The Air and Space Nation is in Peril

By Colonel Philip S Meilinger

The function of the Army and Navy in any future war will be to support the dominant air arm.
(Gen James Doolittle)

This is a good news, bad news story. The United States is the world's first and only air and space nation. That fact is evidenced in our dominance of air and space technology and infrastructure, as well as in the future visions shared by our political, economic, military, and cultural leaders. This domination has important implications for our national security.

Unfortunately, many Americans have come to view air and space dominance as their birthright. It is not, and troubles are brewing, so we must take steps now to ensure our dominance in the future.

Americans have always looked to technology to ease their problems, so they took naturally and quickly to air and space power — the epitome of advanced technology. America was the birthplace of aviation, and it is now difficult to imagine life without our television satellites, cell phones,

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Internet, and air travel. Indeed, US airline passenger traffic has tripled over the past 25 years (*fig. 1*).

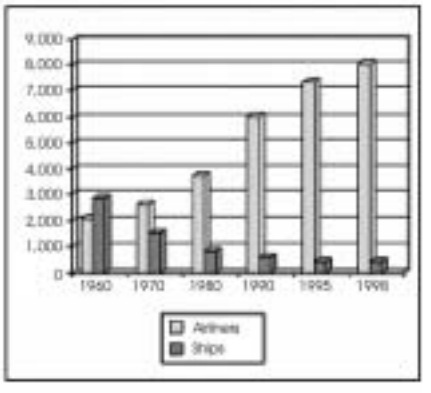
Figure 1. US air-passenger growth (From *National Transportation Statistics 2001*, 'US Air Carrier Aircraft Departures, Enplaned Revenue Passengers, and Enplaned Revenue Tons' [table 1-35], on-line, Internet, 17 January 2003, available from

http://www.bts.gov/publications/nts/index.html

Speed is the engine of commerce and economic growth. Rapid means of transportation have been essential for nations seeking economic dominance.

The rise of Britain in the 18th century was based on global trade carried by its large merchant fleet, which in turn was protected by the Royal Navy, the world's largest and most powerful. By the beginning of the twentieth century, the United States was also a maritime power, possessing a sizeable merchant fleet and navy.

As the 20th century progressed speed became synonymous with aircraft, and expanding American aviation began to push out the ship. Over the past 40 years, the growth of the US airline industry has been dramatic, in contrast to the decline of our shipping industry. Since 1960 the number of airliners has quadrupled (and aircraft have more than doubled in size), while the size of the US merchant fleet has dropped 84 percent, a mere two percent of the world's total (*fig. 2*).



It is ever more essential that the United States maintain strong public support for its actions. This in turn means we must be extremely careful about both inflicting and sustaining casualties

Figure 2. Airlines versus merchant ships (From *National Transportation Statistics 2001,* 'Number and Size of the US Flag Merchant Fleet and Its Share of the World Fleet' [table 1-20], on-line, Internet, 17 January 2003, available from http://www.bts.gov/publications/nts/index.html)

In addition, airport expansion is under way at many airports because airline passenger travel is expected to double over the next decade. As for cargo, 95 percent of the world's air-cargo capacity resides in Boeing airframes, and the value of goods shipped is telling. In 1997 the average pound of cargo travelling by boat was worth seven cents; by rail it was 10 cents, but by air it was $25.59. When Americans have something important and valuable to ship and it needs to get there quickly, they send it by air.

Air and space trade has significantly increased over the past several decades. In 1999 America's air and space industry contributed $259 billion to the nation's economy. The black ink in the air and space balance of trade rose to over $32 billion in 2000, making it the largest net exporter in the US economy (*fig. 3*). At the same time, the *overall* US trade balance has been negative for 27 of the past 30 years, and the deficit now exceeds $250 billion annually. Given these statistics, it is apparent that the United States has now become an air and space nation — indeed, *the* air and space nation.

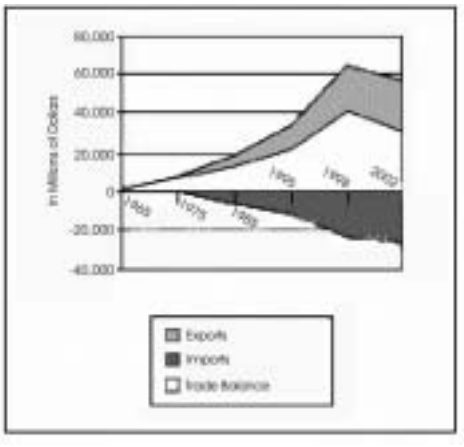


Figure 3. Air and Space Imports/Exports and Balance of Trade (From Aerospace Industries Association, *Year-End Review and Forecast,* 'Aerospace Balance of Trade' [table 6], on-line, Internet, 17 January 2003, available from http://www.aerospace.org/stats/yr_ender/tables/2002/table67_2002.pdf)

One must remember that America once led the world in other transportation technologies, but over the past two centuries, it has relinquished leads in railroads, shipbuilding and automaking. The US share of the world auto market, for example, has fallen from 48 percent to 15 percent over the past 40 years. We cannot allow our lead in air and space to evaporate similarly.

National security and air and space

Just as the Royal Navy defended British economic strength over a century ago, so do our air forces

protect our economic security. This is especially true because military strategy has evolved so dramatically over the past decade. The basic factors that shaped our geopolitical environment during the Cold War era have changed. The Soviet threat is gone, but other threats and other commitments remain. In fact, US military deployments have increased fourfold while the size of our military has shrunk by 40 percent. The character of these engagements has also altered. It is ever more essential that the United States maintain strong public support for its actions. This in turn means we must be extremely careful about both inflicting and sustaining casualties. Our military campaigns from the Persian Gulf War to Afghanistan have been marked by remarkably low losses, and the increasing use of precision weapons has limited civilian casualties and collateral damage, essential to maintaining worldwide public support.

It is obvious, however, that if such sterilized warfare is our goal, then certain types of strategies, tactics, and weapons are more desirable than others. Precision or non-lethal weapons delivered by air platforms — ideally either unmanned, unseen, or flying beyond the range of enemy fire — are the instruments of choice. To be sure, the process of identifying, tracking, and destroying mobile targets — tanks, trucks, and terrorists — remains one of our most difficult challenges, but this problem is being addressed through the use of a combination of space-, air-, and land-based sensors tied to strike aircraft by satellite.

It would be foolish for our leaders to think that air and space power could be effective in any crisis, but it has now become their weapon of first resort. The American people intuitively realize this: recent Gallup Polls reveal that 42 percent of those surveyed believe the Air Force is the most crucial arm of our national defense, and a like number believe it should be built up to a greater extent than the other services.

Just as our commercial air fleet is the largest and most modern in the world, so too is our military airpower. Our superiority is even greater than a comparison of the number of US military aircraft to the totals of other leading countries would indicate (*fig. 4*). Although China has a large supply of aircraft, most are obsolescent, including over 4,500 Vietnam-era MiG-17s, -19s, and -21s. Certainly, quantity has its own quality, but most of the Chinese air force would stand little chance against

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a frontline adversary. Similarly, Russia's air force has atrophied dramatically over the past decade. Once the pride of the Soviet state, much of this vaunted air force now sits unused.

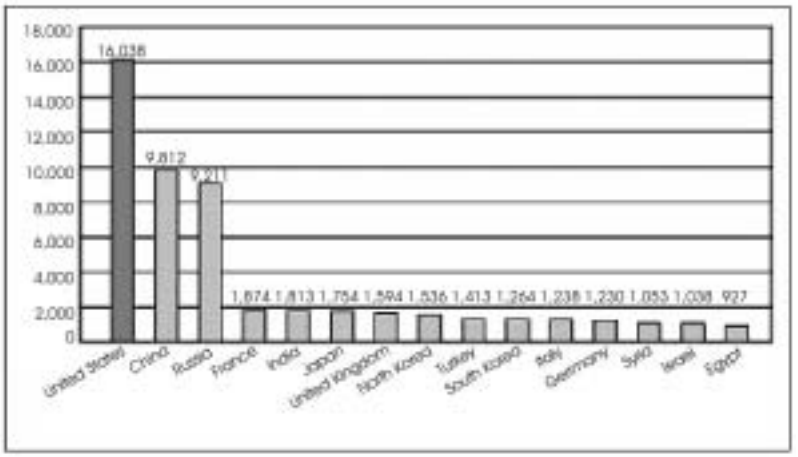

Figure 4. Leading nations in total airpower (From 'World Military Aircraft Inventory', *Aviation Week and Space Technology*, 13 January 2003, 257–76

Examining the *types* of military aircraft comprising the world's air forces is also revealing. The majority of combat aircraft worldwide consists of short-range fighter-bombers, such as the F-16, Mirage 2000, and MiG-21. The United States has nearly 4,000 such aircraft but has far more capability than that. Our airlift and aerial-tanker fleets allow us to project power anywhere in the world on short notice. The United States possesses the vast majority of the world's large military cargo aircraft such as the C-17 and C-5 while also having four times more tankers than the rest of the world combined. Tankers turn our tactical fighters into strategic bombers. No other nation has such an impressive capability to project power and influence. China, for example, has fewer than 50 modern cargo aircraft and virtually no aerial-refueling capability.

Our dominance in space is equally compelling. At present, approximately 550 operational satellites are in orbit. Nearly half of those were launched by the United States, and approximately 100 of them have military missions. In addition, the Global Positioning System's constellation of 28 satellites provides precise geographical data to users all over the world. In contrast, Russia now has only 90 operational spacecraft, and much of its space infrastructure — its missile-launch detection system, for example — is moribund. Although China can be expected to become a space competitor — it is currently working on an anti-satellite system — it has launched an average of fewer than four satellites per year over the past decade.

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Within the US military services, one finds an increasing reliance and emphasis on air and space power. According to an old saying, if you want to know what's important, follow the money. In the American military, that trail is clear. The backbone of the Navy is the aircraft carrier, which costs over $5 billion each (without its aircraft and support ships), and the Navy spends nearly as much on aircraft each year as does the Air Force. The top funding priority of the Marine Corps is the tilt-rotor V-22 cargo plane, which will cost $85 million apiece. The Army has major production and modernization programs for Comanche, Apache, and Black Hawk helicopters that will total $70 billion. Over the past decade the Army has spent more on aircraft and missiles than it has on tracked combat vehicles. In sum, over 60 percent of the US defense budget is devoted to air and space forces. In fact, a comparison of our four air arms with those of the rest of the world shows that each *individually* is greater than the military air assets of most major countries (*fig. 5*). The qualitative superiority of American aircraft makes our air and space dominance even more profound.

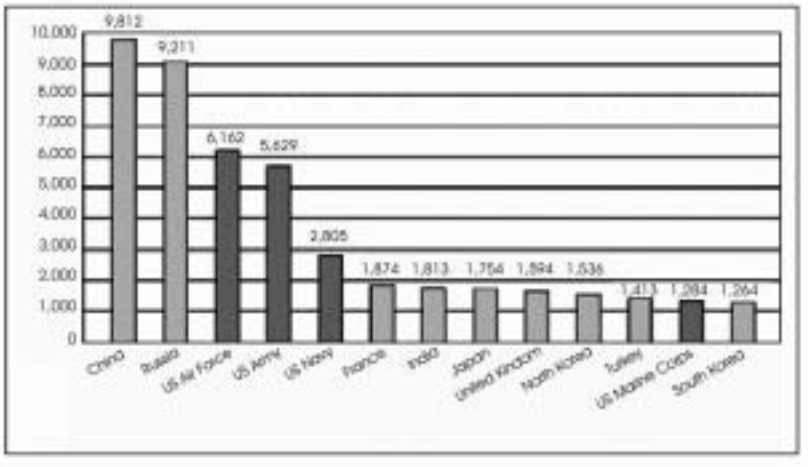

Figure 5. US airpower versus the world (From 'World Military Aircraft Inventory', *Aviation Week and Space Technology*, 13 January 2003, 257–76)

The reason for this emphasis on air and space power among our soldiers, sailors, and marines is their realization that military operations have little likelihood of success without it. It has become the American way of war. The major disagreements that occur among the services today generally concern the control and purpose of air and space assets. All of them covet those assets, but their differing views on the nature of war shape how they should be employed. Thus, we have debates regarding the authority of the joint force air component commander, the role of the corps commander in the deep battle, the question of which service should command space, and the question of whether the air or ground commander should control attack helicopters. All the services trumpet the importance of joint operations, and air and space power increasingly has become our primary joint weapon.

Air and space dominance also provides our civilian leadership with flexibility. Although intelligence is never perfect, our leaders now have unprecedented information regarding what military actions can or cannot accomplish and how much risk is involved in a given action. For example, our leaders understood far better than ever before how many aircraft and weapons would be needed over Serbia and Afghanistan to produce a specified military effect, weapon accuracy, collateral damage that might occur, and risk to our aircrews. This allowed our leaders to fine-tune the air

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campaign, providing more rapid and effective control than previously.

Other factors affect the way we'll fight. One hears much talk today of 'transforming the military' to meet new threats. The Persian Gulf War, Bosnia, Kosovo, and Afghanistan — and, for that matter, Somalia and Haiti — indicate that traditional methods, weapons, forces, and strategy will often be inadvisable. Warfare has changed. Stealth, precision weapons, and space-based communication and intelligence-gathering systems are examples of this new form of war. Certainly, the human element in war can never be ignored. People make war, and all their strengths and weaknesses must be considered. Yet, it would be foolish not to exploit new technologies that remove part of the risk and human burden in war. It is not always necessary for people to suffer. Air and space power permits new types of strategies that make war on things rather than on people and that employ things rather than people. It capitalizes on the explosion in computer, electronic, and materials technologies that so characterize the modern era. This is America's strength — one that we must ensure.

Dangers ahead

The terrorist attacks of 11 September 2001 (9/11) served as a wake-up call. Problems simmering at or below the surface for several years have now burst forth. The shutdown of air traffic after 9/11 stranded thousands of travelers and disrupted business. Things are still far from normal. Perhaps the greatest challenge facing the air and space nation today is conceptual. Although Americans have become dependent upon air and space and although our uniformed leaders realize the domi nance of air and space power in military operations, they have yet to think through its implications or ways of maintaining its momentum.

Air and space power is not merely a collection of airplanes or spacecraft, although those assets are certainly essential. It is not even the combination of those machines with an effective command and control network and intelligence-gathering capabilities. Rather, air and space power is the totality of our military air and space assets from all the services; our commercial airline industry and the pilots and mechanics who comprise it; our commercial air and space industry with its thousands of engineers and designers; the massive airport and airways structure stretching across the nation and, indeed, the world; and our codified doctrine on how all this power should be employed. All of these facets are essential for the United States to remain the air and space nation.

One problem is a tendency to focus on individual services and weapons or specific airport and air-traffic-control problems, thus failing to see air and space power in the broadest sense. Attempts to look at parts of the problem — 'tactical' aircraft, airlift requirements, or air-traffic-control sequencing issues — are limited by their myopia.
The tactical-air debate, for example, never discusses attack helicopters — their cost, vulnerability, or role in conjunction with fixed-wing air assets. Similarly, airlift requirements are tied to Army deployments that may or may not be relevant in the future. Questions remain to be asked. How does one measure the relative value of land-based versus sea-based airpower, or rotary versus fixed wing? What are the trade-offs between the use of air and space power versus ground troops or maritime forces? In an even broader sense, how do we articulate a vision

for all of our air and space assets, military and civilian? How do we ensure the viability and superiority of our industrial base and the competitiveness of our commercial airline companies?

Over the past few years, we have heard references to a 'crisis' in the American air and space industry. Despite America's dominant position, concerns need to be confronted. Funding cuts during the 1990s have left the Federal Aviation Administration (FAA) facing a backlog in modernizing equipment and software. Although its budget has recently been increased, most of the funding is going into security, not new air-traffic-control equipment. Our scientific and engineering force is graying: the average age of the US air and space worker is nearly 50 and over half of that force will be eligible to retire during the next six years. The profitability of airlines is down: they sustained huge losses in 2001 due largely to 9/11 and the subsequent requirement for expensive new security procedures. After the attack, passenger travel dropped 60 percent, and over 60,000 people have lost their jobs in the industry. Passenger loads are not expected to return to normal levels in the near term.

Less travel means fewer flights and aircraft sales are down, and nearly 300 civil cargo aircraft now sit in storage in the desert. Total cargo traffic worldwide fell an unprecedented 9.7 percent last year, billed the worst in the history of air transport. In space only 60 launches took place worldwide in 2001 — the lowest number since 1962 — and US commercial space exports were 75 percent below 1998 levels. Also, international competitors such as Airbus are garnering a greater market share of a field traditionally dominated by American legends such as Boeing, Lockheed Martin, and McDonnell-Douglas. Although Boeing is still the top air and space company in the world, its lead is shrinking, and the European Aeronautics Defence and Space Company has pushed Lockheed Martin out of the number two slot. Industry analysts continue to maintain that the long-term future of air and space is bright, but for the short term, major problems need to be addressed.

Spending on air and space research and development is down nearly 20 percent in the past decade, and the Bush administration has proposed cuts in research of $58 million at the National Aeronautics and Space Administration and $20 million at FAA for 2003. In addition, airline stocks are down; defense spending as a percentage of gross domestic product is three percent, a post–World War II low (*fig. 6*); employment in the US air and space industry has dropped by 600,000 people over the past decade (*fig. 7*); the US share of the world air and space market is down 20 percent over the past 15 years; the number of technology graduates seeking a career in air and space has fallen by 57 percent since 1990; and the air and space industry's net debt is up. US Airways recently declared bankruptcy, and United Airlines has announced that it might have to file for Chapter 11 as well. How can we reverse these trends?

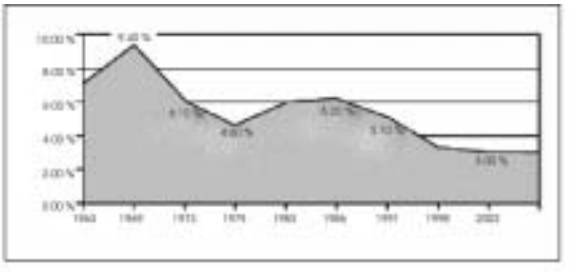

Figure 6. Defense outlays as a percent of gross domestic product (From Tamar A. Mehuron, 'The Defense Budget at a Glance', *Air Force Magazine*, September 2001, 78)

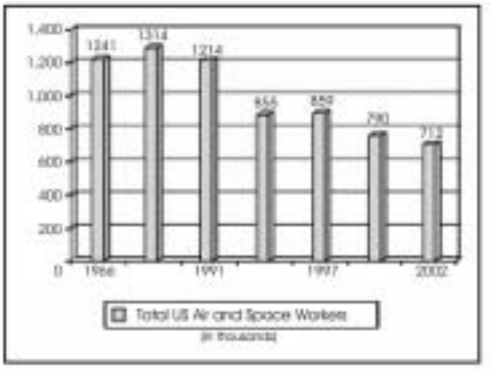

Figure 7. Employment in the US air and space industry (From Aerospace Industries Association,

The F/A-22, the Air Force's new air-superiority fighter, only recently received congressional approval for production. The F/A-22 was designed 20 years ago

Year-End Review and Forecast, 'Aerospace Related Employment' [*table 9*], on-line, Internet, 17 January 2003, available from http:// www.aia-aerospace.org/stats/yr_ender/tables/2002/tble09_2002.pdf)

First and foremost, we must conduct a broad-based examination of all aspects of the air and space nation. Congress took the first step by establishing the Commission on the Future of the United States Air and Space Industry. This blue-ribbon panel of industry and financial experts and former government officials was chartered to study the health of the air and space industry and infrastructure in the United States, both military and civilian , identify problems and propose solutions. Their final report was published in November 2002 and re-identified several problems and highlighted others. They noted, for example, that the World Trade Organization has come down

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hard on the US air and space industry for 'illegal export subsidies' that, if uncorrected, will cost the United States over $4 billion in fines per year. At the same time, American corporations complain that European value-added taxes are a form of government subsidies that are unfair to the United States. These are the types of economic issues that need to be studies at the cabinet/congressional level. Partly as a result of the commission's findings, Sen George Allen (R-Va) and Sen Chris Dodd (D-Conn) have introduced legislation such as the Aeronautics Research and Development Revitalization Act of 2002 to help rectify some of the industry's problems.

Overcrowded airports and late departures are becoming endemic. Herb Kelleher, the retired head of Southwest Airlines, argues that a mere 'fifty miles of paved highway', essentially 30 new runways nationwide, will solve the airport overcrowding problem.[1] Even if his claim is true, it too easily ignores the task of building the ramps, terminals, parking garages, and so forth that must accompany the new runways. So the solution is not easy, given environmental concerns and debates over the use of valuable real estate. Nonetheless, it is important to realize that Kelleher's proposal would require someone with both vision and persistence to implement it. The American Institute of Aeronautics and Astronautics has called for presidential action, a commitment similar to that made by Dwight Eisenhower in the 1950s to build our national interstate highway system.

As for military air and space power, the problems are also daunting. Since taking office, Defense Secretary Donald Rumsfeld has laboured to transform his department. The results so far are mixed. It appears that the Army's Crusader artillery system is dead, but there is little else to show in the way of 'transformation' over the past 18 months. Part of this is due to the war on terrorism which has generated a large boost in defense spending. These funds, plus the necessary focus on the war itself, have tended to defer and blur action on needed changes. Indeed, debate continues as to the best way to fight this war and with what weapons and organisations. Unfortunately, serious systemic problems must be tackled, and they can't wait for things to quiet down.

For example, the F/A-22, the Air Force's new air-superiority fighter, only recently received congressional approval for production. The F/A-22 was designed 20 years ago. The weapons-acquisitions process is broken. Over the past decade, virtually all of the numerous studies on the organisation of the Department of Defense cite the need for acquisition reform. It has not yet happened. Thus, Congress commonly delays, stretches out, and reduces the number of weapons to be purchased-ostensibly in an effort to reduce costs. In reality, this practice creates havoc with the manufacturers, while also driving costs through the roof. For example, Congress originally authorized the purchase of 750 F-22s. Over the past several years, it has cut the planned buy to 295, and further cuts are being discussed. Testimony before Congress reveals that these cuts have raised the unit price of the F-22 by over $21 million. That's real money. Similarly, recent congressional action restructured the Army's Comanche program, cutting the number of helicopters to be purchased. Although this move 'saved' $10 billion, it raised the chopper's unit cost to a whopping $60 million. We cannot afford to have the air and space star hitched to a Model T acquisition system.

The other danger lies in the realm of grand strategy. It became clear during the Persian Gulf War and operations against Serbia that our air and space strength not only exceeded that of our adversaries, but also exceeded that of our allies.

The vast majority of some key air and space assets — stealth, precision munitions, electronic jammers, intelligence satellites, tankers, and strategic airlifters — was provided by the United States. This made it very difficult to devise an effective and balanced air plan. Interoperability has been a goal of the North Atlantic Treaty Organisation (NATO) for decades, but it is now of even greater concern. If our strategy calls for increased reliance on air and space power and the continual quest for technological advances, this interoperability problem can only get worse.

At the same time, it is apparent that US foreign policy requires close relations with our allies. If we are to maintain the moral high ground, we cannot be seen as the 'Lone Ranger'. This was apparent in the aftermath of the 9/11 terrorist strikes. We must have the political top cover provided by either a formal alliance such as NATO or an *ad hoc* coalition, as existed during the Persian Gulf War. Clearly, the imperative to operate in an alliance/coalition will clash with our technical disparity relative to those allies. We must find a way to bridge this gap.

Conclusion

The United States is the world's first and only air and space nation. This is true for many reasons, but the most basic one is that we wished to be. We developed the technology, infrastructure, and mentality at great cost and effort to achieve our dominant status. The fact of this pre-eminent position is reflected in our political, economic, military and cultural lives. We must not take this dominance for granted. If we intend to maintain our position and make full use of the benefits that air and space power provides, then we must do certain things.

The United States must have a comprehensive plan to develop, improve, and coordinate the commercial and military aspects of our policy. We must stem the decline in our research and development efforts while rebuilding and expanding our air and space infrastructure and educational base. We must change the way we develop and buy our air and space technologies to take full advantage of new ideas and advances, ensuring that our equipment is not out of date before it is even fielded. At the same time, we must remember that we are part of a world community that looks to us for leadership. That means we need to cooperate, not dictate, and we must become true partners with our allies.

We must look closely at the fundamental principles and assumptions underpinning our military strategy and force structure. Too much of what our military does today is based on tradition. Old ideas and old ways may not work in the 21st century. Air and space power offers a cost-effective, rapid and discriminate weapon for our political leaders. Let us sharpen that weapon.

Note

[1] Herbert D. Kelleher, 'The Next Century of Flight', *Aviation Week and Space Technology*, 4 June 2001, 86.

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