



THE  
AEROSPACE  
INDUSTRY

*Today  
and  
Tomorrow*

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SPEECH BEFORE  
THE ECONOMIC CLUB OF DETROIT

BY KARL G. HARR, JR.  
*President,  
Aerospace Industries Association*

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**Karl G. Harr, Jr.** assumed the presidency of the Aerospace Industries Association on April 1, 1963. A 1943 graduate of Princeton University (Phi Beta Kappa), Mr. Harr served three years as a special intelligence officer in the U.S. Army. Following his military service, he attended Yale Law School, from which he graduated in 1948. A Rhodes Scholar, he received his Doctorate from Oxford University in 1950. After four years in legal practice, Mr. Harr saw extensive Government service with the Departments of State and Defense and, from 1958 to 1961, as a Special Assistant to the President of the United States.

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## THE AEROSPACE INDUSTRY

— *Today and Tomorrow*

BY KARL G. HARR, JR.

Reports of the aerospace industry's impending demise are, to steal a phrase, grossly exaggerated. I will discuss not the sick man at the party but the healthiest young man there — the one who offers the best promise for the party's success. I will discuss not the "problem" of the aerospace industry but the proven potential of that industry, both to be in the vanguard of, and to be an essential element of, the Great Society of the future. Pursuit of industrial excellence is both our trade and our mission, and this industrial excellence has applications virtually as broad as our society itself.

### INDUSTRY DEFINITIONS

I concede that probably — in fact, undoubtedly — no major segment of American industry is so little understood as is the aerospace industry. And, unfortunately, it is sometimes human nature to be down on what you are not up on. Because its many elements are somewhat loosely defined, it has been called by some a non-industry. Because of its close identification with many key government programs, it has been called a captive industry. Because so much of its enormous product volume does not appear in the commercial marketplace, it has been called an invisible industry. It

has been regarded as being purely a defense industry, notwithstanding its multi-billion-dollar sales in space hardware, and it has been regarded as being purely a government supplier, notwithstanding its multibillion-dollar commercial market. It has been subject to many other unsuccessful attempts at simple categorization.

Efforts to appraise its present and future — by security analysts, statisticians, investors, journalists and other commentators on the government-industry relationship, and even by research institutions — have inevitably come up against and often stumbled over the unique nature of this industry.

#### **UNIQUE PHENOMENON**

For today's aerospace industry does indeed represent a truly unique phenomenon in industrial history in almost every aspect. If one were to try to define it in one sentence, perhaps it would be most accurate to say that it is the industry which places at the disposal of the nation — both its public and its private sectors — the capacity to manage the research, development and production of the most technologically advanced product that is possible, and for whatever purpose desired.

Thus it is certainly not hard to understand when sometimes even very sophisticated attempts to appraise its future

fall into the errors generated as a result of judging it by standard economic and statistical criteria. Such criteria seldom have relevant application to the prospects of this unique industry.

At the outset as I try to look into the industry's future, it is essential that we all understand the principal factors — historical, present and future — that have produced and will continue to produce this uniqueness.

#### **TWO REVOLUTIONS**

First, the genesis and evolution of what is today's aerospace industry is a direct product of the nation's post-World War II history and is inextricably linked thereto. To oversimplify the pertinent portions of this history, World War II unleashed for the world, but particularly for the United States, two revolutions which have been gaining momentum ever since. The first of these was a form of economic revolution which saw the economy of the United States surge into new dimensions. The second was a scientific/technological revolution which saw all that had gone before in man's scientific history pale in comparison. The continued international tension after the war, which we have come to know as the Cold War, not only sustained but increased its pace.

World War II provided an extreme example of the explosive expansibility

of the industrial base of the United States. This expanded industrial base remained after the war to serve as a foundation for a general economic upsurge. But the only significant distinguishing feature between this World War II experience and the classical pattern of any non-military nation confronted with a wartime emergency was the astounding degree to which this mobilization was accomplished in so short a time span. It was not until the postwar period and the gradually hardening resolution of the terms of the Cold War that the factors which shaped our present form came into being. The United States, for the first time in its history, was neither at war nor at peace. The traditional cycle of rapid industrial buildup, followed by an equally rapid dismantling, offered no precedent to guide either government or industry. There were no applicable case studies or rules. Government and industry found themselves embarked on a long-range, perhaps indefinite, joint effort, and in an entirely new way. They were faced not only with meeting the needs, as determined by national policy, of the Cold War, but also with coping with and exploiting all the other potentialities of the technological revolution unleashed by World War II.

As the principal supplier of defense equipment, as the supplier of hardware

to the fastest growing element of commercial transportation, and as almost the sole supplier of hardware for the nation's greatest new adventure—the exploration of space—the aerospace industry was catapulted into and has remained in the forefront of these revolutions to a degree not even approximated by any other segment of American industry. Along the way it parted company, in certain key respects, with the rest of American industry.

#### **INSTRUMENT OF POLICY**

Against this backdrop developed all the problems, opportunities and forms which define the shape and nature of today's aerospace industry. For the aerospace industry has become and remains, in a very real sense, an instrument of national policy, not only in terms of the hardware directly provided the government, but also as it underpins the economic/technological advances in the private sector of our economy.

The moral? Simply that just as the nation's history over these past 20 years has determined this industry's history, so will the nation's destiny over the next 20 years determine this industry's destiny.

As of the immediate present, the industry produced by the past 20 years of history has certain fundamental characteristics which should be noted.

First, we are big. Measured in terms of employees, we are by a substantial margin the nation's largest industry. Measured in terms of dollar volume of sales, we are second only to the automotive industry. We are the nation's largest manufacturing exporter with more than \$1 billion of products shipped abroad annually, and this substantial figure may undergo a sharp increase in the near future. But, despite the fact that we produce all of the nation's commercial and private aircraft, approximately 85 percent of our products and services annually are sold to the government and thus paid for by the taxpayer.

#### **SYSTEMS MANAGEMENT**

Second, this is an extremely technically oriented industry. It has become tailored, in terms of both its needs and its capabilities, to the performance of technological miracles within the structure of the government contract. The companies which comprise this industry have become experts without peer in systems management. A corollary of this factor is that the industry has become the nation's principal industrial reservoir of technical talent, employing a fifth of the nation's scientists and engineers. These are the principal sources of our potential for the future; but they also involve some problems. Technological and systems management excellence have not



been purchased without some cost in the experience and organizational capability needed in the purely commercial marketplace.

#### **CAPACITY FOR CHANGE**

Third, a condition of the survival of aerospace companies has been development of an extraordinary degree of flexibility. The capacity to shift with change has been the hallmark of competitive success. As the pace of technological knowledge has accelerated sharply, as the potential capabilities of our nation's enemies have dictated that we vigorously exploit the technological opportunities afforded, and as national policy decisions constantly shift direction to accommodate these changes, this industry has had to be able to adjust and to adjust rapidly to quantum changes, both upward and downward, and to lateral changes of a major nature, in order to survive.

Fourth, our history has forced us to devise and enter into new dimensions of industrial technique. Developing and mastering new concepts of precision is one example. When your task is to produce a missile that will land within a few hundred yards of a target 9,000 miles away, or to orbit men and then launch them to the moon and back, or to carry commercial passengers safely at Mach 3 speeds, there is no margin for error. We deal in manufacturing tol-

erances of only millionths of an inch. We deal in revolutionary new concepts of manufacturing environment in which dust, temperature change, and even human perspiration cannot be tolerated.

#### INDUSTRY TREND

Fifth, contrary to the normal commercial enterprise, the aerospace company has little or no control or even influence over the size or nature of its major market. In effect, its marketing consists of saying to its customer, "Tell us what esoteric piece of hardware with impossible performance characteristics you need next—anything they (our competitors) can do we can do better." Of course each such company has a few key ideas of its own up its sleeve, the proprietary product of its own research and development, in which it has invested on the gamble that they will lead the way. The trend in this direction is accelerating. National defense and space requirements are becoming larger, more complex and more specific, but fewer units are needed. And the rabbit is put into the hat at the government end.

Sixth, we both enjoy and suffer a unique relationship with the government. Obviously, we must live with a heavy dose of government involvement in our affairs. Where the government is the customer, where the taxpayer's money is the source of funding, and where na-

tional programs, including vital security programs, are at stake, a substantial degree of such involvement is to be expected. The only point at issue is the proper degree. If excessive, it can readily smother and destroy those very assets of free enterprise management for which such management was selected to do the job. Again, having no historical precedent to fall back upon, the optimum degree of government surveillance and control remains an open and constantly contended point.

#### **COOPERATIVE EFFORTS**

At the same time, however, obviously a high degree of *cooperation* between government and industry is equally essential to the accomplishment of the unprecedented technological feats required by our defense and space programs. Although the government and the contractor must scrupulously maintain the integrity of their arm's-length posture, having separate responsibilities in that respect, nevertheless they are daily engaged in thousands of interfaces throughout the nation which require cooperative effort toward a common objective — the production of the best possible hardware in the most efficient manner.

I could go on at some length listing the distinguishing aspects of this industry. It is a low-profit industry. It is a

highly competitive industry and daily growing more so. It must operate in a goldfish bowl under the closest scrutiny of the public, the Congress, the executive agencies of the government and the press. It must not only work at the forefront of scientific and technological knowledge, it must advance those frontiers in order to survive. It plays for unique stakes, in that its product underpins not only the safety of our traveling public but also our national security and our national prestige.

So, this industry is important to each citizen in several fundamental ways: as a substantial element of the national economy, as a substantial user of tax monies, as the principal industrial instrument of this nation's defense and space effort, and as the principal vehicle for the exploitation and application of the scientific/technological revolution for whatever uses, governmental or private, the future may bring.

#### **PECULIAR PROBLEMS**

But, as we look at the distinctive nature of today's aerospace industry, let us also pause to look at its peculiar problems. They are many.

The optimum metes and bounds that should prevail within the government-industry relationship are far from being resolved. The industry is constantly struggling to maintain its integrity and

viability as a free enterprise industry, a struggle in which it must be successful not only in its own interest but also in the interest of the government customer.

The "proper" degree of government surveillance has a built-in and inexorable tendency to expand into counterproductive interference with the essential prerogatives of management and, if permitted to do so, jeopardizes the principal asset which must be relied upon to produce the technological miracles of the future.

#### **DUAL NATURE**

Even the industry itself is constantly torn by its dual nature — being, on the one hand and in a very real sense, an instrument of national policy, and yet, on the other hand, being in no way exempt from the economic disciplines of any free enterprise industry. This industry serves two tough masters.

Further, just as the industry must always maintain the capacity to adjust to change, so must the government, in terms of its policies and regulations. The government is not always so fast-moving in this regard, and the industry often finds itself living under rules and regulations which have become anachronistic due to changed circumstances and demands.

And, finally, the industry certainly has to adjust to special problems arising

from two factors I have mentioned before: the lack of ability to control or influence the size or nature of a major element of its market; and the organizational price that each company has inevitably paid in terms of its commercial capability by tailoring itself to the accomplishment of the rarified technological tasks required by most defense and space projects.

This background is necessary because the future of the industry cannot be understood without a firm grasp of the past and the present. Against this background, here are some of the key elements that must be considered in any evaluation of that future.

#### **NEW FIELDS**

The first of these is that the size and viability of this industry is not tied to defense and space programs, important as these have been and will continue to be in shaping its destiny. It is tied, rather, to the *total technological progress of the nation*, meaning the application of advanced technology to whatever purposes may be desired. Programs now well under way in such diverse fields as air freight, urban transportation, desalination, oceanography, 2000-mph airliners and hundreds of others serve to illustrate this fact.

Second, even in terms of the defense

budget projections which apparently stimulated a somewhat pessimistic analysis of our future, the conclusions must be subjected to close scrutiny. Certainly the top government officials most closely concerned with both the military and civil aspects of aerospace matters have evidenced that they do not join in the conclusions reached—quite the reverse. Certainly aerospace company executives do not subscribe to such an analysis. In fact, I cannot recall such uniform optimism as to the future among those men who know better than anyone else what is involved, and who have the most at stake. Speaking solely to the defense portion of our industry's business, there have been reactions along the following lines by a variety of company executives: "We do not consider a 49 billion-dollar defense budget an unhealthy market" . . . "We think the industry is strong". . . "(The aerospace industry) is in its soundest financial position ever and prospects are for continued improvement" . . . "There is no reason to expect any diminution in the rapid expansion of technology from which major improvements in weapons systems have come."

One simply cannot project the future of the aerospace industry by the use of economic criteria applicable to normal commercial industries. One can neither

use straight-line statistical projections to prove nor to disprove. To attempt to do so is largely to miss the point of the past 20 years of history which have created this industry. The only intelligent way to gauge our future is — always bearing in mind our past and the close identification of this industry with the destiny of our nation — to ask one's self some key questions, and then to draw overall conclusions from the sum of the answers.

#### **BASIC CONSIDERATION**

As a starter, consider the following:

Assuming that only the best defense is acceptable to the American people, will the combination of constant technological advances available to our potential enemies as well as ourselves and the predictable international situation over the next decade permit a major retrenchment in our defense posture?

Now that the U. S. has approached the very threshold of the fourth dimension by achieving a capability to carry man into outer space, will it stop at the moon and leave the mysteries that lie beyond, but within ready reach, unexplored?

Will the increasingly time-pressed businessman or the travel hungry vacationer say of projected new aircraft — “stop here, we can now go as fast and as far as we want to”?



Will the commuter turn his back on a vertical lift hop over traffic if it is offered to him on an economical basis?

Will we leave unprobed the mysteries and treasures of the ocean bottoms—even while other nations are embarking on extensive programs to unravel and exploit them?

Will the several evolving megalopolis of this nation, in danger of seeing transportation choked to the point of paralysis, fail to avail themselves of practical means of alleviating this condition?

Will ships that skim over the water at from 3 to 4 times the speed of their deep draft sisters be uncompetitive?

Is the Federal Aviation Agency wrong when it predicts that the present domestic jet carrier fleet of 500 planes will be doubled over the next five years?

#### **SALES TO GAIN**

Is there any reason why the steadily upward trend during recent years in the sales of both vertical lift and utility aircraft, both at home and abroad, will not continue or even accelerate?

Doesn't the decision by the British and Australian governments to purchase large quantities of U. S. military aircraft portend a major upward trend in our already very substantial foreign sales?

Is there no validity to the announced intention of our government to seek a \$2 billion goal for aerospace exports

and to provide assistance in securing financing to this end?

Are the new powerful, lighter engines now under development not to bear fruit in terms of opening the door to a whole new range of aircraft applications?

#### **FUTURE PROJECTS**

Are the radically new means for cargo handling, the potentials of the very large transport being developed for the Air Force, the planned manned space laboratory, which will be the largest object ever hurled into space, and a hundred other programs well under way to expand the aerospace horizons of the nation to be curtailed short of their fulfillment?

Is the general investing public going to be satisfied with less than the most effective communications satellite system?

Are the highly effective satellites now in orbit which provide revolutionary new means of navigation, weather forecasting, and communication to be discontinued? Or even not improved?

Is the exciting investigation into the potentialities of the laser beam not to be pursued?

Answer these and many other similar questions for yourselves and you will have the best overall answer to the basic question about the future of the aerospace industry.

In all stages of the aerospace spectrum, from an idea to actual production models, there are new and technologically revolutionary products on the way. And as each of them nears reality, horizons expand and new applications and markets develop. The short history of the subsonic jet transport, which has exceeded the most optimistic estimates made at the time of its inception, is a striking case in point. The enormous potential of air cargo is just starting to be tapped. Radical innovations, such as ships that do not touch the water and cars that do not touch the road, are already realities. A variety of vertical lift solutions to urban transportation problems are coming into actual being. Huge cargo aircraft, the supersonic transport and the like, are in advanced design stages.

#### **SPACE PLANS**

And then there is space. In addition to the manned space laboratory, we are programming manned space rendezvous on what will become a routine basis. And, in addition to our being well along the road toward landing men on the moon, programs for a variety of excursions to nearby planets are evolving. The vistas beyond are, of course, infinite. As President Johnson said in his message to the Congress on Aeronautics and Space: "Substantial strides have been made in a very brief span of time and . . . more are

to come. We plan to explore the moon, not just visit it or photograph it. We plan to explore and charter planets and expand our earth laboratories into space laboratories and extend our national strength into the space dimension."

When I participated in the awarding of the Arthur S. Flemming Awards given to the ten outstanding young men in federal service, I did not think it wholly unsymbolic as to the future that four of these ten came from the National Aeronautics and Space Administration and a fifth from the United States Air Force.

#### **FINAL QUESTION**

In the face of these actual and projected accomplishments; in the face of the capability which they portray; in the face of the close and obvious identification of such concepts with the total technological progress of the nation, I suggest you ask yourself one final question.

It is: Is the United States as a nation, in both its public and private sectors, in terms of both its public and private needs, and in terms of both its public and private opportunities, going to avail itself of the opportunity afforded by this unique asset known as the aerospace industry? In short, are we going to use this unique asset in our march toward the Great Society, or are we not?

I believe that question answers itself. I believe that to be involved in the aero-

space industry today is as exciting as it is to be involved in the future of America's technological progress. In fact, the two can hardly be distinguished.

#### **SWEEP OF TECHNOLOGY**

Over the past decade, in addition to representing the aerospace industry, I have served in Washington in the State Department, Defense Department and the White House in duties which involved the consideration of the facts, the problems and the policies which deal with the very kind of fundamental trends all this has been about. From that vantage point, the upward sweep of our technological advance, with all its implications for our society, was very easy to discern. I cannot understand where these people have been who are talking about a halt to the inexorable progress that is constantly accelerating in the course of the technological revolution we are all caught up in — whether we like it or not. Sometimes they make me think of the little old lady who testily chided one of our astronauts as to why he was poking around in outer space instead of sitting at home watching his television set as God intended him to. What kind of “tunnel vision” must people have to establish pessimistic projections about an industry that is clearly so far in the vanguard of our technological progress that almost nothing that comes up hav-

ing a high technological component won't be grist for its mill — and this merely on the basis of a minor, normal cyclical reduction in the defense budget?

#### **WORKING TOGETHER**

Surely we need some things to fulfill our promise. We need a government that understands this fundamental proposition. In terms of the responsible leadership in both Congress and the Executive Branch, we have had one and we've got one. Surely we have problems within that context of preventing over-control that would stunt growth and hinder progress. We are working together on that all the time, and, again, there is no disharmony as to goals and objectives between top governmental leaders and top industry leaders in this respect.

Surely we in the industry must recognize that we have something of a public trust to the whole future of our society in terms of the technological management capacity and technological resources we possess. We do.

What else do we need? We need a general public understanding of the foregoing based on a sense of the long-term future of America. And that involves us all.

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AEROSPACE INDUSTRIES ASSOCIATION  
OF AMERICA, INC.

1725 De Sales Street, N. W., Washington, D. C. 20036