Light Tactical Vehicle (JLTV)** Timeline: **2015–2022** Currently in development, the JLTV is a vehicle program meant to replace some of the HMMWVs and improve reliability, survivability, and strategic and operational transportability. So far, the program has experienced a one-year delay due to changes in vehicle requirements. This is a joint program with the Army. Both services will enter the final year of low rate initial production in 2017. **PROCUREMENT** 130 5,370 **SPENDING** *($ millions)* $387 $2,166	1	4

See Methodology for descriptions of scores. Fleet age—Average age of fleet Date—Year fleet first entered service

MARINE CORPS SCORES

1 2 3 4 5
Weakest ⟷ Strongest

Procurement and Spending ■ Through FY 2016 ■ Pending

Amphibious Assault Vehicle

PLATFORM	Age Score	Capability Score	MODERNIZATION PROGRAM	Size Score	Health Score
AAV-7A1 Inventory: **1,311** Fleet age: **40** Date: **1972** The Amphibious Assault Vehicle transports troops and cargo from ship to shore. The AAV-7 has been through a service life extension to extend its expected life to 42 years.	1	1	**Amphibious Combat Vehicle (ACV)** Timeline: **n/a** The Amphibious Combat Vehicle is now a major defense acquisition program. The ACV is intended to replace the aging AAV. The program has entered the engineering and manufacturing development stage. **PROCUREMENT** 694 **SPENDING** *($ millions)* $271 $1,769	2	n/a
LAV-25 Inventory: **252** Fleet age: **24** Date: **1983** The LAV is a wheeled light armor vehicle with modest amphibious capability used for armored reconnaissance and highly mobile fire support. It has undergone several service life extensions to expand its life span to 42 years and will be in service until 2035.	3	1			

Attack Helicopters

PLATFORM	Age Score	Capability Score	MODERNIZATION PROGRAM	Size Score	Health Score
AH-1W Cobra Inventory: **112** Fleet age: **24** Date: **1986** The Super Cobra is an attack helicopter that provides the Marines with close air support and armed reconnaissance. The Super Cobra will remain in service until 2021, when it will be replaced with the AH-1Z.	1	2	**AH-1Z** Timeline: **2004–2020** The new AH-1Z Viper program is part of a larger modification program to the H-1 platform. The new H-1 rotorcraft will have upgraded avionics, rotor blades, transmissions, landing gear, and structural modifications to enhance speed, maneuverability, and payload. The AH-1Z started out as a remanufacture program, but that was later changed to a New Build program because of concerns over existing airframes. While costs have increased, the program has not met the APB breach threshold. **PROCUREMENT** 95 94 **SPENDING** *($ millions)* $9,800 $2,626	5	3
AH-1Z Viper Inventory: **47** Fleet age: **3** Date: **2010** The AH-1Z Viper is the follow-on to the AH-1W Cobra attack helicopter. The Viper will have greater speed, payload, and range, as well as a more advanced cockpit. It is expected that the AH-1Z will fully replace the AH-1W Cobra in 2021. The expected operational life span of the Viper is 30 years.	5				

See Methodology for descriptions of scores. Fleet age—Average age of fleet Date—Year fleet first entered service

Airborne Electronic Attack Aircraft/ Ground Attack Aircraft

PLATFORM	Age Score	Capability Score
EA-6B Inventory: **18** Fleet age: **27** Date: **1971** The Prowler provides the USMC with an electronic warfare capability. It will be retired in 2019 and will be replaced by the F-35B.	1	1
AV-8B Inventory: **131** Fleet age: **18** Date: **1985** The Harrier is a vertical/short takeoff and landing aircraft designed to fly from LHA/LHDs. It provides strike and reconnaissance capabilities. The aircraft will be retired around 2024.	2	
F-35B Inventory: **39** Fleet age: **1** Date: **2015** The F-35B is the Marine Corps' short takeoff and vertical landing variant meant to replace the AV-8B Harrier. Despite some development problems, the F-35B achieved IOC in July 2015.	5	
F/A-18 A-D Inventory: **247** Fleet age: **23.5** Date: **1978** Many aircraft in the F/A-18 fleet have logged about 8,000 hours compared with the originally intended 6,000. The fleet life has been extended until 2030. This is necessary to bridge the gap to when the F-35Bs and F-35Cs are available.	2	

MODERNIZATION PROGRAM	Size Score	Health Score
F-35B/C Timeline: **2008–2033** The Corps is purchasing 353 F-35Bs and 67 F-35Cs. The F-35B is the USMC version of the Joint Strike Fighter program. It is meant to replace the AV-8B Harrier, completing transition by 2030. The Joint Strike Fighter has had many development issues, including a Nunn–McCurdy cost breach and major development issues. The F-35B in particular has had software development problems and engine problems that led to grounding. The Marine Corps announced IOC of its second F-35B squadron in June 2016. The F-35C will not reach IOC until 2018. **PROCUREMENT** 107 313 **SPENDING** *($ millions)* $111,219 $267,823	3	1

See Methodology for descriptions of scores. Fleet age—Average age of fleet Date—Year fleet first entered service

MARINE CORPS SCORES

1 2 3 4 5
Weakest ⟷ Strongest

Procurement and Spending ■ Through FY 2016 ■ Pending

Medium Lift

PLATFORM	Age Score	Capability Score	MODERNIZATION PROGRAM	Size Score	Health Score
MV-22 Inventory: **269** Fleet age: **5** Date: **2007** The Osprey is a vertical takeoff and landing tilt-rotor platform designed to support expeditionary assault, cargo lift, and raid operations. The program is still in production. The program life expectancy of the MV-22 is 23 years.	5	5	**MV-22B** Timeline: **1997–2031** The Osprey is in production, and the platform is meeting performance requirements. The modernization program is not facing any serious issues. Procurement figures include 48 Navy MV-22s and 50 of the carrier variant CV-22s. **PROCUREMENT** 372 / 86 **SPENDING** *($ millions)* $44,886 / $10,977	4	3

Heavy Lift

PLATFORM	Age Score	Capability Score	MODERNIZATION PROGRAM	Size Score	Health Score
CH-53E Super Stallion Inventory: **139** Fleet age: **26** Date: **1981** The CH-53E is a heavy-lift rotorcraft. The aircraft will be replaced by the CH-53K, which will have a greater lift capacity. The program life of the CH-53E is 41 years.	2	1	**CH-53K** Timeline: **2017–2028** The program is in development. It is meant to replace the CH-53E and provide increased range, survivability, and payload. The program still has not fully developed the critical technology necessary. The program is experiencing delays and cost growth. **PROCUREMENT** All 194 pending **SPENDING** *($ millions)* $5,469 / $23,734	5	3

Tanker

PLATFORM	Age Score	Capability Score	MODERNIZATION PROGRAM	Size Score	Health Score
KC-130J Inventory: **45** Fleet age: **8** Date: **2004** The KC-130J is both a tanker and a transport aircraft. It can transport troops, provide imagery reconnaissance, and perform tactical aerial refueling. This platform is currently in production. The airframe is expected to last 38 years.	4	5	**KC-130J** Timeline: **1997–2028** The KC-130J is both a tanker and a transport aircraft. The procurement program for the KC-130J is not facing acquisition problems, but the original procurement quantity for FY 2014 was reduced from two to one; only one was procured in FY 2015 as well. **PROCUREMENT** 55 / 49 **SPENDING** *($ millions)* $4,314 / $5,478	4	3

NOTES: The total program dollar value reflects the full F–35 joint program, including engine procurement. As part of the F–35 program, the Navy is purchaing 67 F-35Cs for the U.S. Marine Corps, which are included here. The MV-22B program also includes some costs from the U.S. Air Force procurement. The AH–1Z costs include costs of UH–1 procurement.
SOURCE: Heritage Foundation research using data from government documents and websites. See also Dakota L. Wood, ed., *2016 Index of U.S. Military Strength* (Washington, DC: The Heritage Foundation, 2016), http://index.heritage.org/militarystrength/.

See Methodology for descriptions of scores. Fleet age—Average age of fleet Date—Year fleet first entered service

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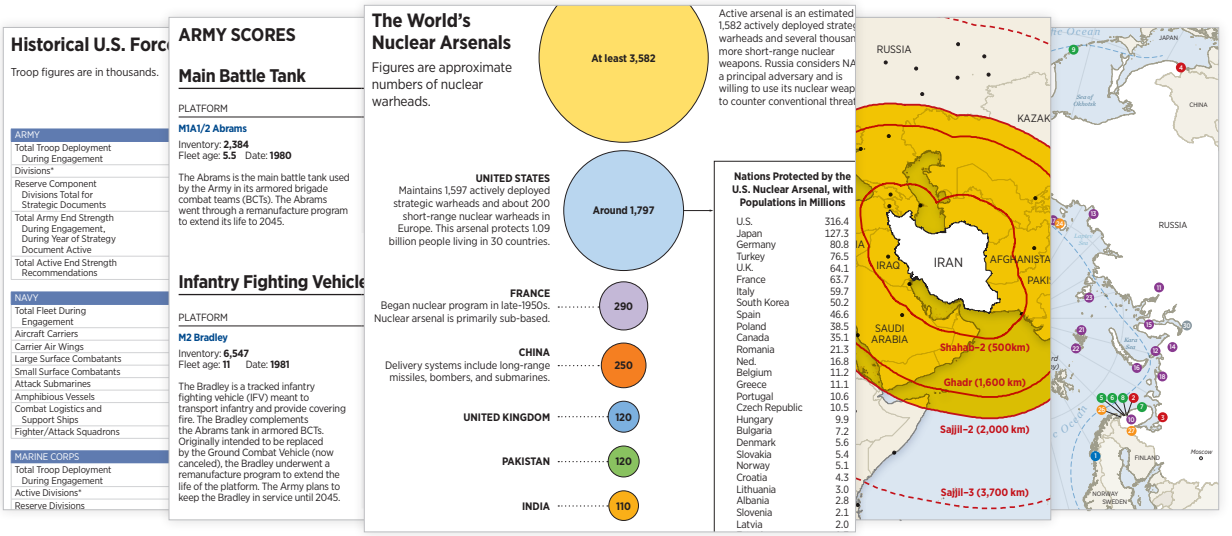

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