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**DURING DRAWDOWN--AIRCRAFT  
AND THE  
U.S. INDUSTRIAL BASE**

With the long awaited outbreak of worldwide peace, this nation is once again evaluating our defense role. Considering the necessary long lead time for our modern, tactical/strategic aircraft, will we maintain a sufficient industrial base during drawdown? My bottom line--is positive--but we must proceed very carefully. The U.S. remains firmly committed to maintaining the strongest defense in the world. An evaluation of roles and missions for the services will lead to a complete reevaluation of necessary aircraft. We need to maintain surge capability in the event it becomes necessary--and it will.

This highly competitive worldwide market needs creative government guidelines that encourage innovation and technological superiority--the very traits that originally created this great American industry.

1993  
Executive Research Project  
DIS8

**During Drawdown--  
Aircraft and the  
U.S. Industrial Base**

**Sandra Sable**  
Department of the Air Force

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**DURING DRAWDOWN -- AIRCRAFT  
AND THE  
U.S. INDUSTRIAL BASE**

**Goal: Surge Capability**

Several times in the history of our country we have surged our national industrial base to defend ourselves and our allies. In this catchup mode our industrial base has been rekindled as rapidly as possible to produce necessary goods. Once again as the hostilities have subsided, the U.S. desired action is to quickly revert to more desirable peacetime activities.

Industries such as aircraft manufacturing do not easily surge or mothball. During the current military drawdown--with innovative thinking, planning and goal setting--the U.S. industrial base can be carefully preserved to maintain necessary capability and capacity for our future defense.

**Aircraft Industry History**

In 1903, the airplane was invented. By 1914, forty-nine aircraft were produced that year. In 1917 and 1918--during World War I--over 14,000 aircraft were made. While aircraft did not play a major part in World War I, it did set the stage for future

development with President Coolidge establishing the Morrow Board to investigate U.S. air power needs. The findings of this Board and other appeals, led to the passage of several pieces of legislation that helped maintain aircraft demand.

During World War I, airplanes had been recognized as a powerful offensive weapon. By the end of the war, twenty-four U.S. aircraft companies had been established. Three months after the armistice, the aircraft industry war strength had been liquidated. However, the true pioneers of the industry held on.

The Air Mail Act of 1925 encouraged commercial aviation and authorized the Postmaster General to contract for air mail service. The Air Commerce Act of 1926 gave the Secretary of Commerce the authority to establish airports, civilian air routes and navigation aids. The Department of Defense was authorized to procure over 1600 Navy aircraft and 1800 Army Air Corps airplanes.

In 1927, Charles Lindbergh by bringing Europe closer, won the imagination of the public and set the stage for the birth of the aircraft industry. His daring solo flight caused us to focus on the future global impact of this great innovation.

The passage of the Air Commerce Act in 1927 established a five year program for the Army and Navy to procure planes. For the

first time in history, in 1928 aircraft manufacturers produced more commercial planes than military.

The 1929 Depression caused the fledgling industry to contract by forcing many manufacturers out of business. However, using selective procurement policies, the government managed to keep the aircraft industry alive with five year military contracts. Several of the manufacturers received all the orders for military aircraft as well as the government air mail business.

The anti-trust atmosphere in our country made these arrangements suspect. The interlocking business between the major air transport companies and large aircraft manufacturers necessitated change. The Air Mail Act of 1934 forced the legal separation of the air transport companies from the aircraft manufacturers. Our government displayed concern for adverse publicity in dealing with these companies and challenges of favoritism. Reflecting this attitude, the Civil Aeronautics Act of 1938 reorganized and divided into distinct transport and manufacturing companies such as:

**Manufacturers**

United Transport Division  
American Airways of Aviation Corp  
General Motors Group

**Transport**

United Air Lines  
American Air Lines  
-Eastern Air Lines,  
-Western Air Express  
-Transcontinental

During these years the American public was well aware of government concern to protect the well being of our nation. With the world events unfolding, war began to emerge once again. By the end of this decade, the aviation companies had once again gained the spotlight as builders of our most spectacular means of defense. The nation must arm again. Aviation was now considered as a vital link to our nation's defense.

This industry had been fostered by the government to assure that this vital form of defense could be relied on in times of war. This cornerstone is woven throughout the history of this industry. In 1935, the Federal Aviation Commission reported:

"It has always to be remembered that this industry is peculiar in that it has essentially but a single customer."

#### **WORLD WAR II IMPACT**

With the advent of World War II, the handmade process tooling techniques needed to be modernized to allow massive aircraft production. While line production was being used for other purposes, the wartime aircraft demand requirements necessitated changing to this procedure. It improved the process considerably

by increasing the interchangeability of parts. Skillful use of organization became essential to maintain the smooth flow of production lines. Any change could cause a significant slowdown. However, the aircraft industry was rapidly changing their constantly improving designs. The line production methods quickly became more flexible to meet these design needs.

Maintaining the quality U.S. aircraft product became part of our proud heritage. With no competition, the aircraft companies joined together to create the volume of needed aircraft. Despite labor strikes during World War II, the work effort made by both labor and management resulted in tremendous capability for this country--and undoubtedly, profit for the aircraft manufacturers as well.

### **PEAK PRODUCTION**

The peak production year was 1944. As early as 1943, American aviation was being heralded as the greatest single industry in the world. Between 1941 and 1943 over 163,000 planes were built. As peace was achieved, these heady production statistics were soon to end.

The efficiency developed by these production methods was significant and never to be lost again. By mastering these

improved techniques, a new more efficient industry had been born. The prime contractor had developed a system of subcontracting to support the increased orders. Scheduling became crucial as lives could be lost if orders were delayed. The need to support the war front was uppermost to all.

## **AFTER WORLD WAR II**

Lessons from World War I were recalled as World War II began to end. The government had protected the fledgling aircraft industry by providing on going contracts with the air mail grants and other means. The desire to maintain a powerful, responsive defense system meant that the aircraft industry must survive.

Now widely accepted by the public, the airplane must again continue to be maintained as a viable defense weapon for this country. Annual government appropriations were provided to the Services to maintain this effective U.S. air superiority.

From a high of sixty-six aircraft companies during the war, only sixteen companies emerged. The invention of the jet engine had made many companies obsolete without extensive retooling. By 1949, the industry had reverted back to the major prewar producers. These producers had formed the backbone of this industry.

As the Korean War began, differences were obvious in the industry. For the first time, companies began to put funding into new facilities to develop modern infrastructure. The Defense Production Act of 1950 permitted amortization of new investment over a five year period for tax purposes. This encouraged modern infrastructure improvements in the assembly line procedures, equipment and plants.

The technical innovation of the missile questioned the need for airplanes. Were they to become obsolete? The production mix of the industry did change, but with quick innovation, aircraft are still vital for delivery and protection.

#### **TODAY'S REQUIREMENTS**

The dismantling of the former Soviet Union has currently eliminated our previous Cold War adversary and has significantly reversed any U.S. military weapon's expansion.

Additionally our society's pressure for resource reallocation from defense to other pressing national social needs has been recognized as valid. Therefore weapon systems procurement has been reduced, delayed or curtailed as a reevaluation of our future military needs is conducted. Alternatively, the need to

assure a crucial defense industrial base--for our purposes, the aircraft industry--necessitate some hard decisions must be made. Although our defense outlays turned downward in 1986, significant further reduction will occur.

As defense contractors struggled through the immediate shock of postwar adjustment following World War II and again in 1950 after Korea, lessons were learned. The Department of Defense did maintain aircraft industry capability through on-going appropriation bills. However, the primary alternative use for this industry was the civilian airline market. Some companies tried to further diversify to nonmilitary goods such as industrial electronics, small gas turbine engines, nuclear reactors and civilian space program support.

In an article on "Downsizing the Defense Companies", Murry Weidenbaum explains the difficulties of defense contractors working to attain their niche in a civilian marketplace.

"A common set of themes arises from studies of the diversification experiences of military contractors. The major defense companies are very special business organizations. They are very good at what they are set up to do--design and produce state-of-the-art weapons and comparable civilian systems--but they have, for the most part, failed at commercial diversification. They differ, in both capabilities and shortcomings, from typical commercial companies in terms of technology, organization structure, marketing and financing."<sup>1</sup>

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<sup>1</sup>Downsizing the Defense Companies, By Murry Weidenbaum, pg 46.

These firms do offer significant design and engineering capabilities, intricate weapon system integration skills and technical abilities that assure they need to survive as a national asset during needed response times. Although mergers, consolidations and closings must occur, the industrial base must be nurtured to meet our changing future defense requirements.

### **INTERNATIONAL STAGE**

As this industry is fully global in scope, the U.S. technological leader status is being challenged. For the first time since World War II, companies abroad are serving as very real competitors in aircraft production.

International joint ventures with a range of relationships continue to grow on the worldwide market. The primary reasons are sharing the high developmental costs and high risk inherent in aircraft development. Equally important is access to advanced technology and future foreign market penetration.

The U.S. policy on strictly enforcing technology transfer--for both security and economic reasons--further restrict alliances with other foreign firms. Additionally, this country restricts sales to some third world countries--further limiting our worldwide competitiveness.

## **NEW ALLIANCES**

In recent years coproduction/codevelopment teams have been allowed. The Advanced Tactical Fighter, the Advanced Technical Bomber and the V-22 Osprey represent this new phenomenon--which has been prevalent throughout Japan and Europe for over 30 years. Sharing the high costs and risks have finally encouraged the U.S. firms to reexamine these potential approaches.

According to a recent study by Booz, Allen and Hamilton, a management consulting firm:

"The industry will see rampant consolidation throughout the 1990's, and by 2000 fewer than half of the current contractors will remain independent or leaders in their field."<sup>2</sup>

Having too many competitors in a shrinking market, wastes our resources and forces contractors out of business.

## **INDUSTRIAL CAPABILITIES**

Our crucial defense technology and industrial base consists of two principal functions:

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<sup>2</sup>"Pentagon's Cuts Are Forcing Big Contractors to Consolidate", New York Times, Nov 27, 1992, pg D2.

- 1) fielding effective military systems during peacetime
- 2) meeting those increased requirements in wartime<sup>3</sup>

To meet these specified goals of fielding effective military systems and meeting increased requirements, design and engineering capabilities must be carefully nurtured. According to Aviation Week, October 1992, seven U.S. companies now possess the capabilities to develop a new military aircraft. They are:

- Boeing's Military Airplane Div
- General Dynamics Ft. Worth Div .
- Grumman's Aircraft System Div
- Lockheed's Aeronautical Systems Co and Advanced Development Co
- McDonnell Aircraft Co and Douglas Aircraft Co
- Northrop's Aircraft Div and B-2 Div
- Rockwell's North American Aircraft<sup>4</sup>

In February 1993, General Dynamics Ft. Worth Div. sold their prized tactical aircraft division to Lockheed.

### **SURVIVAL TECHNIQUES**

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<sup>3</sup>Redesigning Defense, Congress of the U.S., Office of Technology Assessment, pg3.

<sup>4</sup>"U.S. Military Aircraft Design Base Eroding," Aviation Week, Oct 19, 1992, pg 22.

The Chairman of General Dynamics, Mr. William A. Anders, described their corporate strategy for this divestiture as not to liquidate but to maintain a critical mass in their core business. Actually General Dynamics will have only three existing product lines--armored tanks, nuclear submarines and space launch vehicles. If you follow Mr. Anders' reasoning for protecting the critical mass of the core business, General Dynamics is now completely out of the aircraft production business.<sup>5</sup>

A crucial aspect of the General Dynamics tactical aircraft division sale to Lockheed is its impact on the Advanced Tactical Fighter, the F-22. Due to other aircraft program cancellations, the F-22 corporate overhead rate costs were significantly increasing. While the F-22 program was being well managed, these escalating costs could have threatened the very existence of the program. During the negotiations attempting to lower these overhead costs, the General Dynamics/Lockheed deal was made. With General Dynamics no longer a team contractor, their corporate overhead bill will not be charged to the F-22 program--thereby reducing that cost.<sup>6</sup>

The remaining six companies able to develop new military aircraft are currently evaluating the General Dynamics strategy. Where

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<sup>5</sup>"General Dynamics' Selling Strategy," Fortune, January 11, 1993, pg 56-57.

<sup>6</sup>Ibid.

are they going in the next decade? In a short period of time these companies will obviously look very different. Further consolidation will be likely.

Product divestiture of any low-yield operations of these companies is another effective means of reducing costs. A good example is Lockheed's sale of its original corporate headquarters in Burbank, CA. This sale allowed resources to be redirected to the main corporate business--aircraft production.

Downsizing by each company is imperative. Vast numbers of aircraft industry personnel--both management and production--have been laid off. These employees tend to have better paying positions than the average commercial industry employee. Many of these positions utilize technical education, training and skills. While these attributes are the very reasons employees preferred the higher paying jobs, they do not easily transfer to new positions in the commercial sector.<sup>7</sup>

Over the past six years the total aerospace employment figures have declined by approximately 148,000 employees. Although this represents both the military and civilian sector, the military sector has incurred the larger share of reductions.<sup>8</sup>

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<sup>7</sup>Downsizing the Defense Companies, By Murry Weidenbaum, pg 51-52.

<sup>8</sup>Aerospace U.S. Industrial Outlook 1993, pg 20-1.

While these reductions represent tremendous impact on these employees, it is necessary if the industries are to survive. A smaller, more efficient workforce is essential to maximize resources in this beleaguered industry. The very nature of the business meant that with declining aircraft orders, employees must migrate to other types of jobs.

These companies also have expensive excess plant and equipment capacity. This overcapacity from the years of Cold War competition cause this industry to be overextended today. Every effort must be made to reduce these costs by using the most efficient methods possible.

To share the extremely high risks and costs in developing new aircraft, the entire industry is teaming as either partners or primes and subcontractors. The following table captures in part the entwined teaming nature of this industry:<sup>9</sup>

<b>AIRCRAFT</b>	<b>PRIME</b>	<b>TEAMMATE</b>
V-22	Bell	Boeing/Lockheed
RAH-66	Boeing	Sikorsky
AX	General Dynamics	MCDonnell Douglas/ Northrop

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<sup>9</sup>Grumman Slides presented to Aircraft Industry Class, February 5, 1993.

FS-X	General Dynamics	Foreign Mfrs
AX	Grumman	Boeing/Lockheed
ATA	Grumman	LTV/Northrop
JPATS	Grumman	Foreign Mfrs
AX	McDonnell Douglas	LTV
F/A-18	McDonnell Douglas	Northrop
B-2	Northrop	Boeing/LTV

### **TECHNOLOGY CONCERNS**

Maintaining technology dominance in the arms race is as essential today as it was during both the World Wars and the Cold War years. The global nature of today's aircraft industry makes this even more crucial. Effective strategy needs to be developed that assures the U.S. maintains this dominant position.

In order to preserve our technological lead in military aircraft, we must be able to design, produce and maintain effective aircraft that incorporate the latest technological edge.

As our defense requirements dwindle, the need for aggressive aircraft design teams erode to the point that creativity is impacted and teams disband. Planning for effective research and development funding is more essential than ever before. During this military drawdown time, design teams must be fostered to

continuously project their ideas and capabilities into future drawing board ideas. Research and development funds need to be earmarked to maintain these design teams in a ready status. Without these precautions, the future of our U.S. design capability is at risk.

Limited production capacity can be maintained by developing and fielding small quantities of aircraft that incorporate the latest improved prototype designs. These aircraft need only be built if the technology produced state-of-the-art advantages are necessary to maintain our dominant defense position. Production skills need to be sharpened by developing more effective, efficient processes.

#### **ALTERNATIVE METHODS**

The monopsony relationship the military aircraft manufacturers have with only one customer--the government--make the future of this industry more difficult. Our present business practice of preserving competition by seeking bidding between companies for future aircraft design, development and production is simply too costly.

Today military and commercial aircraft companies must be separate entities. Even though these companies may be within the same

corporation, completely independent companies are maintained. Our U.S. military procurement laws specify extensive, precise accounting and auditing procedures necessary to validate expenses and programs as aircraft proceed through the procurement stages. These excessive reporting requirements need to be minimized. Our government needs to bear more of the risk in developing new aircraft systems.

Another alternative could be to review the military contracting specifications to minimize the peculiarities of military requirements. Using as many similarities to civilian aircraft that are practical would significantly reduce the unique cost structure requirements necessary for military aircraft procurement.

Eliminating the need for separate overhead within corporations--for both military and civilian aircraft production--would be very effective by increasing productivity and reducing costs.

Dual use technology for both military and civilian aircraft needs further exploration by encouraging design engineers to develop innovative applications that can effectively be used for both purposes. Production lines could be developed to adapt more readily to necessary changes from one product line to another. By advance planning, careful attention could be given to tooling

the production line for ease in adopting these planned changes.

Our current military procurement procedures result in reduced productivity within this industry. If we combined aircraft production into one entity--as opposed to one military company and one civilian company accomplishing quite similar tasks--we can eliminate several duplicative layers within organizations.

### **OTHER APPROACHES**

Expanding our government sponsored research and development is another viable alternative. Today SEMATECH is an excellent example of supporting research and development for our national purposes. The SEMATECH concept could be expanded to encourage more government controlled research and development. These research findings need to be shared equally with firms seeking competitive development bids. The U.S. cannot rest on past accomplishments in the technology arena. We must assume that potential adversaries will be developing new technology that could negate our superior military position.

We must target the design segment of our aircraft industry to preserve our industrial base capabilities. Research and development can serve as a government laboratory that encourages innovative application in developing new aircraft and aerospace

technology.

Prototyping of a limited quantity of aircraft will be necessary to validate our newly developed technology. Advance planning could develop procedures for rapid expansion into increased production if desired or necessary due to emerging world events. Critical materials--such as titanium or special reconnaissance glass--need to be stockpiled and preserved for future contingency operations.

#### **INCREASED SCOPE**

The National Aeronautics and Space Administration (NASA) role could take a leadership position in preserving our crucial aeronautical industrial base. Future accomplishments in both aeronautics and space are essential to our national goal of maintaining military superiority. The Department of Defense is in an extreme reduction posture that would make these changes in aeronautics even more difficult to obtain.

Mr. Daniel S. Goldin, administrator of the National Aeronautics and Space Administration, said in a recent speech:

"An increase in aeronautic research could be the most highly leveraged investment government can make for the future of

the aeronautics industry and the whole economy."<sup>10</sup>

Acting as a spearhead, NASA could develop innovative changes in our legal system to encourage increased research and development incentives. The research findings need to be offered widely within the industry to create a new environment for improved exchanges of information. Anti-trust laws need to be reviewed to eliminate barriers between U.S. companies that would obtain more efficiency by sharing the risk of future development.

Many of our defense procurement laws were changed in the 1980's as the defense business was booming. These changes made the aircraft corporations assume more risk with greater competition for contracts. With the defense budget in upswing, contractors could still convince themselves that production business would be good and that bidding was worthwhile. Today these regulations are forcing this industry to reevaluate their position with many making the decision to exit. As the industry leader, NASA could help preserve an equitable balance of this industry for our necessary industrial base protection. We cannot afford to just rely on the industry survivors. Leading the efforts for new procurement regulations in the aircraft industry is timely and beneficial for our government while protecting critical elements of our industrial base.

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<sup>10</sup>"Aircraft Industry's Free Fall Poses Challenges for Clinton," The Washington Post, February 13, 1993, C-1.

## **TOMORROW'S VIEW**

The new Clinton Administration is keenly aware that the aircraft industry is in peril. At a recent town meeting, President Clinton stated he wants to set up a commission as follows:

"...to focus on how to rebuild the aviation industry in our country....People who work for Boeing, McDonnell Douglas and other subsidiary companies, how can we get more jobs?"<sup>11</sup>

While this focus is on the immediate problem of finding and retaining existing jobs, the U.S. policy must be careful when making changes that could be construed as protecting an industry. It would not benefit our economy or industrial base to protect or subsidize a declining industry. Valuable resources would be wasted. The U.S. has many examples of declining industry protectionism--such as agriculture, auto and steel manufacturing--that have not experienced beneficial results.

The aircraft industry must be revitalized by innovative approaches to future research and development with design team preservation. Accomplishing this challenge will not be easy--but our well being as a nation depends on our success.

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<sup>11</sup>Ibid.