Defence is the domain of the military NOT incompetent, lying, lackey politicians like Abbott

by Adam Ciralsky via mitch - Vanity Fair *Saturday, May 30 2015, 12:37pm*
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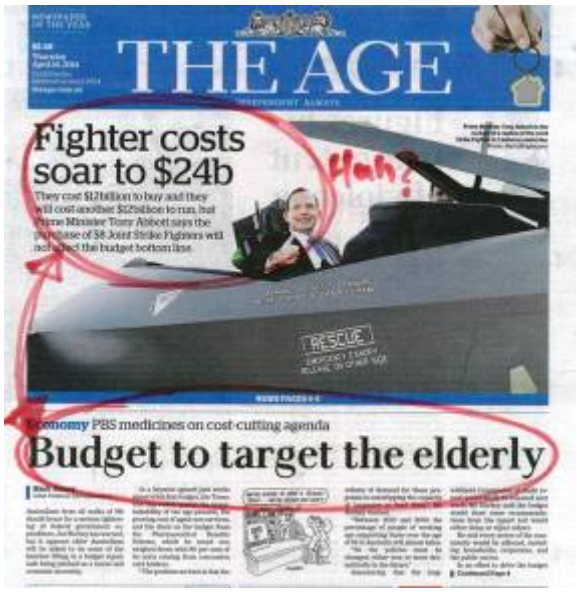
The F-35 is a billion dollar blowout nightmare - 'good one,' Tony!

> The Joint Strike Fighter is the most expensive weapons system ever developed. It is plagued by design flaws and cost overruns. It flies only in good weather. The computers that run it lack the software they need for combat. No one can say for certain when the plane will work as advertised. Until recently, the prime contractor, Lockheed Martin, was operating with a free hand—paid handsomely for its own mistakes. Looking back, even the general now in charge of the program can't believe how we got to this point.



Washington lackey Abbott regardless of cost to Aussie Taxpayers

At nearly 500,000 acres, Eglin Air Force Base is not the most unobtrusive piece of real estate along Florida's Emerald Coast. It is, however, among the best guarded. The base is home to top-secret weapons laboratories, swamp-training facilities for U.S. Special Forces, and the only supersonic range east of the Mississippi. Even from a great distance, bands of quivering heat can be seen rising from the miles of tarmac. At the end of May, I flew into Fort Walton Beach, a civilian airfield that shares a runway with Eglin, a fact that was driven home when the regional jet I was on ran over an arresting wire, a landing aid for fast-moving fighters, while taxiing to the gate.

With F-15s and F-16s circling overhead, I drove to the main gate at Eglin, where I was escorted through security and over to the air force's 33rd Fighter Wing, which is home to the F-35 Lightning II, also known as the Joint Strike Fighter, and some of the men who fly it. The Joint Strike Fighter, or J.S.F., is the most expensive weapons system in American history. The idea behind it is to replace four distinct models of aging "fourth generation" military jets with a standardized fleet of state-of-the-art "fifth generation" aircraft. Over the course of its lifetime, the program will cost approximately $1.5 trillion. Walking around the supersonic stealth jet for the first time, I was struck by its physical beauty. Whatever its shortcomings—and they, like the dollars invested in the plane, are almost beyond counting—up close it is a dark and compelling work of art. To paraphrase an old

Jimmy Breslin line, the F-35 is such a bastardized thing that you don't know whether to genuflect or spit.

When the J.S.F. program formally got under way, in October 2001, the Department of Defense unveiled plans to buy 2,852 of the airplanes in a contract worth an estimated $233 billion. It promised that the first squadrons of high-tech fighters would be "combat-capable" by 2010. The aircraft is at least seven years behind schedule and plagued by a risky development strategy, shoddy management, laissez-faire oversight, countless design flaws, and skyrocketing costs. The Pentagon will now be spending 70 percent more money for 409 fewer fighters—and that's just to buy the hardware, not to fly and maintain it, which is even more expensive. "You can understand why many people are very, very skeptical about the program," Lieutenant General Christopher Bogdan, who has been in charge of it since last December, acknowledged when I caught up with him recently in Norway, one of 10 other nations that have committed to buy the fighter. "I can't change where the program's been. I can only change where it's going."

The 33rd Fighter Wing's mission is to host air-force, Marine, and navy units responsible for training the pilots who will fly the F-35 and the "maintainers" who will look after it on the ground. The Marine unit, known as the Warlords, has outpaced the others: the commandant of the Marine Corps, General James Amos, has declared that his service will be the first to field a combat-ready squadron of F-35s. In April 2013, Amos told Congress that the Marines would declare what the military calls an "initial operational capability," or I.O.C., in the summer of 2015. (Six weeks later, he moved the I.O.C. date to December 2015.) By comparison, the air force has declared an I.O.C. date of December 2016, while the navy has set a date of February 2019. An I.O.C. declaration for a weapons system is like a graduation ceremony: it means the system has passed a series of tests and is ready for war. The Marines have been very explicit about the significance of such a declaration, telling Congress on May 31, 2013, that "IOC shall be declared when the first operational squadron is equipped with 10-16 aircraft, and US Marines are trained, manned, and equipped to conduct [Close Air Support], Offensive and Defensive Counter Air, Air Interdiction, Assault Support Escort, and Armed Reconnaissance in concert with Marine Air Ground Task Force resources and capabilities."

The chief Warlord at Eglin is a 40-year-old lieutenant colonel named David Berke, a combat veteran of both Afghanistan and Iraq. As we walked around the Warlords' hangar—which for a maintenance facility is oddly pristine, like an automobile showroom—Berke made clear that he and his men are intently focused on their mission: training enough Marine pilots and maintainers to meet the 2015 deadline. Asked whether Washington-imposed urgency—rather than the actual performance of the aircraft—was driving the effort, Berke was adamant: "Marines don't play politics. Talk to anyone in this squadron from the pilots to the maintainers. Not a single one of them will lie to protect this program." During the day and a half I spent with the Warlords and their air-force counterparts, the Gorillas, it became clear that the men who fly the F-35 are among the best fighter jocks America has ever produced. They are smart, thoughtful, and skilled—the proverbial tip of the spear. But I also wondered: Where's the rest of the spear? Why, almost two decades after the Pentagon initially bid out the program, in 1996, are they flying an aircraft whose handicaps outweigh its proven—as opposed to promised—capabilities? By way of comparison, it took only eight years for the Pentagon to design, build, test, qualify, and deploy a fully functional squadron of previous-generation F-16s.

"The F-16 and F-35 are apples and oranges," Major Matt Johnston, 35, an air-force instructor at Eglin, told me. "It's like comparing an Atari video-game system to the latest and greatest thing that Sony has come up with. They're both aircraft, but the capabilities that the F-35 brings are completely revolutionary." Johnston, like Berke, is evangelical about the airplane and insistent that "programmatics"—the technological and political inner workings of the J.S.F. effort—are not his concern. He has a job to do, which is training pilots for the jet fighter that will someday be. He was

candid about, but unfazed by, the F-35's current limitations: the squadrons at Eglin are prohibited from flying at night, prohibited from flying at supersonic speed, prohibited from flying in bad weather (including within 25 miles of lightning), prohibited from dropping live ordnance, and prohibited from firing their guns. Then there is the matter of the helmet.

"The helmet is pivotal to the F-35," Johnston explained. "This thing was built with the helmet in mind. It gives you 360-degree battle-space awareness. It gives you your flight parameters: Where am I in space? Where am I pointing? How fast am I going?" But Johnston and Berke are prohibited from flying with the "distributed aperture system"—a network of interlaced cameras, which allows almost X-ray vision—that is supposed to be one of the airplane's crowning achievements. The Joint Strike Fighter is still waiting on software from Lockheed that will make good on long-promised capabilities.

When I spoke with Lockheed's vice president for program integration, Steve O'Bryan, he said that the company is moving at a breakneck pace, adding 200 software engineers and investing $150 million in new facilities. "This program was overly optimistic on design complexity and software complexity, and that resulted in overpromising and underdelivering," O'Bryan said. He insisted that, despite a rocky start, the company is on schedule. Pentagon officials are not as confident. They cannot say when Lockheed will deliver the 8.6 million lines of code required to fly a fully functional F-35, not to mention the additional 10 million lines for the computers required to maintain the plane. The chasm between contractor and client was on full display on June 19, 2013, when the Pentagon's chief weapons tester, Dr. J. Michael Gilmore, testified before Congress. He said that "less than 2 percent" of the placeholder software (called "Block 2B") that the Marines plan to use has completed testing, though much more is in the process of being tested. (Lockheed insists that its "software-development plan is on track," that the company has "coded more than 95 percent of the 8.6 million lines of code on the F-35," and that "more than 86 percent of that software code is currently in flight test.") Still, the pace of testing may be the least of it. According to Gilmore, the Block 2B software that the Marines say will make their planes combat capable will, in fact, "provide limited capability to conduct combat." What is more, said Gilmore, if F-35s loaded with Block 2B software are actually used in combat, "they would likely need significant support from other fourth-generation and fifth-generation combat systems to counter modern, existing threats, unless air superiority is somehow otherwise assured and the threat is cooperative." Translation: the F-35s that the Marines say they can take into combat in 2015 are not only ill equipped for combat but will likely require airborne protection by the very planes the F-35 is supposed to replace.

Software is hardly the only concern. In Norway, where he was addressing the Oslo Military Society, General Bogdan said, "I have a list of the 50 top parts of the airplane that break more often than we expect them to. And what I am doing is I am investing millions of dollars in taking each and every one of those parts and deciding: Do we need to redesign it? Do we need to have someone else manufacture it? Or can we figure out a way to repair it quicker and sooner so that it doesn't drive up the costs?" This is very late in the game for an airplane the Marines intend to certify in two years.

In January, Berke's Warlords had a close call of the kind that brings Bogdan's Top 50 list into sharp relief. As a pilot was taxiing out to the runway for takeoff, a warning light went on in the cockpit indicating that there was a problem with the plane's fuel pressure. Returning to the hangar, maintainers opened the engine-bay door to find that a brown hose carrying combustible fuel had separated from its coupling. When I asked what would have happened had the defect gone undetected before takeoff, Berke replied with the noncommittal detachment of a clinician: "I think you can easily infer that, from the fact that the fleet was grounded for six weeks, there was no question that the scenario, the outcomes, were not acceptable for flying." What he meant, General Bogdan told me later, was that it was a very close call: "We should count our blessings that we caught this on the ground. It would have been a problem. A catastrophic problem." (When asked

about this incident, the engine's prime contractor, Pratt & Whitney, wrote in a statement to Vanity Fair, "The engine control system responded properly when the leak occurred. The pilot followed standard operating procedures when he was alerted to the leak. The safeguards in place on the aircraft allowed the pilot to abort takeoff without incident and clear the active runway. There were no injuries to the pilot or ground crew. For clarification, the grounding was cleared three weeks after the event.")

General Bogdan, it turned out, would have a lot more to say in the course of a long and forceful interview in which he held up the Joint Strike Fighter program and the prime contractor, Lockheed Martin, to scrutiny and found both of them deficient on many counts.

II. "Acquisition Malpractice"

Washington's Union Station, modeled in part on the Baths of Diocletian, is a fitting gateway to a city that continues to spend on the military with imperial abandon. Earlier this year, I wound my way through throngs of travelers as I waited for a call. When it came, I was vectored to the top floor of the Center Café, which occupies a circular platform with a 360-degree view of the lobby below. The man I was to meet—I'll call him "Charlie"—is a well-placed source with a decade's worth of hands-on experience with the Joint Strike Fighter, both inside and outside the Pentagon. Charlie explained that his choice of meeting location was less paranoid than practical: the J.S.F. program is so large, financially and geographically—and saturated with so many lobbyists, corporate executives, congressional aides, Pentagon bureaucrats, and elected officials—that it takes considerable effort in Washington to avoid bumping into someone connected with the program. And he did not want to bump into anyone. He asked that I conceal his identity so he could speak candidly.

In the course of this and many other conversations, Charlie walked me through the troubled history of the airplane and tried to separate the rosy public-relations pronouncements from what he saw as the grim reality.

"The jet was supposed to be fully functional by now and that's why they put people down in Eglin in 2010–2011—they were expecting a fully functional jet in 2012," he said. "But the only military mission these planes can execute is a kamikaze one. They can't drop a single live bomb on a target, can't do any fighter engagements. There are limitations on Instrument Flight Rules—what's required to take an airplane into bad weather and to fly at night. Every pilot out there in civil aviation, his pilot's license says he can take off and land in perfect weather. Then they have to graduate to instrument conditions. What the program is saying is that the J.S.F., your latest and greatest fighter, is restricted from flying in instrument meteorological conditions—something a $60,000 Cessna can do."

Charlie cited a news report about Frank Kendall, the Pentagon's undersecretary of defense for acquisition, who in 2012 had used the words "acquisition malpractice" to describe the design and production process for the Joint Strike Fighter. (In June 2013, Kendall sounded more optimistic during a conference call with me and other journalists: "I think all of us are encouraged by the progress we're seeing. It's too early to declare a victory; we have a lot of work left to do. But this program is on a much sounder, much more stable footing than it was a year or two ago.")

Unfazed by Kendall's change in tone, Charlie insists that technical problems will continue to bedevil the program. "You can trace the plane's troubles today back to the 2006–2007 time frame," he explained. "The program was at a critical point and Lockheed needed to prove they could meet weight requirements." That, he says, led to a series of risky design decisions. "I can tell you, there was nothing they wouldn't do to get through those reviews. They cut corners. And so we are where

we are." While acknowledging that weight was a pressing issue, Lockheed Martin spokesman Michael Rein told me that design trade-offs in 2006 and 2007 were made in concert with, and with the blessing of, Pentagon officials. He strenuously denied the company cut corners or in any way compromised safety or its core values.

III. Hands-Off Management

On October 26, 2001, the Pentagon announced that it had chosen Lockheed Martin over Boeing to build what Lockheed promised would be "the most formidable strike fighter ever fielded." The Pentagon's ask was huge: Build us a next-generation strike-fighter aircraft that could be used not only by the U.S. military but also by allied nations (which would come to include the United Kingdom, Italy, the Netherlands, Turkey, Canada, Australia, Denmark, Norway, Japan, and Israel). On top of that: Produce three versions of the airplane—a conventional version for the air force, a short-takeoff and vertical-landing version for the Marines, and a carrier-suitable version for the navy. The idea was that a single stealthy, supersonic, multi-service airplane could entirely replace four existing kinds of aircraft. And the expectation was that this new airplane would do everything: air-to-air combat, deep-strike bombing, and close air support of troops on the ground.

Lockheed Martin won the contract—worth more than $200 billion—after the much-chronicled "Battle of the X-Planes." In truth, it was not much of a competition. Boeing's X-32, the product of a mere four years' work, paled next to Lockheed's X-35, which had been in the works in one form or another since the mid-1980s, thanks to untold millions in black-budget funds the company had received from the Defense Advanced Research Projects Agency (DARPA) to develop a supersonic short-takeoff and vertical-landing aircraft.

To turn its X-35 prototype into a fleet of F-35 fighters, Lockheed has relied on two seemingly separate but equally controversial acquisition practices. In military jargon, these are known as "commonality" and "concurrency."

Commonality simply meant that the three F-35 variants would share portions of high-cost components like the airframe, the avionics, and the engines. This was supposed to help ensure that the plane was "affordable"—a term that the company and Defense Department managers invoked with the frequency of a Vajrayana chant. But commonality did not really come to pass. The original plan was that about 70 percent of all the parts on the airplanes would be common; the actual figure today is about 25 percent. Commonality, even at this reduced level, has unintended consequences. When a crack in a low-pressure turbine blade was discovered in an air-force F-35A engine earlier this year, Pentagon officials took the only responsible course, given that the part is used in all models: they grounded the entire fleet of F-35s, not just the ones flown by the air force. In his June testimony, the Pentagon's Dr. Gilmore revealed another, less public grounding of the entire F-35 test fleet, which occurred in March 2013 after the discovery of "excessive wear on the rudder hinge attachments."

From the outset, Lockheed assured Pentagon officials that technological innovation, including heavy reliance on computer simulation, which could take the place of real-world testing, would keep costs down. The Pentagon bought those assurances and allowed the company to design, test, and produce the F-35 all at the same time, instead of insisting that Lockheed identify and fix defects before firing up its production line. Building an airplane while it is still being designed and tested is referred to as concurrency. In effect, concurrency creates an expensive and frustrating non-decision loop: build a plane, fly a plane, find a flaw, design a fix, retrofit the plane, rinse, repeat.

Vice Admiral David Venlet, who managed the J.S.F. program until late last year, acknowledged the

absurdity in an interview with AOL Defense: “You’d like to take the keys to your shiny new jet and give it to the fleet with all the capability and all the service life they want. What we’re doing is, we’re taking the keys to the shiny new jet, giving it to the fleet, and saying, ‘Give me that jet back in the first year. I’ve got to go take it up to this depot for a couple of months and tear into it and put in some structural mods, because if I don’t, we’re not going to be able to fly it more than a couple, three, four, five years.’ That’s what concurrency is doing to us.”

Adding to the problem has been the Pentagon’s hands-off management policy, a stepchild of the deregulation frenzy of the 1990s. At the time the F-35 contract was written, the Pentagon was operating under a principle called Total System Performance Responsibility. The idea was that government oversight was unduly burdensome and costly; the solution was to put more power in the hands of contractors. In the case of the Joint Strike Fighter, Lockheed was given near-total responsibility for design, development, testing, fielding, and production. In the old days, the Pentagon would have provided thousands of pages of minute specifications. For the Joint Strike Fighter, the Pentagon gave Lockheed a pot of money and a general outline of what was expected.

Nailing down the true cost of the Joint Strike Fighter is a maddening exercise as various stakeholders use different math—along with byzantine acronyms—to arrive at figures that serve their interests. According to the Government Accountability Office (G.A.O.), which is relatively independent, the price tag for each F-35 was supposed to be $81 million when the program began in October 2001. Since that time, the price per plane has basically doubled, to $161 million. Full-rate production of the F-35, which was supposed to start in 2012, will not start until 2019. The Joint Program Office, which oversees the project, disagrees with the G.A.O.’s assessment, arguing that it does not break out the F-35 by variant and does not take into account what they contend is a learning curve that will drive prices down over time. They say a more realistic figure is $120 million a copy, which will go down with each production batch. Critics, like Winslow Wheeler, from the Project on Government Oversight and a longtime G.A.O. official, argue the opposite: “The true cost of the airplane—when you cast aside all the bullshit—is $219 million or more a copy, and that number is likely to go up.”

IV. The Helmet

The F-35 is a flying computer tricked out with an impressive array of sensors and outward-facing cameras stitched together—through a process called sensor fusion—to give the pilot what Lockheed’s Bob Rubino, a former navy aviator, calls “a God’s-eye view of what’s going on.” Under Rubino’s guidance, I test-drove the helmet at the company’s Fighter Demonstration Center, located in Crystal City, Virginia—a stone’s throw from the Pentagon and home to scores of corporate contractors for the Defense Department.

For decades, American fighter pilots have achieved air dominance with the help of a heads-up display, or HUD. This is a sloping glass plate affixed to the dashboard that projects flight data as well as the bombsight and gunsight displays, called “pippers.” HUDs allow pilots to fly and fight without peering down at their instruments. They are ubiquitous. They appear in civilian and military aircraft, in video games, and in the recently unveiled Google Glass.

For fighter pilots, a HUD is not a gimmick. It is a lifesaver. Even so, when the time came to design the F-35’s cockpit, Lockheed Martin dispensed with the HUD in favor of a complex helmet-mounted display (H.M.D.), which in many ways is the centerpiece of the Joint Strike Fighter. The new system displays mission systems and targeting data inside the helmet’s visor and gives the pilot something akin to X-ray vision thanks to the “distributed aperture system” that weaves together disparate feeds from those outward-facing cameras embedded in the airframe and projects a single image inches

from a pilot's eyes.

It is impossible to wrap your head around the system until the system wraps itself around your head. Rubino helped me put on the helmet. It took time to adjust to the reality projected in front of my eyes. In an instant, I had left Crystal City and was flying over Maryland, close to Baltimore Washington International Airport. The world in front of me possessed a greenish glow and was "biocular," meaning that instead of looking at an image through two separate eyepieces, inside the helmet my eyes had a circular view of the world.

Along with that artificial world I could see data: altitude, bearing, speed, and other information. Testing my newfound powers, I peered down at my legs and saw right through the floor of the aircraft. Looking down to my left I could see the runway at B.W.I. as though the interfering wing did not exist. The system wasn't perfect, however. When I turned my head quickly from side to side, the stitching that weaves six cameras into a single portrait appeared to fray ever so slightly. When I removed the helmet after 20 minutes, I had the somewhat unsettling feeling you might get after a day spent riding roller coasters.

At first blush the helmet-mounted display struck Charlie and his colleagues as a major advance. But they were left with a nagging question: what happens if something goes wrong with the helmet? The answer: without a HUD as a fail-safe, pilots would have to fly and fight using the plane's conventional heads-down displays.

Visibility is critical to pilots of every stripe. It has proven to be a problem for some F-35 pilots. In February 2013, the Pentagon's chief weapons tester, Dr. Gilmore, reported that the cockpit design impedes pilots' ability to see their "six o'clock"—that is, directly behind them. According to Gilmore, who collected the bulk of his data down at Eglin, one air-force pilot reported on his evaluation form that lack of aft visibility in the F-35 "will get the pilot gunned [down] every time." What is more, the distributed aperture system, which is supposed to compensate for structural impediments to visibility, itself has blind spots, which, according to Charlie and others, preclude its use during airborne refueling.

The helmets are manufactured by RCESA, a joint venture between the Cedar Rapids–based Rockwell Collins and the Israeli company Elbit, and they cost more than $500,000 apiece. Each helmet is bespoke: a laser scans a pilot's head to ensure optical accuracy when his eyes interface with the display. To understand the sensory impact of an H.M.D., imagine if, instead of having a rearview mirror in your car, you saw the same imagery projected onto the inner surface of your sunglasses, along with data from the speedometer, tachometer, fuel gauge, and global-positioning system. Now imagine driving forward, and as your eyes glance down toward the pedals, the video feed in front of your eyes changes to reveal the road beneath the vehicle.

Like other parts of the plane, the helmet-mounted display—with its newfangled gadgetry—works better on paper than in practice. According to Charlie, some test pilots have experienced spatial disorientation in flight serious enough that they have disabled the data and video streams to the helmet and landed using the plane's conventional flight displays. Spatial disorientation is a potentially lethal condition in which a pilot loses his bearings and confuses perception with reality. A 2002 joint U.S.-U.K. review of Class A mishaps in the U.S. Air Force between 1991 and 2000 found that spatial disorientation was implicated in 20 percent of cases, at a cost of $1.4 billion and 60 lives. (Class A mishaps are defined as incidents that result in a "fatality or permanent total disability," destruction of an aircraft, or $1 million or more in damage.) The report's authors worried that, with the advent of helmet-mounted displays, mishaps involving spatial disorientation "will continue to pose a significant threat to aircrew."

One cause of spatial disorientation is latency—when what is displayed lags behind what the plane does. In much the same way that video lagged behind sound on early Blu-ray players, the F-35's onboard computer takes time to figure out where the pilot is looking and to display the appropriate camera feed. Another problem is "jitter." Unlike a heads-up display, which is bolted to the airplane, the F-35's helmet-mounted display is designed to be worn by pilots whose heads bounce around in flight. The image created by projectors on both sides of the helmet shakes in front of the pilot's eyes.

Pierre Sprey, who began working in the Pentagon in the 1960s as one of Robert McNamara's "whiz kids" and spent decades helping design and test two of the airplanes the F-35 is supposed to replace (the A-10 and F-16), contends that, even if designers can deal with latency and jitter, the resolution of the video is "fatally inferior" compared with the human eye when it comes to confronting enemy aircraft. "Right from the start, they should have known there would be a huge computation problem and a huge resolution problem," says Sprey. "Why do drones shoot up wedding parties in Afghanistan? Because the resolution is so poor. That was knowable before the helmet was built." The helmet-mounted display, says Sprey, is "a total fuckup from start to finish."

In a statement to Vanity Fair, Lockheed maintained that "we have addressed the helmet's three primary areas of concern—green glow, jitter and latency—and remain confident that this capability will provide F-35 pilots a decisive advantage in combat."

V. A Plane for Some Seasons

From the outset, critics have worried that by trying to meet so many missions for so many masters, the Joint Strike Fighter would end up being, as Charlie—one of the plane's earliest proponents—put it, a "jack of all trades, and master of none."

Take the matter of stealth technology, which helps an airplane elude detection. Charlie explained that while stealth is helpful for deep-strike bombing missions, where planes must remain unobserved while going "downtown" into enemy territory, it doesn't serve much purpose in a Marine Corps environment. "The Joint Strike Fighter's forte is stealth," he said. "If it's defending Marines in combat and loitering overhead, why do you need stealth? None of the helos have stealth. The Marines' obligation is not to provide strategic strike. Look at Desert Storm and the invasion of Iraq. Marine aviators did close air support and some battlefield prep as Marines prepared to move in. Not deep strike. Ask the commandant to name the date and time the Marines struck Baghdad in Desert Storm. Sure as hell wasn't the start of war. Why invest in a stealth aircraft for the Marines?"

Charlie's question resonates with others in the aerospace community who argue that stealth may actually inhibit the Marines' ability to carry out their primary mission: close air support. To remain low-observable—military-speak for stealthy—the F-35 must carry fuel and ordnance internally. That, in turn, impacts how long it can loiter over the battlefield (not exactly a stealthy tactic to begin with) and how much weaponry it can deploy in support of Marines below. Consider this: the air force's non-stealthy A-10 Thunderbolt II—a close-air-support aircraft that the Marines routinely call upon and which the F-35 is replacing—can carry 16,000 pounds worth of weapons and ordnance, including general-purpose bombs, cluster bombs, laser-guided bombs, wind-corrected munitions, AGM-65 Maverick and AIM-9 Sidewinder missiles, rockets, and illumination flares. It also has a 30-mm. GAU-8/A Gatling gun, capable of firing 3,900 rounds a minute.

By comparison, the F-35B, which the Marines insist they will field in 2015, will carry two AIM-120 advanced air-to-air missiles (which protect the F-35 from other aircraft, not grunts on the ground) and either two 500-pound GBU-12 laser-guided bombs or two 1,000-pound GBU-32 J.D.A.M.'s. In other words, a plane that costs at least five times as much as its predecessor will initially deploy

carrying one third as much ordnance and no gun whatsoever. Lockheed maintains that the F-35 is outfitted with a series of hard points that will eventually allow the plane to carry up to 18,000 pounds of ordnance for the air-force and navy variants and up to 15,000 pounds for the Marine version. However, carrying external ordnance will eliminate the plane's stealth signature—which is routinely touted as one of the plane's primary advantages over legacy aircraft.

Having built the F-117A Nighthawk and F-22 Raptor, Lockheed Martin has plenty of experience with the highly toxic coatings and svelte surfaces that help stealth aircraft go undetected. The company also knows that the technology is finicky and has the capacity to turn a cutting-edge fighter into a hangar queen. A significant portion of an F-22 Raptor's downtime is spent in hangars with maintainers mending its stealthy coating, which has a tendency to wear off during certain meteorological conditions.

When the time came to cover the F-35 with a radar-absorbing material, Lockheed changed its technology, covering the plane with a rigid coating applied in sections. Unfortunately, prolonged use of the plane's afterburners causes the F-35's stealthy outer layer—as well as the skin underneath—to peel and bubble near the tail. As a result, the F-35 is prohibited from supersonic flight while Lockheed Martin comes up with a fix—one that will require retrofitting the 78 planes that have already come off the production line. The fact that this could have occurred at all, much less on the Pentagon's biggest and most important weapons program, baffles Pierre Sprey. "Everyone knows that the faster a plane goes, the warmer the skin gets," he says. "All they had to do was test a one-square-foot portion in an oven. Yet again, we're finding this stuff out on planes that are already built."

When asked how two signature elements of the same program—stealth and supersonic speed—could have come into such direct collision, a senior Pentagon official with access to F-35 test data explained, "This is not rocket science. When you let a contractor do whatever he wants to do, and you don't watch him very carefully, he's going to trust his engineering analysis as opposed to doing what you just said—building a piece and putting it in an oven. Because he looks at a piece of paper and he's got his engineers and he says, 'Oh, this is good; we've got margin there. We've got an extra 10 degrees and an extra five minutes on the coatings. We're good. We don't have to test that.' Government oversight would say, 'Show me.'"

Among the F-35's current limitations, perhaps the most surprising involves inclement weather. As I witnessed during my second day at Eglin Air Force Base, when storm clouds loomed over the Gulf of Mexico, the Pentagon's supposedly "all weather" F-35 Lightning II, ironically, cannot fly within 25 miles of lightning. I watched as pilots gathered around a computer and tracked the weather, trying to decide if it was safe enough to go aloft. While this prohibition has been publicly reported, the reasons behind it have not.

"Every airplane flying today—civilian and military—has static-electricity dissipation built into it. That's because there's lightning all over the planet," Charlie explained. To guard against an onboard fire or explosion caused by lightning, static electricity, or an errant spark, modern planes carry something called an onboard inert-gas generation system (OBIGGS), which replaces combustible fuel vapor with non-combustible nitrogen. As important as these systems are to civilian aircraft, they are indispensible to military planes, which carry ordnance and must also contend with incoming bullets and missiles. Yet when the time came to outfit the F-35 with such a system, certain fasteners, wire bundles, and connectors inside the plane that ordinarily help dissipate electrical charges were replaced with lighter, cheaper parts that lacked comparable protection.

VI. Pushback

Spend even a brief amount of time with members of the J.S.F. program and you'll hear the basic sales pitch over and over again: The F-35 is a fifth-generation fighter-bomber. It is a quantum leap over legacy aircraft that are nearing the end of their natural lives. Fourth-generation planes like the F-16 and F/A-18 cannot easily be upgraded. You can't change the shape of the plane. You can't just keep bolting on new pieces of equipment. Fifth-generation characteristics—like stealth, sensor fusion, and increased maneuverability—must be baked into the plane from the start.

Still, when they think about the F-35 simply as an airplane—leaving aside the delays, the defects, the costs, the politics—military pilots tend to like what they see, or at least what they imagine will come. Pilot-speak is typically uninflected, but enthusiasm pokes through. I spent many hours with Berke and Johnston at Eglin and discussed many of the issues that have provoked criticism of the F-35. The pilots invoked the "above my pay grade" response to some questions. On others they offered explanations or pushback.

I asked, What about that comment, from an evaluation, about how lack of aft visibility in the F-35 will "get the pilot gunned [down] every time"?

Johnston: Well, you come back from flying and you get 100,000 questions and they're like, What do you think of the rearward visibility? I'm not thinking, O.K., this is on the cover of The Washington Post. I'm thinking, like, O.K., yeah, visibility's more limited than what I'm used to. Uh-huh. Copy. It was designed that way for a reason. But I'm not going to sit there and write this paragraph on it. I'm just going to say the aft visibility is not as good as it was in a [F-16] Viper. And if that pilot was sitting here with you, you'd be like, O.K., I see that you would write something like that. But you're thinking you're talking to a bro, and you're trying to write as quickly as you can because you have a million questions to go.

So the visibility issue isn't a concern?

Berke: Not even a tiny bit. The convenience factor of looking from a Viper is really nice, and I've flown that jet. But if you put it in context—of all the systems on the airplane and how you fly fifth-generation fighters—a minor reduction in visibility in the F-35 does not concern me. I wouldn't even spend a brain cell on that.

I asked, What about General Bogdan's remark about the "50 top parts that break more often than we expect them to"?

Johnston: Things are going to happen. There has never been a program with more end users and shareholders than this. You're asked to develop the most sophisticated go-to-war system ever. Then you're told you've got to make it take off from an aircraft carrier, take off near vertically, then land vertically on a small boat, which I can't even believe the Marines land on. Oh, and we've got international partners that all get a say in this. So I will say I'm not surprised that we have parts that don't work and things like that.

Critics point to several publicized episodes when the discovery of design or technical problems has grounded the entire fleet. I asked, Are you troubled?

Berke: The idea of grounding a fleet is not something new to aviation. It's happened in every airplane I've ever flown. Many, many, many, many times.

Berke and Johnston aren't policymakers or engineers. They're pilots, and they believe in their work. A more disturbing assessment came from perhaps the most improbable source: Christopher Bogdan,

the general who heads the Joint Strike Fighter program. A few weeks after I saw him in Norway, we sat down at his office in Crystal City. The plate-glass windows offered views of the Jefferson Memorial and the Washington Monument, and if Bogdan had been wearing a dress uniform with his ribbons and his three stars, the scene would have looked like a cartoon or a cliché. But Bogdan, 52, wore a green flight suit. He too is a pilot, one who has logged 3,200 hours in 35 different military aircraft. When answering questions, he frequently thumped his fist on a conference table.

With dry understatement he took issue with the bedrock concept of the Joint Strike Fighter—that a single airplane could fulfill the different missions of three different services—calling it "a little optimistic."

He felt that the way the program had been set up with Lockheed at the outset made absolutely no sense. His first target was the concept of Total System Performance Responsibility: "We gave Lockheed very broad things that said the airplane has to be maintainable, the airplane has to be able to operate from airfields, the airplane has to be stealthy, the airplane has to drop weapons—without the level of detail that was necessary. We have found over the 12 years of the program that the contractor has a very different vision of how he interprets the contractual document. We go, 'Oh no, it needs to do X, Y, and Z, not just Z.' And they go, 'Well, you didn't tell me that. You just told me in general it needed to do something like Z.'"

His second target was the payment structure: "Most of the risk on this program when we signed this contract in early 2001 was on the government squarely. Cost risk. Technical risk. Perfect example: in the development program, we pay Lockheed Martin whatever it costs them to do a particular task. And if they fail at that task, then we pay them to fix it. And they don't lose anything." Bogdan explained that, since taking office, he has made burden-shifting a priority. Beginning with more recent batches of F-35s, Lockheed Martin will cover increasingly larger shares of cost overruns as well as a percentage of "known aircraft retrofit requirements"—that is, the cost to fix flaws discovered on planes that have already come off the assembly line.

Bogdan made it clear that he is tired of business as usual. "Sometimes industry is not accustomed to what I call straight talk. It can get cozy sometimes. I've seen it happen. I've been there," he said. "I've seen senior leaders on both sides of the fence. And I can tell you that when you take over a program that has had problems like this, being cozy is not an advantage." He continued, "We awarded the original contract in 2001. We've been at this for 12-plus years, and we should be a lot further on in the program and in our relationship than where we are in 12 years."

Strains in that relationship were evident when I asked about various issues dogging the program. Lockheed, for example, describes the problem of the afterburner essentially cooking portions of the F-35's stealthy skin as "a minor issue that has been resolved." The company insists that "[t]here is no structural retrofit needed for the F-35. This was an issue with the adhesive used on the edge of the horizontal tails of test aircraft. A new adhesive is being incorporated in current production aircraft."

General Bogdan, to whom Lockheed reports, told me that supersonic flight (or any prolonged use of the afterburner) "creates a thermal environment on the back tail portion of the airplane where over time that heat kind of starts disbonding the coatings we have. That's just not good." If he had his druthers, salvation would not lie with Lockheed Martin. "If I needed a 911 number or a pick-up-and-call-a-friend, it will be a company like DuPont who builds chemical sealants and those kinds of things." Continuing on, he said, "Our desire is that we will fix this problem. But that'll cost us money because we have to cut in the new fix to the production line, and all the airplanes out there have to be retrofit. So there's a cost there, and we bear that cost. Remember how I told you we took too

much risk on this program? Well, there's some of it."

When it came to questions about the helmet-mounted display, Bogdan said he was unaware of any instance in which pilots reported spatial disorientation. That said, he conceded that problems with the helmet were real and ongoing, though design solutions had been found for most of them: "But we haven't put them all together yet in the helmet. Now I've got to put it in the helmet and produce the helmet so that I can build 3,000 helmets that all work. Instead of just one helmet that's been handcrafted with solutions." Bogdan's gone one step further, sourcing an alternative helmet from aerospace giant BAE in case the current RCESA helmet is beyond redemption. "Lockheed Martin would very, very much like to influence my decision-making here in favor of the Rockwell helmet. I'm not letting them do that," he explained. As if to punctuate that he remains open to another solution, Bogdan told me that the BAE helmet is "$100,000 to $150,000 less."

As for the prohibition against flying the F-35 in inclement weather, Bogdan explained that the OBIGG system "wasn't up to snuff when it came to protecting for lightning, because it couldn't keep up with diving and climbing and keeping enough nitrogen in the fuel tanks. So we had to beef up the OBIGG system and that is part of the redesign that's causing us not to be able to fly in lightning right now. Until that OBIGG system gets redesigned for that purpose and becomes more robust, I guess, we don't fly in lightning. Now we're going to have that fixed by 2015." The bottom line amounted to: this is a fixable problem, it shouldn't have happened in the first place, and in normal circumstances it would have been fixed during testing, so it's too bad that airplanes are already rolling off the assembly line and will all have to go back for repair. That's what concurrency does. "It makes the program very complicated. It adds cost. I hate to armchair-quarterback. And today I may be making decisions that another three-star seven years from now may look back and say, 'What the hell was Bogdan thinking?' It's frustrating. But I just have to play the cards I'm dealt."

He was philosophical about his situation, wishing he could change a lot of the Joint Strike Fighter's history and knowing he could not. "I look in the rearview mirror to understand where we've been, so I don't make those same kinds of errors. But if I look in the rearview mirror too much, one, I don't keep my eye on the road in front of us, and two, it would drive me nuts, and I wouldn't be in this job very long."

VII. Political Engineering

By the time Pierre Sprey left the Pentagon, in 1986, he had come to a conclusion: "The level of corruption had risen so high that it was impossible for the Pentagon to build another honest aircraft." In 2005, a Pentagon procurement official, Darleen Druyun, went to prison after negotiating a future job with Boeing at the same time she was handling the paperwork on a $20 billion tanker deal the company was competing for (and won). Boeing's C.E.O. and C.F.O. were ousted, the contract was canceled, and the company paid $615 million in fines. The man called in to clean up that mess was Christopher Bogdan.

The political process that keeps the Joint Strike Fighter airborne has never stalled. The program was designed to spread money so far and so wide—at last count, among some 1,400 separate subcontractors, strategically dispersed among key congressional districts—that no matter how many cost overruns, blown deadlines, or serious design flaws, it would be immune to termination. It was, as bureaucrats say, "politically engineered."

Founded in 1912, Lockheed earned its stripes during World War II when its twin-engine P-38 Lightning fighter helped the Allies gain air superiority. After the war, the company built a string of aircraft that changed the course of aviation history, from the SR-71 Blackbird to the F-22 Raptor. In

1995, Lockheed merged with Martin Marietta to form Lockheed Martin, which employs 116,000 people worldwide and recorded $47.2 billion in sales last year. The company receives more federal money—nearly $40 billion in 2012—than any other company. Lockheed's corporate motto is, "We never forget who we're working for."

The company employs a stable of in-house and outside lobbyists and spends some $15 million on lobbying each year. When it comes to the F-35, which accounts for one of its largest revenue streams, Lockheed takes every opportunity to remind politicians that the airplane is manufactured in 46 states and is responsible for more than 125,000 jobs and $16.8 billion in "economic impact" to the U.S. economy. Signing up eight allied countries as partners provides additional insurance. "It's quite frankly a brilliant strategy," said General Bogdan, acknowledging that it is effective even if it is not admirable. Political engineering has foiled any meaningful opposition on Capitol Hill, in the White House, or in the defense establishment.

During the 2012 campaign cycle, Lockheed—either directly or indirectly through its employees and political-action committee—doled out millions in campaign cash to virtually every member of Congress. The company's lobbyists included seven former members of Congress and dozens of others who have served in key government positions. According to Charlie, Pentagon officials involved with the Joint Strike Fighter routinely cycle out of the military and into jobs with the program's myriad contractors, waiting out intervening fallow periods required by ethics laws at Beltway "body shops" like Burdeshaw Associates. Until recently Burdeshaw was led by Marvin Sambur, who, as assistant secretary of the air force for acquisition, oversaw the F-35 program. (He resigned in the wake of the Boeing tanker-lease scandal, for which his subordinate Darleen Druyun went to prison.) The firm itself lists dozens of generals and admirals as "representative associates," and on its board it boasts none other than Norman Augustine, a former chairman and C.E.O. of Lockheed Martin. When asked about the Lockheed Martin connection, Burdeshaw's vice president, retired air-force major general Richard E. Perraut Jr., wrote in a statement to Vanity Fair, "It is our company policy to not comment on questions about clients, projects, or Associates" (emphasis in the original). For his part, Dr. Sambur wrote in a separate statement: "I never consulted for Lockheed on the F35 or F22, and while I was at Burdeshaw, we had no contract with Lockheed for any consulting with respect to these programs."

Enter "F-35" as a search term in the House's Lobbying Disclosure database and you will find more than 300 entries dating back to 2006. Lockheed is hardly the only company trying to influence congressional action on the Joint Strike Fighter. According to congressional filings, West Valley Partners, a coalition of Arizona cities organized to preserve the long-term viability of Luke Air Force Base, near Glendale, has paid the aptly named lobbying outfit of Hyjek & Fix more than $500,000 since 2010 to influence "F-35 Basing Plans for the US Air Force." In August 2012, Secretary of the Air Force Michael Donley announced that Luke A.F.B. had been chosen to house three F-35 fighter squadrons as well as the air force's F-35A pilot-training center.

The Beaufort Regional Chamber of Commerce, in South Carolina, has paid the Rhoads Group $190,000 since 2006 to help ensure "East Coast basing of F-35 mission." In December 2010, the Pentagon announced its decision to base five F-35 squadrons at Marine Corps Air Station Beaufort. Senator Lindsey Graham, a beneficiary of Lockheed campaign contributions, issued a statement that said, "Christmas came early this year."

These efforts pale in comparison to the $2.28 million that Cleveland-based Parker Hannifin has paid its lobbyists, the LNE Group, since 2007. Parker Hannifin expects to receive revenues of approximately $5 billion over the life of the Joint Strike Fighter program. Working with aerospace giant Pratt & Whitney, which is overseeing construction of the F-35's engine, Parker Hannifin is

producing, among other things, fueldraulic lines for the short-takeoff and vertical-landing version of the airplane. It was the failure of one of these fueldraulic lines that led to the grounding of the Marines' entire fleet of F-35Bs earlier this year. (In a statement to Vanity Fair, Pratt & Whitney said it is working to ensure that "no costs associated with the inspection and replacement of the hoses are borne by the taxpayer").

VIII. Ready for Combat?

"I ask you to buckle down your seat belts and snug your harness up nice and tight," Marine Corps Commandant James Amos announced last November, welcoming what he described as the first operational F-35 squadron at Marine Corps Air Station Yuma, "because you are about to take a ride of a lifetime in a great airplane at an important point in America's history." Ten months later, the squadron is by no means operational. Like its sister squadron at Eglin, it lacks the Block 2B software that would allow the planes to drop real bombs, engage enemy aircraft, or do much besides fly in good weather. Moreover, the planes at Yuma, like the entire fleet of F-35s, are hobbled by design flaws, some of which, according to General Bogdan, will require retrofitting. Nevertheless, the Marine leadership remains bullish. At a recent Marine Aviation Dinner, General Amos declared that the F-35 would be ready to fight in the next campaign the U.S. faces.

As if to bolster that case, on May 31, 2013, the Marines, at Amos's direction, reported to Congress that their own airplane "will reach the I.O.C. milestone" between July and December 2015. Amos's declarations have both angered and baffled many J.S.F. insiders. "Neither the F-35B nor the other variants have begun much less completed operational testing, which can take up to two years," says Charlie. "And that can't begin until they get at least the Block 2B software, which won't even happen until 2015."

I asked General Bogdan about the Marines' decision to declare their planes combat-capable without adequate time for operational testing (O.T.)—or, as the Pentagon used to call it, "field testing." His answer was straightforward—yes, that was what the Marines are going to do, and yes, they have the power to do it. "By law," he said, "we have to do operational testing. But by law, the service chiefs, the secretaries of the services, get to decide I.O.C. and when the airplane can go into combat. There's nothing that says the results of the O.T. must be used, factored in, to determine what the services do. I can tell you that's why, when you look at the real letter of the law, the U.S. Marine Corps intends on declaring I.O.C. before we start O.T." In other words, the commandant of the Marine Corps plans to announce that his planes are ready for combat before operational testing proves they are ready for combat. (Despite repeated queries over a period of nearly a month, including requests for an interview and the submission of written questions, the office of the commandant of the Marine Corps would make no comment.)

One can argue—as General Bogdan does, and as some opponents concede—that given enough time, and given copious yet unspecified amounts of additional money, the Joint Strike Fighter could become the airplane its creators dreamed of. But how much is too much and can we afford three variants of an airplane whose flaws are still being uncovered? The Department of Defense is on the hook to serve up $37 billion in sequestration savings this year alone. Those cuts, however, have yet to hit the F-35. Instead they are being visited upon hundreds of thousands of civilian employees—including some of those who work in the F-35's Joint Program Office—in the form of furloughs.

Near the end of my interview with General Bodgan, I thanked him for his candor. His reply was a broad one, not directed at any branch of the military or any particular company. "It is unfortunate," the general said, "that you can't get straight answers, because we're at a point in this program

where transparency leads to trust, leads to advocacy or at least support. People have committed to this program. We're not walking away from the program. Something catastrophic would happen to walk away from that. So just tell everybody the truth. It's hard."

http://www.vanityfair.com/news/2013/09/joint-strike-fighter-lockheed-martin

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