

Rethinking

The last time US ground forces were killed by enemy airplanes was in April 1953, when North Korean biplanes attacked an island off the Korean peninsula. Two US Army soldiers, manning an anti-aircraft battery, were killed.

Since then, the Air Force has made it Job 1 to control the air in any armed conflict. It has succeeded so well that success has come to be taken for granted and is a foundational concept in the doctrine of every branch of the armed forces: The Air Force will achieve air superiority. It has been obtained through a combination of technology, training and tactics, and often, overwhelming numbers. Having the very best fighters has been a cornerstone of this thinking.

But some Air Force leaders are starting to question whether there are other ways to achieve air dominance. For two decades, USAF has not been challenged for control of the air in a shooting war. The mission, officials argue, is too important to become

bogged down in debates about airframes and force structure. New approaches and new thinking may be required.

The Air Force's five-year budget plan emphasizes modernization of its fighter force and standoff weapons. But a new Quadrennial Defense Review is underway, and given unprecedented constraints on defense spending in the modern era, Pentagon leaders promise every mission will get a serious relook, and air superiority will be no exception.

The discussion has to be about more than fifth generation fighters and capability gaps, says Maj. Gen. Steven L. Kwast, who is heading the Air Force element of the QDR.

"Creativity and innovation is not an accident and it's not genius people in a closet somewhere that are going to come up with it," Kwast told defense journalists in March. The former head of requirements for Air Combat Command said USAF has gathered leaders from a variety of disciplines to look at the "spectrum of ideas"

An F-22 Raptor (l) and an F-15 Eagle pull into vertical climbs over the Nevada Test and Training Range near Nellis AFB, Nev.

USAF photo by MSgt. Kevin J. Gruenwald

Air Dominance

By Marc V. Schanz, Senior Editor

for new solutions to the air dominance problem.

“When I look across all the ‘black’ programs and all the ‘white’ programs”—meaning heavily classified and unclassified projects—“I see ideas that have germinated and increased in technology readiness levels over the last 10 years, and nobody’s really looked at them together again on some of these really wicked problems we have,” he said.

Kwast said the Air Force is taking the rethink seriously and wants to push unconventional ideas about how to gain freedom of maneuver and freedom from attack from the air in any given scenario. In January, ACC convened an air superiority “Innovation Summit” of scientists from many disciplines—ranging from marine biology to anthropology—at JB Langley-Eustis, Va., he said.

Involving disciplines not commonly associated with air combat was intended to produce novel ideas and illustrate how air superiority can be differently interpreted by different audiences. In this case, the audience was a panel of Air Force subject matter experts, directors, and weapon systems chiefs. They then had to select some of the best ideas to brief to ACC’s leadership.

The guidelines to presenters, Kwast said, were to “figure out how to control this continuum of air and space somewhere in the globe, in a temporal dimension that is fast and ... violent.” Some of the ideas presented were “astounding,” he said.

The Air Force Research Laboratory presented its latest research on directed energy—high-power chemical lasers and electric lasers, as well as high-power electromagnetic systems—and their possible application to air superiority. A biology professor presented territorial defense strategies employed in the animal kingdom, ranging from swarm attacks to defeat larger predators to the cost-benefit analysis of close combat in certain species.

“You don’t have to build a bigger shark necessarily to control the environment,”

USAF photo by A1C Joseph A. Pagan Jr.



Gen. Michael Hostage, head of Air Combat Command, exits a surface-to-air missile system at Fort Polk, La. Plans now call for more power projection and countering anti-access, area-denial threats, leaders say.

Kwast noted, “especially when you’ve got people out there with spear guns; there are other ways of controlling that environment.”

Unfriendly Overhead

Kwast said the summit produced some “aha moments” which challenged some long-held assumptions. Sometimes the surprises were revelations about just how far some technologies have advanced—in engines or space suits—bringing them into the realm of a “game changer.” What all the different disciplines and experts brought really challenged ACC officials to think about the future of air superiority, he added.

There won’t be any sudden, aggressive shifts in doctrine, Kwast said, “because you don’t want to grab onto that wacky idea and let go of theology that’s worked.” Nevertheless, “we sure as hell can be a little bit better than we are at being creative and innovative.”

The ACC leadership considers its summit—with its theme “Air Superiority: 2030 and Beyond”—a great success, and a second phase of the summit is slated for this summer.

Uncertainty about the battlespace of the future and the prospect of austere budgets are also adding urgency to the new thinking. USAF leaders don’t want to miss out on creative alternatives due to complacency or inertia.

“Fundamentally, air dominance is the ability to operate unchallenged or at least unprohibited” from the air, ACC chief Gen. G. Michael Hostage III said in April.

“There has been an assumption over time [that] the noise overhead will always be friendly,” he added, noting that over the last 20 years at least, adversary air capabilities were promptly dealt with. But USAF received a more complicated set of missions in the January 2012 Defense Strategic Guidance.



At left, an artist's concept of a future USAF fighter. Going forward, air dominance may require more innovative approaches than designing a new air superiority aircraft, USAF officials say.

Illustration by Erik Simonsen

superiority forces, unlike ground or naval force packages, can't spool up over the course of weeks or months; they must be ready to fight in hours.

Air dominance and air superiority, though often used interchangeably, mean different things to military planners.

Air superiority, per the Joint Chiefs of Staff Joint Publication 3-01, is the "degree of dominance in the air battle" which permits conduct of operations at "a given time and place without prohibitive interference" from air and missile threats.

Air dominance—a far more difficult task—is achieved when opposing forces are incapable of effective interference with US operations within a given area using air and missile threats.

The distinction isn't lost on USAF's top airman. In one of his first addresses as Chief of Staff, Gen. Mark A. Welsh III told the Air Force Association's Air & Space Conference last September, "If we are not able to gain and maintain air superiority ... in a future conflict—if we couldn't guarantee that we could—then everything about the way the United States Army and the United States Marine Corps fight on the ground would have to change." The mission of air dominance is a "foundational element of the use of airpower," Welsh said, and it is incumbent on the Air Force to "make that very clear to everyone."

Still, air superiority programs have been on the losing side of many recent Pentagon budget battles. As a mission, it was eclipsed by the needs of two grinding counterinsurgencies where air dominance was never in question. The most visible casualty came when then-Defense Secretary Robert M. Gates' capped the F-22 program in 2009.

Welsh and others are quick to insist that it's not a debate centered on force structure, but in making a priority of air superiority and air dominance because they are key to any 21st century military strategy.

"I'm not talking about asking for more F-22s, folks," Welsh said in September.

Hostage, speaking to the Atlantic Council in Washington, D.C., noted the strategic calculus has shifted as the US pulls back from its manpower-heavy counterinsurgency commitments. Planning constructs now demand more emphasis on power projection and operating in scenarios where anti-access, area-denial (A2/AD) capabilities have steadily built up, from the Pacific to the Persian Gulf. Counterair technology—in the form of advanced and increasingly portable air defense weapons and the proliferation of "fourth generation" fighters around the globe—has greatly shrunk the capability gap between the US and its potential adversaries.

"In a contested, denied environment, [air dominance] will be more temporal; it won't be pervasive," Hostage asserted. There will be no resemblance to the Iraq or Afghanistan battlespace, where an air commander could operate freely, having to worry only about deconflicting the traffic, he said.

Airpower analyst John Stillion, a senior fellow at the Center for Strategic and Budgetary Assessments, said the last 10 to 20 years can be viewed as an anomaly in the history of combat, and this should concern USAF leadership.

The increasing ranges of World War I machines gave rise to long-range escort fighters in World War II, Stillion noted. From the postwar era to today, air superiority has been defined by missiles and advanced radar.

Now, however, "what we have is an increased reliance on sensors and weapons, and that I think is going to drive us

into an arena where we have this growing measure-countermeasure competition," he said. Stealth, infrared sensors, networks, and electronic countermeasures will make the air-to-air fight increasingly complex and difficult with a near-peer competitor, he noted.

Such an environment is one which USAF leaders haven't had to fight in for some time, Stillion noted, echoing Hostage's observation that any air dominance-air superiority scenario would not be static.

A Sortie Factory

Air superiority "will not be something that happens in a day or a week ... if you are up against someone with a capable air force," Stillion said, and this raises the issue of attrition.

"We haven't thought about that in a while," he noted.

Stillion pointed out that nations such as China and Iran have invested heavily in missile forces which could target bases and carriers. That in turn has prompted a conversation inside the Pentagon about base resiliency.

"Think of the air base as a sortie factory. ... If you can disrupt that process, you will have a significant impact on the combat power that sortie factory can generate," Stillion said.

These scenarios, coupled with readiness-damaging budget cuts, give air planners pause, because air dominance and air superiority are non-negotiable aspects of joint doctrine. In any environment, they must be gained quickly and decisively to make other operations possible. Air

“I’m just saying this mission is critical to us. It’s foundational.”

Though thinking about transformation, the Air Force wants to keep a steady grip on the capabilities it has today. Despite spending cuts, USAF is investing in air superiority by modernizing at least a portion of its legacy F-16C/D and F-15C/D fleets with active electronically scanned array (AESA) radars and new processing technology, as well as countermeasures and additional situational awareness tools, according to USAF’s military deputy for acquisition, Lt. Gen. Charles R. Davis. The Air Force is also boosting procurement and development of its air superiority weapons, the AIM-9X Sidewinder and AIM-120D Advanced Medium-Range Air-to-Air Missile (AMRAAM), in the Fiscal 2014 budget request.

Production of the latest version of AMRAAM—USAF’s premier medium-range air-to-air weapon—was slowed while the test program verified fixes to software issues and production delays. The Air Force wants to purchase 199 AIM-120Ds in Fiscal 2014, up from 113 sought in 2013, and plans to increase production of both the AMRAAM and Sidewinder across the Future Years Defense Program.

These investments don’t advance USAF’s state of the art, though.

“These new systems and enhancements really only bring capabilities and technologies [that have been in existence for] years” and which have been fielded on other platforms, Davis told the Senate Armed Services airland subcommittee in April. The Air Force is now in a mode of reacting to adversary capabilities that are rapidly improving, and Davis noted that several countries have tested prototype fifth generation aircraft in just the last three years.

“We are doing very little to bring new systems on right now, to be able to stay in front of that threat and make the threat react to us,” Davis warned.

The shrinking capability gap, as measured in air superiority aircraft, is

one of the issues behind ACC’s push for innovative approaches. Kwast said the Air Force and the rest of the military is still on a long journey away from a Cold War-era force structure: built around large numbers, redundant capabilities, and shaped to defeat adversaries in two near-simultaneous wars.

Kwast, at AFA’s Air Warfare Symposium in February, said the “tapestry of capability” in today’s force is “unsustainable” in the long-term strategic and fiscal environment. New technology can enable better ways of prosecuting missions, he said.

Comms Out, GPS Out

DOD has also indicated its desire to harness cutting-edge research and development to advance the conversation about air superiority. Arati Prabhakar, director of the Defense Advanced Research Projects Agency, said DARPA is in the early stages of the “Air Dominance Initiative,” a collaboration with both the Air Force and Navy to look at technologies which could create a “generational shift” in US air superiority. The project emerged from a consensus among the military services that future threats will be far more sophisticated than those of the last decade, and DARPA has taken a “systems approach” to the question of air superiority and air dominance.

“This is not a question about what the next aircraft looks like,” she explained. The goal of the project is to explore capabilities which, when layered, would “comprehensively extend air superiority.” The ADI team is examining areas such as networking, communications, advanced sensors, and manipulation of the electromagnetic spectrum as potential tools to achieve this. “We’re talking about how manned and unmanned systems might work together, what role space assets play,” she said, adding the

ADI study results will inform the next budget cycle.

While much of the air dominance conversation focuses on the future, Hostage noted that he still has to present forces to fight today, and part of the challenge in maintaining air dominance is maintaining a flexible and adaptable mindset.

“We are working the fleet” and the tactics, techniques, and procedures they employ, Hostage said, adding “I’m changing the culture.” In a process began by Hostage’s predecessor, Gen. William M. Fraser III, ACC has steadily ramped up training activities across the combat air forces to be more representative of a combat environment where things taken for granted don’t work or are denied—space-based navigation or functional runways, for example.

When he first flew fourth generation fighter aircraft, Hostage noted, radars and data links were new and sometimes didn’t work correctly. Today, he said, when a pilot turns on the jet, everything works. “I’m taking it away from them. ... They’ll fly one scenario where the GPS isn’t working. They’ll fly another scenario where their comms aren’t working. ... I want them to be able to ... operate routinely and effectively in a contested, degraded environment.”

The days of being able to operate Predator and Reaper orbits over an enemy continuously will be long gone in such a scenario, Hostage added—but by training in an environment where capabilities are degraded, it will prepare airmen for air superiority operations in the future.

It “may not be continuous, but I’ll be able to provide it at a level that allows our combatant commanders to do what they have to do,” Hostage said. “Air dominance means when you’re there, you ... hold the upper hand. ... That is what this is about—changing the calculus” of the enemy. ■

AFRL/DTA photo by Nick Tarasenko



A high-energy laser aboard a mobile active targeting resource takes out an unmanned aircraft in an Air Force Research Laboratory demonstration.