

# Strategy Research Project

## Recommendations for the Future of the F-35 Joint Strike Fighter

by

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United States Army War College  
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## **Abstract**

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This monograph examines the investment the United States has made into the F-35 Joint Strike Fighter program. The paper will analyze the potential long term effects the procurement of this aircraft will have on the United States' ability to effectively implement its military power in an effort to act in its own national interests. A series of recommendations that includes the curtailment of the program, investment in viable commercial-off-the-shelf alternatives, and re-initiation of the Joint Capabilities Integration Development System (JCIDS) capability gap analysis process will be advanced. This work will suggest the path that senior government leaders should take in regards to this program in an effort to mitigate the shortfalls this aircraft's acquisition has generated.



## **Recommendations for the Future of the F-35 Joint Strike Fighter**

The Lockheed Martin F-35 Lightning II is an impressive technological achievement and has the potential to be a paradigm changing platform in the realm of airpower. It is touted to not only dominate in the air domain, but also enhance cross-domain synergy in the contested land, sea, and cyber domains through its complex data fusion capabilities. Although these capabilities themselves sound like enough to make a case for the F-35, the platform also boasts advanced stealth technology and all the advances of the latest generation of manned fighter aircraft. The aircraft is intended to be able to penetrate the most contested environments to deliver its cross-domain effects in support of the Joint Force Commander.

While these are desirable characteristics of our newest front-line fighters, the roll out of the F-35 has been anything but successful. The F-35 is the most expensive military program in history and the glaring problems with the program have had significant impacts on the military capability of the Department of Defense (DoD).<sup>1</sup> This monograph will examine these impacts in an effort to analyze their long term effects on the U.S. ability to effectively implement its military power in an effort to act in its own national interests. A series of recommendations will be advanced that suggest the path that senior government leaders should take in regards to this program in an effort to mitigate the shortfalls this aircraft's acquisition has generated.

### **Background**

The Joint Strike Fighter (JSF) program was originally conceived in 1994 as a U.S. government effort to replace its fleet of legacy fighter platforms with an aircraft able to penetrate the most contested operating areas in what is referred to as an anti-

access/area denial environment (A2/AD).<sup>2</sup> Anti-access refers to adversary capability that denies the ability of coalition forces to deploy to a theater of operations and area denial refers to the capability of a hostile force to deny coalition forces freedom of action and the ability to maneuver within the area of operations.<sup>3</sup> While the F-22 Raptor would replace the F-15C Eagle in the U.S. Air Force inventory, what would come to be known as the F-35 would replace fighter and attack aircraft across the joint services. For the Air Force, the F-35 would replace the A-10 Thunderbolt II attack aircraft and the F-16 Fighting Falcon multi-role fighter. In the Navy, it would replace the F/A-18 A/C Hornet, and for the Marines, the F-35 would replace the F/A-18 A/B/C/D fighter/attack jet and the aging AV-8B Harrier, the short take-off and vertical landing (STOVL) aircraft designed to provide the Marine Corps with an integrated airpower element for their well-regarded expeditionary force structure.<sup>4</sup> Originally, the F-35 was supposed to achieve initial operational capability (IOC) in March 2012 with the Marines with normal production rates to supply the joint force with this new combat aircraft starting soon after.<sup>5</sup>

To achieve this IOC date, the DoD and the JSF program proposed a testing and fielding “concurrency” concept for this new platform.<sup>6</sup> The objective of this paradigm was to expedite the fielding of aircraft to the warfighter through a concurrent production and testing phase. The assumed basis for success of this framework was that the developments of such advanced technologies that make the F-35 such a capable platform on paper were low risk efforts and easily translated into manufacturing and operations. The concept was intended for prototype aircraft to come off the production line, go through initial developmental flight worthiness testing, and conclude with

operational testing for combat certification. In theory, this plan is extremely efficient because it changes what is normally serial progression (one in which one step must be completed before the next can begin) into a parallel construct in which multiple processes can be completed simultaneously, thus vastly increasing efficiency. However, the concurrent paradigm has a very limited tolerance for setbacks. Nearly from the beginning, the JSF program was faced with real-world developmental issues and the program faltered. These issues set off cascading effects on the aircraft's fielding timeline that has not only left the joint services and our multinational partners without a capable replacement for their legacy fleets, the delays have driven the cost of this system well beyond the original pricing forecasts estimated prior to program start.

The JSF program is comprised of three different variants of the aircraft, the F-35A, the U.S. Air Force variant, the F-35B for the Marines, and the F-35C for the U.S. Navy. While commonality between 70 to 90 percent of the parts for these aircraft is publicized as a cost savings measure, in reality, the three variants are essentially three different aircraft with commonality in parts estimated only to be between 27 to 43 percent.<sup>7</sup> Some of the major differences between the Air Force and Navy models include the larger airframe size of the Navy F-35C to be able to withstand the force of carrier landings, incorporation of a tail hook for arrested landings, and extra fuel capacity for sea-based operations. The F-35B is an aircraft all its own as the U.S. Marines demanded STOVL capability as part of their JSF requirements which in turn necessitated a complex propulsion system highlighted by an internal ducted fan system and a vectored rear nozzle assembly that gives the aircraft the capability of short take-offs and vertical landings. Another significant difference between the F-35B and the F-

35 A/C is that the Marine variant has no internal gun system based on the lack of physical space due to the special STOVL requirements.

Although the Marine variant is the most mechanically complex model of the F-35, the Marines have set an aggressive 2015 IOC date for their platform. The Marine Corps is taking both operational risk by fielding Block 2B software, a version that gives the F-35 only 88 percent of the code required for full combat capability, and developmental risk by assuming that there will be no subsequent structural design flaws that will set the program back further.<sup>8</sup> Similarly, the Air Force is forecasting an IOC date in late 2016 with software Block 3i, which provides a marginally better 89 percent software code completion.<sup>9</sup> The Navy will accept the least risk as it is forecasting IOC of the F-35C for early 2019 with the full-rate production software, Block 3F.<sup>10</sup> Although the preponderance of Marine attack aviation rests with conventional fixed wing fighters in the F/A-18 A/B/C/D Hornet variants, the sense of urgency for the service can be tied to the need to replace the high sustainment and maintenance cost AV-8B. Further adding to their resolve is the Marine cultural paranoia that not fielding the F-35B would create an existential threat to the Marine Corps because it could no longer claim it was the only self-contained, combined-arms expeditionary maneuver force in the DoD.<sup>11</sup> In the minds of some Marines, the reliance on only a conventional fixed wing aircraft fleet would raise the oft heard question of “Why does the Navy’s army need its own air force?”, a question the service would prefer left un-asked because of the likely follow-up question of “why does the U.S. need two armies?”

The primary reason for both the Marines and the Air Force declaring initial operational capability early is driven by politics rather than by actual combat capability

as IOC for the Marines means only one squadron of 10 F-35s and for the Air Force one squadron of 12 F-35s with less than 90 percent of the combat capability of the advertised production aircraft. The likelihood of these initial squadrons seeing any type of combat is extremely low so the IOC milestone itself is a hollow operational achievement as the services will still heavily depend on their legacy fleets of aircraft until sufficient quantities of fully capable F-35s come off the production line. The political nature of IOC declaration is the most important aspect of this milestone as it gives service chiefs ammunition to provide to the Congressional appropriations committees for continued support and funding of the program. The delays and over-reaching capabilities goals of this program have ultimately led to soaring costs that the U.S. government has estimated will cost well over \$1 trillion over the life of the aircraft.<sup>12</sup> The production costs alone for the U.S. inventory of approximately 2,400 F-35s approaches \$391 billion.<sup>13</sup>

If not citing the explicit need for technologies to counter future A2/AD environments, F-35 proponents will rightly make the case that the U.S. legacy fleet of aircraft is aging and has a limited capacity for modernization and sustainment. They will also argue that there are no other options to the F-35 for the U.S. military. In a 2011 speech, Secretary of the Air Force Michael Donley stated, "With a fighter fleet now averaging 22 years old and with two decades of declining fighter force structure, modernizing our aging and smaller fighter force depends on the fifth generation capabilities of the Joint Strike Fighter. Simply put, there is no alternative to the F-35 program. It must succeed."<sup>14</sup> As will be detailed later, statements such as these are simply not accurate.

The massive size of the F-35 program puts the enterprise on a unique level that has not been seen in the U.S. Because of the extraordinary cost and scope of the F-35 program, this procurement effort has created a harmful wake of effects on the U.S. ability to implement its instrument of military power. Critics will immediately dismiss the notion that a weapons procurement program could affect a great power's ability to employ its spectrum of power, but this paper will examine some of the aspects under which the F-35 deleteriously influenced our national power.

### The F-35 is Not the Solution the Joint Services Need

The development of the F-35 comes at a unique time in American history that witnesses the U.S. in a weakened economic position that is a result of a catastrophic domestic housing crisis, an ensuing world-wide recession, and as of October 2013, a \$17.075 trillion debt.<sup>15</sup> As a measure to get the U.S. financial house in order, the Department of Defense has been forced to scale back both personnel and procurement programs across the joint services. The Army and Marines have been impacted primarily through personnel cuts, the Navy has been forced to reexamine its number of carrier strike groups, and the Air Force has been obliged to cut hundreds of aircraft from its arsenal. Through these deep cuts across the defense spectrum, the F-35 has survived.

In particular, at nearly 18 percent of the entire Air Force acquisition budget, the F-35 program leaves little room for other funding required to modernize and sustain the remainder of the service's legacy inventory.<sup>16</sup> Although the Air Force will declare the largely ceremonial milestone of IOC for the F-35 in 2016, the service is already being forced to make considerable cutbacks to its existing fighter force to pay the bill for the F-35 that will have questionable combat capability initially and marginal strength in

numbers until at least the late 2020s. Simply put, the service is recapitalizing platforms without a ready replacement available for use in a conflict thus creating a fissure in its ability to perform its airpower function. This presents a significant concern to our stakeholders in the Executive branch, in Congress and with the American public because this capability gap represents an actual vulnerability to the security of the U.S.

In regards to the U.S. military instrument of national power, the F-35 is not only a liability to the security of the U.S. because the aircraft is not available in mass, but it is also unsuited to the range of military operations that it will be called upon in either today's or tomorrow's operational environment. A study by Dr. Thomas P. Ehrhard, an expert within the Air Force leadership hierarchy as the Special Assistant to the Chief of Staff of the U.S. Air Force, frames the F-35 "as a classic 'middle' capability that lacks critical performance characteristics needed to meet high-end challenges, while it is over-specified and over-priced for the low-end challenges."<sup>17</sup> Specifically, the report goes on to critique the F-35's limited range, limited weapons payload, and even its stealth capabilities against an all-aspect, high threat environment like the one the U.S. would face in a conflict with China.<sup>18</sup> The report concludes that because of the aircraft's short range and its unsupportable tanker requirement, the "F-35 will encounter significant obstacles getting to the fight, let alone winning it."<sup>19</sup> Even Senator Saxby Chambliss, R-Georgia, in whose state final assembly occurs, says "the F-35 was designed to operate after F-22s secure the airspace and does not have the inherent altitude and speed advantages to survive every time against peers with counterelectronic measures."<sup>20</sup> On the opposite end of the intensity scale, the airframe is a superfluous solution for the lower threshold of threats found in a low-intensity

conflict.<sup>21</sup> In the first case, the F-35 is too expensive an aircraft to not provide the needed combat capability, and in the second case, the F-35 is too expensive a solution that provides combat capabilities that are not needed.

The extraordinary cost of the F-35 program also undermines the ability of the Department of Defense to remain financially solvent while addressing its airpower requirements across the range of military operations. The investment in the F-35 program eliminates the Department's ability to not only invest in the modernization of its existing legacy fleet of aircraft, but this program also requires drawdowns in personnel and training expenditures across the joint services to support this zero sum investment. According to the latest F-35 Selective Acquisition Report published by the DoD Joint Strike Fighter Office, the cost of the F-35A will likely fall to approximately \$150 million per jet, while the cost of the F-35B and the F-35C will likely settle at a cost near \$200 million per aircraft.<sup>22</sup> These costs do not include the cost per flying hour of the aircraft which government estimates mark at \$32,000 per flying hour, but which in this paper's estimation will likely be closer to the \$68,000 per flying hour of the F-22 Raptor, the only other 5<sup>th</sup> generation fighter in the military arsenal.<sup>23</sup> The reason that the cost per flying hour figures are important and relevant is that the fleet of legacy aircraft including the F/A-18 and the various models of the F-16 are about half the cost to operate as the F-35, even at the lower end Department of Defense estimate. This means that over the life of the F-35, the operations and maintenance cost for operating an F-35 for a nominal 8,000 flight hours over its service life would be \$256 million . . . per airplane. The costs skyrocket if cost per flying hour numbers are closer to those of the F-22, where factors such as replacement of the temperamental radar absorbent material and

other complexities required for routine maintenance are taken into account.<sup>24</sup> The savings accrued by nearing the flying hour costs of the U.S. legacy fleet are in the multi-trillion dollar range over the lifetime of this aircraft.

The magnitude of these costs drive mutually exclusive and zero sum strategic decision making. According to the March 2014 F-35 U.S. Government Accountability Office report, “At \$12.6 billion per year, the F-35 acquisition program alone would consume around one-quarter of all the DoD’s annual major defense acquisition funding. Therefore, any change in F-35 funding is likely to affect DoD’s ability to fully fund its other major acquisition programs.”<sup>25</sup> While the U.S. military places all of its fighter-based airpower capability in one questionable basket, its leaders are failing to act as good stewards of taxpayer money as they spend funds on aircraft that have acceptable, lower cost substitutes at the expense of other government programs and taxpayers’ money. As will subsequently be explained in detail, existing alternatives to the F-35 can essentially be purchased off-the-shelf and put into the inventory with most of the combat capability and at half the cost of the F-35. In the resource constrained setting that makes up our current strategic environment such a decision is the fiscally responsible approach the military must take with respect to our stakeholders.

### Recommendations

This examination of the impacts the F-35 has had on the ability of the U.S. to leverage its influence leads to the offering of several recommendations as a method to inhibit these negative effects and reinvigorate the ability of the U.S. to more capably assert its power in the global community. Three recommendations will be described that build upon each other to provide a suitable off-ramp for strategic decision makers that will give them an opportunity to correct the vector our fighter procurement system has

taken the U.S. military. The first recommendation entails limiting the production of the F-35 to approximately 200 aircraft. Because stopping F-35 production short of its intended goal will still leave U.S. air components with a maintenance and sustainment problem for their respective legacy fleets, a replacement platform will be required to mitigate this deficiency. The second recommendation will address this shortfall through the purchase of new legacy platforms with existing and open production lines. The third recommendation will entail calling for a new capabilities gap analysis within the Joint Capabilities Integration Development System (JCIDS) process in an effort to determine the true capability gaps faced by U.S. air components across the spectrum of likely operations in the next 20 to 30 years. This analysis must take a broad unbiased approach to the threats that will be faced by the next generation of warfighters. While the U.S. rebalances to the Pacific and turns its focus to peer and near-peer competitors, it must not fail to account for the requirement of airpower to effectively support unified action partners against the unsophisticated, but equally deadly low-intensity threat.

The first action that must be taken is the radical curtailment of the number of F-35s acquired by the joint services. Although this proposal will face severe resistance from the various stakeholders associated with the F-35, including the services themselves, Congress, international partners, and the defense industry, the negative impacts that the procurement of this platform has and will continue to have on the economic viability and the capability of the U.S. military is too great to not take immediate and decisive action. The F-35 should be limited to a final production number of 200 aircraft. This number is not arbitrary as it halts production of the airplane prior to the manufacturer entering full-rate production in 2019 and allows for a multi-year

production sunset process for the affected stakeholders.<sup>26</sup> Proponents of the F-35 program may admit that the development and procurement of the aircraft has not been a success up to the present, but they will likely argue that the U.S. military has limited options for sustaining its deteriorating fleet of legacy aircraft.<sup>27</sup> While this argument has partial merit, the state of today's legacy fleet is not as dire as the supporters of the F-35 purport. For example, the U.S. Air Force already has modernization and service life extension plans for its fleet of legacy F-16 fighter aircraft. The programs known as Combat Avionics Programmed Extension Suite (CAPES) and the F-16 service-life extension program (SLEP) are designed to improve not only the combat capability of the fleet of F-16s but are intended to make them sustainable and structurally sound for another decade of operations.<sup>28</sup> There is currently question on whether the Department of Defense will continue to fund CAPES in the coming years due to the limited resource constraints caused mainly by the continued support of the F-35 program. This indicates that the Air Force views funding of CAPES as an opportunity cost and that supporting both CAPES and the F-35 is a mutually exclusive proposal. The curtailment of the F-35 program would allow full funding for both CAPES and SLEP and give the fleet of Air Force F-16s credible combat capability and sustainability into the 2030s. Such a program would also provide U.S. airpower an asymmetric combat advantage in a much shorter time span that the F-35 could possibly achieve.

The Navy could take a similar approach to curtailment of the F-35 as the Air Force. A distinct advantage that the Navy has in this particular problem is that they have already hedged against the potential delays and failure of the F-35 through investment in the F/A-18 E/F Super Hornet. The Navy decision to move forward with this program

not only provides the service with combat capability matching the requirements of today's operational environment, but the airframes themselves are new and do not face the high sustainment costs and requirements because of structural fatigue confronted by aircraft in both the Air Force and the Marine Corps. The cutback in the F-35 program would require the Navy to continue to modernize the F/A-18 by investing in programs like the Advanced Super Hornet program which provides advanced capabilities at affordable costs.<sup>29</sup>

While the Marines face more sustainment issues with the AV-8B than the other services do with their fleet of legacy aircraft, the AV-8B does not constitute the preponderance of the Marine fixed-wing attack aircraft force. The majority of the Marine attack aviation force consists primarily of the single-seat variant of the F/A-18. From personal experience, the Marine Corps is continuing to modernize and sustain the AV-8B at their U.S. Navy Naval Air Systems Command facilities at China Lake Naval Air Station, California. While the structural lifespan might be shorter on the Harrier than the other services' platforms, lifespan extension and mitigation efforts could be implemented until a replacement aircraft could be made available. Such efforts could include new engineering efforts and depot-level fixes to replace critical structural components or through the implementation of more restrictive aircraft operational limitations through changes to Naval Air Training and Operating Procedures Standardization (NATOPS) flight manuals. These efforts could serve as viable short term solutions until the second recommendation of this proposal could be implemented.

In regards to our international partners, the subsequent recommendations would likewise be appropriate for their air services. While the U.S. would no longer invest in

the F-35 and this platform would likely cease to be an option to our allies, the U.S. government could offer similar procurement avenues as detailed below.

The second course of action that the Department of Defense must take to support parallel curtailment efforts of the F-35 program are to replace aging platforms with new legacy aircraft that are newly assembled off of active production lines. Currently, three U.S.-built fighter aircraft that match this description have open production lines that are capable of supplying new airframes to force providers. These three platforms are the previously mentioned F/A-18 E/F Super Hornet, an extensively updated model of the F-16, the F-16 E/F also known as the Block 60 or “Desert Falcon,” and updated variants of the F-15E Strike Eagle, known as the F-15SE or “Silent Eagle.” All three of these choices provide the Department of Defense with viable options for the replacement of unsustainable platforms with new airframes, the latest avionics, and at a fraction of the cost of the Joint Strike Fighter. According to the Joint Strike Fighter Selective Acquisition Report, the long term cost of the stealth aircraft measured over the life of the program and taken under the context of a full production purchase of 2,457 F-35A/B/Cs will result in a per aircraft cost of approximately \$159.2 million.<sup>30</sup> While this average price is a cost reduction from the current low rate, initial production F-35 bill, some analysts predict that the \$159 million average over the long haul is optimistic.<sup>31</sup>

Comparatively, the cost of each of the updated legacy platforms comes in the range between \$55 million for the F/A-18 E/F to \$90-95 million for the F-15SE and the F-16E/F.<sup>32</sup> At these prices, the cost of replacing the F-35 for all three services is easy math. If the F/A-18 E/F were selected as the replacement of choice, three new F/A-18s could be purchased for the cost of one F-35, even using the Joint Strike Fighter Office’s

figures. Any of these options would essentially be commercial-off-the-shelf purchases and require no significant research and development investment. The business case of this recommendation is very plain to understand. Proponents of the F-35 will likely argue that these legacy platforms cannot overcome the challenges of the A2/AD environment that the Joint Strike Fighter was designed to conquer and the risk to military capability would be unacceptable.<sup>33</sup> This would be only partially correct. While these legacy platforms do not have a comparable stealth capability, advancements in electronic warfare systems and platform-based cyber-attack systems allow for cross-domain synergy that mitigates this risk and minimizes the need for structural and material-based stealth technology. Proponents of the F-35 will also argue that besides the advanced stealth platform that this aircraft provides, it also serves as a unique node for data fusion.<sup>34</sup> While this system may have this inherent capability, it would make far greater sense to place such capability in an unmanned platform that would provide data fusion for the joint force with far greater persistence. It is also not an engineering stretch to re-host the data fusion computers on the F-35 on an unmanned aerial system. This discussion provides a segue for the final recommendation which will call for the operational requirements of the F-35 to be re-evaluated, not only to ascertain the true capability gaps that exist for U.S. airpower in an A2/AD environment, but also to understand the requirements to support our unified action partners in less contested, austere areas of operation.

The last recommendation of this analysis requires re-initiating the JCIDS process in regards to the airpower needs for the combatant commander with a thirty year outlook to the future. The JCIDS process was established in 2003 as the core element

of the defense acquisition process.<sup>35</sup> The JCIDS framework is designed to receive strategic guidance through inputs from both force providers and combatant commanders and translate those inputs into requirements. These requirements are then compared to current military capabilities to determine capability gaps. Once capability gaps are identified, the process identifies paths to address the gaps through either material or non-material solutions using the Doctrine, Organization, Training, Material, Leadership and Education, Personnel, and Facilities analysis tool, commonly referred to as DOTMLPF. The DOTMLPF apparatus seeks to address the capability gap through either the acquisition of new hardware to address the problem (material solution) or through a non-material means like changing the doctrine of an organization, updating tactics, techniques, and procedures, or readdressing organizational paradigms as the U.S. Army did with its relatively new Brigade Combat Team construct. The options to address the capability gaps of the future operational environment are wide-ranging, and while addressing them may require acquisition of a new platform to address those needs, the JCIDS process allows for a variety of non-material solutions to be vetted for consideration.

As applied to the F-35 program, the aperture for the future operational environment must be widened. While threats to our ability to operate in the air domain from peer and near-peer adversaries may present the greatest challenge to our military force, those environments may not represent the most likely scenarios in which U.S. airpower will be implemented in the coming decades. Especially in a severely constrained economic environment, the Department of Defense should be obligated, merely as a good steward of taxpayer dollars, to re-evaluate its operational airpower

needs not only through the lens of the highly contested A2/AD environment, but across the range of military operations that the joint force will operate in the coming decades.

While the U.S. strategic shift to the Pacific implies that our most likely high-end military confrontation in the future may be with China, the realities of our globalized world, economic interdependencies, and continuing security challenges from violent non-state actors should take a more prominent role in the posturing and development of the force structure of the U.S. military. While China continues to assert its presence in South East Asia, its actions should be viewed through a realist perspective of a country that is working in its own self-interest to ensure its future success in the world community rather than that of the hegemonic power seeking world domination. Understanding this viewpoint, while mindful of the deeply interconnected economic ties between the U.S. and China, and the much less discussed fact that both these world powers are both nuclear actors, the likelihood of a major regional state-on-state conflict between these two nations is low. Proponents for the F-35 use the “pivot to the Pacific” as their foundational rationale on why the F-35 is an essential requirement for the joint force.<sup>36</sup> This paper contends that this logic is fundamentally flawed in that even if the F-35 was unexpectedly fielded on time with all the capabilities promised by its prime contractor, the likelihood for the need of its full complement of capabilities is small and only satisfies a small slice of the airpower requirements called for by the range of military operations American forces conduct. While, it is true that over the next 20 years our adversaries will continue to advance their technology to counter U.S. military power projection, in our economically constrained environment an objective cost-benefit

analysis must be conducted to compare the most likely threats to American security with areas that a certain amount of operational risk can be accepted.

This monograph postulates that under a fresh look JCIDS process pertaining to U.S. airpower needs, that the following conclusions about the requirements to overcome the challenges of the future operational environment would be made. First, as stated earlier, the F-35 is a “middle-weight” technology that does not meet the actual requirements to overcome the A2/AD threat environment and is too expensive a platform to justify procuring for the low-end (and more likely) conflict. Material solutions that would likely surface from a new-look JCIDS process would include the development of new long range, stealth, stand-off weapons capable of being launched from legacy platforms. Additionally, new low-observable, unmanned aerial systems hardened to withstand a denied and degraded electronic and global positioning system environment would likely be identified as candidates for development. Lastly, interchangeable, plug-and-play type accessories for aircraft that give legacy platforms the ability to take advantage of cross-domain synergistic efforts would also be given a push for development. The continued use of an updated legacy fleet of aircraft would allow for the greatest economy of force especially when dealing with the lower end spectrum of conflict.

In regards to non-material solutions, there should be recommendations that call for a more active integration of cross-domain warfighting techniques across all services. For example, the true capabilities of our cyber forces are shrouded behind layers of secrecy that our warfighters and planners have little or any access to. These programs must be brought forward in an effort to help shape the operational environment.

Expansion of joint doctrine, training, and education concerning these cross-domain operations assets is vital to the success of our military force especially in a financially constrained environment.

### Conclusion

The procurement of the F-35 represents a significant misstep for the fighting capability of our military force and for future American economic solvency. While it may seem to our military leaders that political pressure will not allow the termination of such a program that is considered “too big to fail,” they must make the difficult choices mandated by an environment of very limited resources. Our leaders must continue to inspire and promote critical thinking and must be willing to accept arguments against the accepted standard and against trillion dollar programs like the F-35. Continued investment in this platform is not prudent and there are multiple options to not only mitigate the termination of the F-35 program, but to achieve greater combat capability for U.S. airpower in the future.

### Endnotes

<sup>1</sup> Thomas P. Ehrhard, “An Air Force Strategy for the Long Haul,” *CBS*, 2009, <http://www.csbaonline.org/publications/2009/09/an-air-force-strategy-for-the-long-haul/> (accessed February 10, 2014).

<sup>2</sup> Srdjan Vucetic and Richard Nossal Kim, “The International Politics of the F-35 Joint Strike Fighter,” *International Journal* 68, no. 1 (2013): in ProQuest (accessed March 14, 2014).

<sup>3</sup> U.S. Department of Defense, *Joint Operational Access Concept (JOAC)* (Washington, DC: U.S. Department of Defense, January 17, 2012).

<sup>4</sup> “Naval Aviation Vision 2012,” January 2012, linked from *Naval Aviation Enterprise Home Page*, [http://www.public.navy.mil/airfor/nae/Vision%20Book/Naval\\_Aviation\\_Vision.pdf](http://www.public.navy.mil/airfor/nae/Vision%20Book/Naval_Aviation_Vision.pdf) (accessed March 14, 2014).

<sup>5</sup> Jeremiah Gertler, *F-35 Joint Strike Fighter (JSF) Program* (Washington, DC: U.S. Library of Congress, Congressional Research Service, February 16, 2012).

<sup>6</sup> Lee Ferran, "U.S. Weapons Man: F-35 Fighter Plan Was 'Acquisition Malpractice,'" *ABC News*, February 7, 2012, <http://abcnews.go.com/Blotter/35-fighter-plan-acquisition-malpractice-pentagon-official/story?id=15530008> (accessed February 19, 2014).

<sup>7</sup> Mark A. Lorell, et al, An, and Robert A. Guffey, *Do Joint Fighter Programs Save Money?* (Washington, DC: Rand Project Air Force, 2013).

<sup>8</sup> "A Digital Jet for the Modern Battlespace," linked from "Lockheed Martin F-35 Lightning II," at <https://www.f35.com/about/life-cycle/software> (accessed February 18, 2014).

<sup>9</sup> Ibid.

<sup>10</sup> "DoD Announces Services' F-35 IOC Dates," May 31, 2013, linked from "Lockheed Martin F-35 Lightning II," at <https://www.f35.com/news/detail/department-of-defense-announces-f-35-ioc-dates-for-all-services/> (accessed February 18, 2014).

<sup>11</sup> United States Marine Corps, "F-35B Lightning II-Joint Strike Fighter," *U.S.MC Division of Public Affairs Current News Playbook*, December 12, 2012.

<sup>12</sup> Lt Gen Christopher Bogdan, *Selected Acquisition Report F-35 Joint Strike Fighter Aircraft (F-35)* (Arlington, VA: F-35 Lightning II Program Office, December 31, 2012).

<sup>13</sup> Ibid.

<sup>14</sup> Colin Clark, "Pentagon Reportedly Mulls Large JSF Cut," *Breaking Defense*, September 19, 2011, <http://breakingdefense.com/2011/09/pentagon-reportedly-mulls-huge-jsf-cut/> (accessed February 10, 2014).

<sup>15</sup> Stephen Dinan, "U.S. Debt Jumps a Record \$328 Billion — Tops \$17 Trillion for First Time," *Washington Times Online*, October 18, 2013, <http://www.washingtontimes.com/news/2013/oct/18/us-debt-jumps-400-billion-tops-17-trillion-first-t/> (accessed February 19, 2014).

<sup>16</sup> Kris Osborn, "F-35, Flying Hours Top Air Force's Wish List Under Potential New Budget," December 13, 2013, <http://www.dodbuzz.com/2013/12/13/f-35-flying-hours-top-air-forces-wish-list-under-potential-new-budget/> (accessed February 17, 2014).

<sup>17</sup> Ehrhard, "An Air Force Strategy for the Long Haul."

<sup>18</sup> Ibid.

<sup>19</sup> Ibid.

<sup>20</sup> "F-35: The Military's Chevy Volt?" *Investor's Business Daily*, February 28, 2012, in Proquest (accessed February 10, 2014).

<sup>21</sup> Ehrhard, "An Air Force Strategy for the Long Haul."

<sup>22</sup> Bogdan, *Selected Acquisition Report F-35 Joint Strike Fighter Aircraft (F-35)*.

- <sup>23</sup> Mark Thompson, "Costly Flight Hours," April 2, 2013, <http://nation.time.com/2013/04/02/costly-flight-hours/> (accessed February 10, 2014).
- <sup>24</sup> A1C Anthony Jennings, "First Ever Deployed PMP Performed on Andersen," August 6, 2010, <http://www.andersen.af.mil/news/story.asp?id=123216574> (accessed March 30, 2014).
- <sup>25</sup> Mike Sullivan, *F-35 Joint Strike Fighter: Problems Completing Software Testing May Hinder Delivery of Expected Warfighting Capabilities* (Washington, DC: Government Accountability Office, March 24, 2014).
- <sup>26</sup> Amy Butler, "Lockheed Looks to Push F-35 Production Rate," *Aviation Week*, December 16, 2013, [http://www.aviationweek.com/Article.aspx?id=/article-xml/awx\\_12\\_16\\_2013\\_p0-647173.xml](http://www.aviationweek.com/Article.aspx?id=/article-xml/awx_12_16_2013_p0-647173.xml) (accessed February 12, 2014).
- <sup>27</sup> Sydney Freedberg, Jr, "Forbes Champions More Super Hornets; F-18 Vs. F-35, Round Two," *Breaking Defense*, December 5, 2013, <http://breakingdefense.com/2013/12/forbes-champions-buying-super-hornets-f-18-vs-f-35-round-two/> (accessed March 30, 2014).
- <sup>28</sup> Aaron Mehta and Wendell Minnick, "F-16 Upgrade Dropped from U.S. Budget Proposal, Sources Say," *Breaking Defense*, January 27, 2014, <http://www.defensenews.com/article/20140127/DEFREG/301270023/F-16-Upgrade-Dropped-From-US-Budget-Proposal-Sources-Say> (accessed February 12, 2014).
- <sup>29</sup> Kris Osborn, "Navy Weighs Possible Upgrade to Advanced Super Hornet," *Defense Tech*, November 4, 2013, <http://defensetech.org/2013/11/04/navy-weighs-possible-upgrade-to-advanced-super-hornet/> (accessed March 25, 2014).
- <sup>30</sup> Bogdan, *Selected Acquisition Report F-35 Joint Strike Fighter Aircraft (F-35)*.
- <sup>31</sup> Winslow Wheeler, "Different Planes, Common Problems," June 6, 2013, <http://nation.time.com/2013/06/06/different-planes-common-problems/> (accessed February 19, 2014).
- <sup>32</sup> Lisa Maull, "F/A-18 Super Hornet," *Boeing Backgrounder*, August 2013; Pierre Tran, "UAE May Buy More F-16s," *Defense News*, July 6, 2011, <http://www.defensenews.com/article/20110706/DEFSECT01/107060305/UAE-May-Buy-More-F-16s> (accessed February, 26, 2014).
- <sup>33</sup> Robert P. Haffa, "Full-Spectrum Air Power: Building the Air Force America Needs," October 12, 2012, <http://www.heritage.org/research/reports/2012/10/full-spectrum-air-power-building-the-air-force-america-needs> (accessed March 30, 2014).
- <sup>34</sup> Robbin F. Laird, "Game Changer: The F-35 and the Pacific," *The Diplomat*, April 25, 2013, <http://thediplomat.com/2013/04/game-changer-the-f-35-and-the-pacific/> (accessed March 30, 2014).
- <sup>35</sup> U.S. Government Accountability Office, *Guidance and Progress Measures Are Needed to Realize Benefits from Changes in DoD's Joint Requirements Process: Report to Congressional Committees* (Washington, DC: U.S. Government Accountability Office, February 2012).

<sup>36</sup> Paul Shinkman, "Marines Must Have F-35 to do Their Jobs," *US News*, March 26, 2013, <http://www.usnews.com/news/articles/2013/03/26/marines-must-have-f-35-to-do-their-jobs> (accessed March 30, 2014).