



**Keynote Address at
the Air, Space, and Cyberspace Power in
the 21st Century Conference**

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Thank you for that kind introduction. Doctor Pfaltzgraff, it is my distinct honor to be here. I would like to thank the Institute for Foreign Policy Analysis, and the International Security Studies Program of the Fletcher School, for organizing this conference; and, I commend the Air Force Strategic Studies Group for their tremendous efforts in co-sponsoring this event. As well, I'd like to thank the Defense Threat Reduction Agency for their support.

It is my distinct pleasure to be amongst such a group as this, and to share my thoughts on the future of America's Air Force. In this room, we have a wide array of leaders and thinkers who have contributed to our Nation's worldwide leadership and prominence in air, space, and cyberspace – the result of many bold visionaries and pioneers in U.S. history. We, as professionals in this dynamic field, have an obligation to protect and uphold that legacy of leadership and innovation, and to continue considering how we can best leverage and integrate air, space, and cyberspace power to protect our Nation against current and future security threats.

Our intent at this conference therefore should be to embrace that same boldness and ambition that our forebears exemplified. As we attempt to further hone our strategic edge, ideas that are generated here perhaps should be as controversial as they are novel. For, debate is effectively the whetstone upon which we sharpen our thoughts on strategic design; *debate* is a sign of a healthy enterprise – within a particular institution or even within a broader community – and is the hallmark of any significant progress and evolution. As we engage in robust discourse on how these three operating domains of air, space, and cyberspace will continue to serve our national security, we must embrace this professional obligation. Spirited but respectful discussions truly are the essential elements of assuring our vitality in the years ahead.



The U.S. Air Force: A Unique Brand of Air-Mindedness

In the twentieth century, airpower and its inherent characteristics of speed, range, and flexibility forever changed warfare. As these advantages evolved with greater lethality and precision, a revolution in its truest sense shook the foundations of military affairs: make effective use of airpower, or be left behind. Billy Mitchell's sinking of the *Ostfriesland* on the 21st of July, 1921, demonstrated that navies could no longer ignore the range of airpower. During the early stages of World War II, as the concept of *Blitzkrieg* again made warfare more lethal, Hitler's Luftwaffe showed how the close integration of land and air power could provide a synergistic effect; and yet, it was Allied airpower that proved pivotal in ending *Blitzkrieg's* reign of terror. In the late 1950s, the deployment of intercontinental ballistic missiles forever altered the strategic landscape. The march into space in the 1960s brought about the fielding of the first CORONA satellites that began to revolutionize intelligence, surveillance, and reconnaissance. These are but a few early examples. The common thread is that traditional forms of terrestrial warfare became subject to the effects of air and space power, insofar as land and sea forces were inherently vulnerable to attack from above; and, each step in this evolution of air, space, and cyber power has significantly changed warfare and our understanding of it.

Today, the United States Air Force provides this Nation with *Global Vigilance, Reach, and Power*, and establishes and maintains control of the air where friendly forces must operate, providing the ability to maneuver, free from enemy air attack. It leverages, on a global scale, the advantages that air and space power provide, and is among those on the leading edge in cyberspace. The control of these fundamentally interdependent domains provides for the unique capabilities that are among the Air Force's most significant and enduring contributions to national defense: global mobility, long-range strike, and intelligence, surveillance, and reconnaissance capabilities.



The Strategic Environment: Context

But, *Vigilance, Reach, and Power* cannot be taken for granted. They require stewardship so that they can be applied to today's challenges, even as we develop them for employment in the future security environment. We therefore must take note of our strategic context. The challenge of our times is to succeed in a protracted and irregular global struggle against elements of violent extremism and irreconcilable actors – near-peer rivals and others who cannot be readily influenced or coerced. We must be able to operate across a spectrum of conflict that, to be sure, has its so-called “high” and “low” ends, but in reality, is more accurately characterized as a highly complex hybrid. Equally complicated are the tools and tactics of warfare, which cannot be separated into an orderly taxonomy of methods. Instead, we find that they also take on a hybrid quality, especially with the proliferation of advanced technology and the myriad ways in which our adversaries use them.

As threats continue to emerge, these methods of warfare further evolve, thus creating new, unmet requirements that we as a Nation must fulfill. And, as our adversaries further exploit the growing spread of long-range cruise and ballistic missiles and advanced conventional weapons, they will have more means at their disposal to contest our access to the global commons, which this Nation requires to effectively operate within our strategic environment.

As a Nation, therefore, we must be prepared to respond with a military instrument that is capable of producing the desired effects, and a whole-of-government approach, with a carefully developed balance of all of our national instruments, that is appropriate to the particular circumstances. This demands that the United States Air Force set a clear vision of how it will move to meet emerging threats and fulfill evolving requirements, and establish clear priorities for investment and – yes – divestment, in ways that correspond with strategic and fiscal realities. Against a backdrop of leveled or even shrinking purchasing power, the Air Force still must remain agile and able to act according to the current state of affairs, while being ready and able to respond to any number of potential contingencies – high, low, hybrid, or irregular.



Strategic Challenge: Increasing Our Capabilities

At the “high” end of conflict, the Air Force must continue to provide the Nation with its global strike capability, both nuclear and conventional. As it has for over 50 years, the Air Force will continue to ensure the vitality of two of our Nation’s three nuclear arms of deterrence, so that, in the event of an existential threat to our national survival, it remains a credible option for our leadership. To do this, our nuclear posture must be properly sustained and resourced; and, our nuclear operations and logistics must continue to be uncompromising in its precision and reliability, enabled by dedicated professionals who are well-trained, equipped, and unwavering in their capacity for self-assessment and commitment to excellence.

For the last 70 years, the Air Force, through its ability to penetrate denied airspace, has met the national strategic imperative of holding adversary targets at risk. This priority remains, although the evolving nature of the threat forces us to reevaluate our ways and means. Future systems must be versatile, particularly in two dimensions: in terms of their *function*, such as strike, or intelligence, surveillance, and reconnaissance; and, in their *ability to flex* between various methods of employment, such as manned versus unmanned, or penetrating versus standoff. Existing and future operational requirements – for example, the ever-increasing demand for persistent ISR capabilities – call for an ability to gain access to, and then loiter in, potentially denied or contested airspace, in order to find, fix, and track high-value targets. These targets – sometimes mobile, sometimes bunkered deeply underground – would otherwise be difficult to locate without penetrating systems. And, while unmanned platforms likely better serve this required persistence from a physiological perspective, current technology does not allow for the type of fully autonomous and dynamic systems that are required in an opposed and networked environment. Therefore, contemplating a “family of systems” that are capable of multiple methods of employment and capabilities will help to ensure future systems with maximum versatility for our platforms and concepts of operation. It is true that some systems likely will be single-



purpose, but by and large, the majority of our systems must be able to address myriad hybrid and irregular warfare threats.

Such flexibility to task and re-task assets will be essential to the Air Force's ability to maximize its contribution to the Joint team, and help to ensure its success. While this is a conference on air, space, and cyber power, we must remember that national defense is a total team effort. An air, naval, or ground victory alone is insignificant to the overall achievement of national political objectives. In the end, only the combined success of the military instrument, in concert with other national levers of power, is truly meaningful.

Therefore, further Joint integration and inter-Service cooperation toward enhanced air-land and air-sea interoperability remains a top strategic imperative. Common issues – irrespective of whether on *terra firma* or the oceans, or in the air or in space – are emerging as a result of proliferating technologies and the resultant rapidly advancing adversary capabilities. Threats are not confined to any single domain; therefore, only a coordinated response by all of the Services – working to resolve issues such as Joint command and control, the growing demand in ISR, our collective dependence on cyberspace, and strike operations – will develop the integrated and balanced response that is required for our national security.

As we further integrate, the benefits are not limited to a single domain. Airpower makes surface warfare better, and land and sea power enhance the effectiveness of air forces. The U.S. Air Force and Navy, for example, are working on new ways to integrate maritime interdiction operations, anti-submarine warfare, and missile defense. In the area of land warfare, the Air Force must continue evaluating how we can enhance Joint counterland capabilities, perhaps by effectively reducing opposing ground forces to dismounted infantry, thus allowing lighter, more rapidly deployable friendly ground units to effectively maneuver and operate in conventional and hybrid conflict environments. Also, the Air Force must maintain its capability to conduct precise, timely, and effective operations across the full spectrum of counterland operations, to include close air support and air interdiction. A



wide array of improved capabilities – such as infrared, electro-optical, and laser-enhanced sensors; improved signals intelligence capabilities; advanced radars; and directed energy weapons – will enable advanced capabilities such as high-fidelity target discrimination down to the level of being able to find, track, and target individual combatants within a crowd. These types of advances represent new territory into which we will venture to provide battlefield commanders with even greater capabilities, especially in irregular warfare environments.

Indeed, in this increasingly complex landscape, we must leverage every bit of capability that we have, and that we will develop. The Joint team has long recognized the exploitation of space as enormously beneficial to our Nation. However, as near-peers and potential rivals advance into space – commercially, civilly, and militarily – we must consider that our advantages will not be unmatched or asymmetric for an indefinite period. Space must be completely accessible to our Nation, and our systems must be more agile and responsive to combatant commanders' needs. Space control – assuring our freedom of action to and in space – remains a national priority. As a subset, space situational awareness allows us to evaluate and attribute threats to our assets. And, we must be able to begin planning for any number of contingencies in the event of an outbreak of hostilities in which space systems – communications, global positioning, missile warning, reconnaissance, and others – surely will be major players. In all of these areas of national security space, the Air Force bears a special responsibility, as it has for over 60 years; and, as the vanguard into military space in the twentieth century, the Air Force must continue to lead that effort, and keep our commitment to national security space in equal measure to our national ambitions in space, and as high as the ultimate high ground itself.

To ensure the continued viability of our air and space operations, we must pay considerable attention to evaluating options for multi-tiered concepts of operating from distributed bases across the globe. By delivering balanced capabilities through smaller, tailored forces that are specific to the task, we



receive the accompanying benefit of fostering international engagement and building key overseas partnerships. At all of these forward locations and cooperative security operations, however, the proliferation of precision – in cruise missiles, in guided ballistic missiles, and with precision mortars, rockets, and artillery – puts our forces, and those of our partners, at risk. While we have enjoyed relative security at these forward locations over the last twenty years or so, our adversaries are actively seeking advanced weaponry to threaten this current advantage. These increasing threats and demanding logistical requirements, in the face of rising costs and flat budgets, force us to consider how we will harden our bases and fortify them with active defenses, and how we will balance them with an increasing array of “softer” bases.

Strategic Challenge: Decreasing Our Vulnerabilities

As we move forward, the Air Force must actively protect itself against emerging vulnerabilities. Our operations cannot grind to a halt for want of a degraded or denied system, or a scarce resource. Our reliance on information technologies, for example, is very well known. I.T. enables an entire universe of command and control capabilities, which underpins all aspects of Joint operations. To be sure, this has enhanced our ability to maintain unprecedented situational awareness at all levels of operations; but, our reliance on information technologies has also created vulnerabilities that we must address and mitigate. In future warfare, we must maintain our ability to exploit cyberspace.

Also, with the growing sophistication of electronic warfare methods and techniques, protecting our communications and data links from degradation and even denial will remain a strategic priority. Realistically, in a hostile environment, we will experience some degree of degraded communications. Reasserting ourselves in electronic warfare is a step toward ensuring that such degradation is minimized. We must identify our vulnerabilities, refine our tactics and procedures, and build more resilient systems, including next-generation, protected space communications, and air-breathing or terrestrial alternatives and complements for a variety of space-based capabilities. In the



near term, however, we must ensure that our forces are trained and configured for realistic, network-degraded environments.

Another widely-known dependence that creates an exploitable vulnerability is that of GPS. From efficient mission planning to lethal precision munitions, global positioning has transformed an entire universe of warfighting capabilities. Our dependence on precision navigation and timing will continue to grow, so physicists at the Air Force Research Laboratory are exploring promising new technologies like cold atoms, pseudolites, and image-aided inertial navigation systems that use laser radar, which move us toward achieving ultra-accurate, less GPS-dependent, navigation systems. It seems critical to me that the Joint force should reduce its dependence on GPS-aided precision navigation and timing, allowing it to ultimately become less vulnerable, yet equally precise, and more resilient.

Still another area of overdependence and vulnerability is petroleum. The Air Force consumes more petroleum each year than any other agency of the U.S. Government, and thus is also the most susceptible to energy price volatility and disruption of logistics lines. The global energy market will likely continue to exert significant influence on the Air Force's budget. Each 10-dollar increase in the price of a barrel of oil equates to a 600-million-dollar increase in fuel costs to the Air Force. In order to reduce its reliance on oil, the Air Force will continue to field innovative technologies to provide energy to its bases, reduce its logistical footprint and energy-intensive base infrastructure in the continental United States and elsewhere, and invest in research and development of transformative propulsion systems for future platforms.

Ensuring the Future

Indeed, I encourage you to address these challenges head-on during this conference and beyond, as your thoughts will help to ensure that we continue to optimize our contributions to the Joint team. In addition to evaluating the enduring contributions that I have already covered, we must also continue to address the growing demand for near-real-time ISR from our remotely-piloted systems, as well as the continued requirement for timely airlift and air



refueling. Approximately 75 percent of our Predator-class unmanned aircraft are currently deployed; and, we continue to surge more into Afghanistan and Iraq, to remain on track toward 50 combat air patrols by the end of 2011, adding another 300,000 or so flying hours to the 600,000 hours that we already have accumulated. Our best shooters on the ground have come to rely on remotely-piloted aircraft, for the unprecedented and unmatched situational awareness that these remotely-piloted systems provide.

And, what better, more current example of rapid air mobility is there, than the ongoing humanitarian operations in Haiti? As the President has unambiguously stated, the United States will continue to be steadfast in its disaster response. I am extremely proud of our Airmen, who immediately lent their substantial expertise to help the Haitians regain air traffic control, and manage their airfield operations in Port-au-Prince and elsewhere, enabling U.S. C-17s and C-130s, and aircraft from a host of other nations, to rapidly deliver vital lifesaving and life-sustaining emergency supplies – some by aerial delivery of much-needed water and rations. Yet again, in critical moments, American airpower has made, and will continue to make, a significant difference. This, I am certain, will be a recurring – and appropriate – theme throughout this conference.

Conclusion

As you listen to the impressive lineup of speakers at this conference, I would ask that you frame their contributions as I have presented them here. Our Air Force has the following overriding imperatives: to increase our capabilities, to decrease our vulnerabilities, and to enhance our integration with our Joint and Coalition partners.

In the area of increasing our capabilities, I need ideas about how we can better guarantee the credibility and viability of our components of the Nation's nuclear forces. Passing inspections is not good enough; we need to explore how these forces can be best postured for a very different, highly complex deterrent environment in the coming years. We should also carefully consider the way ahead for the next generation of long-range and persistent-strike and



ISR platforms, to include the many tradeoffs associated with such platforms. Is there a better way to acquire the next generation of these systems? What are the key tradeoffs between manned and unmanned, and how do we expand our low-observable advantage? Additionally, we must explore how we can better prepare ourselves to operate in opposed network environments, where our communications and data link capabilities will be challenged. We have spent the last two decades optimizing network systems for maximum information flow. Perhaps we need to explore how to command and control in bandwidth-constrained environments. And what might we be missing in counterland operations? It is likely that we will need to move to the next level of target discrimination, where the risk of collateral damage is high, or to explore how to better disable mechanization, effectively dismounting enemy formations or even high-value targets, and making them more vulnerable. Finally, we must carefully consider how we can better posture our forces and basing structure around the world, to ensure that we have the access that is the lifeblood of U.S. power projection.

In the wider area of decreasing our vulnerabilities, we should reflect on how we can reduce our reliance on GPS and petroleum. The global value of GPS will endure, but our forces must be able to operate in GPS-denied environments in the future. You can help us realize that vision. Likewise, the logistical and operational vulnerabilities, posed by our petroleum dependence, must be mitigated. That will be a long-term project, but our Air Force must continue to squarely address this issue rather than wait for someone else to provide an answer. While these are two examples, we must ensure that no one system or commodity becomes a single point of failure, and that we are adequately diversified.

Last, we must consider all the ways in which we can better our partnerships with our Joint and Coalition partners, and provide more synergistic effects for our national security. Our new cooperation with the United States Navy, called "Air-Sea Battle," will be a model for addressing the challenges posed by the increasing interdependence of the global commons of



air, sea, space, and cyberspace. Admiral Roughead and I are committed to making our organizations face the tough issues, and to forging a new kind of integration that overcomes decades of inertia. You can help us take that effort to a whole new level.

I am grateful that you committed your time to be here with us for these next two days. We commissioned this conference to jump-start our look to the future, and to re-energize a Service with a proud heritage of innovation. We cannot do that without the active participation of those who understand the critical importance of the United States Air Force to the future of our common defense.

I want to thank you again for the opportunity to share these views with you, and for your efforts at this conference and beyond. Your contributions are critical to our national security, and I am honored and humbled to partner with you, in singular and dedicated service to our Nation. Thank you.