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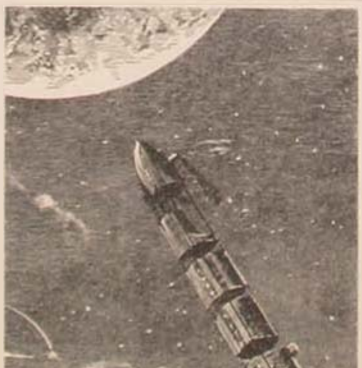


the cover

Predicting the future is at least as old as the Delphic oracle of classical times, but anything approximating technological forecasting as we know it today probably dates from the nineteenth century and such Jules Verne works as *De la terre à la lune* (1865), a spaceship from which is shown in a contemporary illustration on our cover. Dr. Roy K. Frick, of AFSC's Aeronautical Systems Division at Wright-Patterson AFB, Ohio, projects us still further into the future with his exposition "Operations Research and Technological Forecasting."

OPERATIONS RESEARCH AND TECHNOLOGICAL FORECASTING

Dr. Roy K. Frick

TECHNOLOGICAL forecasting is a relatively new field and is receiving increasingly more attention as a necessary planning tool for management. It is a field that represents a growth area for operations research. Conversely, the field of operations research can benefit from application of some of the methods now being used in technological forecasting.

development of technological forecasting

Knowledge of the future has always been of interest to civilized man, and numerous efforts by noted persons throughout history to predict the future could be cited. Many historical instances of prediction or forecasting have a technological flavor. Included in this category would be science fiction or novels about future societies, and statements and writings by noted experts and prophets. Books by science-fiction authors such as Jules Verne and H. G. Wells have described many events or technological capabilities that have come to pass. Similarly, Aldous Huxley's *Brave New World* and George Orwell's *1984* have alerted many people to some of the dangers of a future technological society. Writings of such noted experts as Charles de Gaulle and Billy Mitchell, foreseeing the role of armor and aircraft in future warfare, could also be cited.

The start of modern systematic technological forecasting in the United States can be traced to the mid-thirties, but its starting point is generally recognized as being in the late fifties and early sixties. In 1962 Mr. Ralph Lenz, one of the chief planners for the U.S. Air Force, published a monograph entitled "Technological Forecasting," which has become one of the basic references in the field.[1] This report laid the foundation for most of the systematic and analytic forecasting practiced today. A particularly good discussion of the history of technological forecasting is found in Robert Ayres's *Technological Forecasting and Long-Range Planning.*[2]

operations research for quantitative planning and forecasting

Planning can be seen in at least two aspects. A reactive type of plan would be based on the view that economic, political, social, technological, and other forces will determine pathways to the future, and thus planning should be a reflection of these forces at work. The other view is that the future can be influenced, at least in how we reach the future. A plan resulting from this view, which could be called a formative type of plan, would be based on determining preferred strategies for reaching the future in some "best" way.

Operations research can be applied with either view of planning in mind. As an example, if market projections anticipated an increased demand for electronic calculators in the next five years, a reactive plan for a manufacturer of calculators could be developed, based on a study using the operations research tools of decision and game theory. This study could account for competitors' intentions in the marketplace, their production capacities, and their projected share of the market. Decision variables could be in terms of which regional markets to compete in. A long-range plan, on the other hand, might be based on estimates of the future numbers of scientists and engineers. Alternative methods of meeting the demand for calculating aids, including peripheral equipment, could be the basis for a study to determine best strategies for a company in meeting the demand. Potential areas of new technology could be identified as a by-product, giving rise to other studies as to how best to exploit the new technologies. This could be a formative plan because it would be influencing the future, perhaps to a significant degree.

Linear programming has been one of the more popular operations research techniques and has been extensively used in product mix studies, studies of warehouse location, transportation, and assignment problems.

The warehousing problem provides a good illustration of how linear programming can be used as a tool for either reactive or formative planning. A plan based on the best use of an existing network of warehouses for a given type of product, with an assumed transportation capability (e.g., a given truck type) would be primarily reactive in nature. On the other hand, such a study could be broadened to consider the storage network and transportation system as decision variables. In this broadened context, promising alternatives to warehouses or trucks could be identified, and thus the plan could be more formative in nature.

As another example, consider a product mix study using linear programming or whatever optimization technique is appropriate. A reactive plan for a refinery, showing the proper mix of additives to minimize costs, would be based on the assumption that petroleum would remain as the prime energy source for transportation. Alternatively, a higher-level study, showing a preferred mix of energy sources to minimize pollution levels, with appropriate constraints in costs and resources, could provide the basis for a formative plan which, in effect, could influence social and technical changes.

Methodology of Technological Forecasting

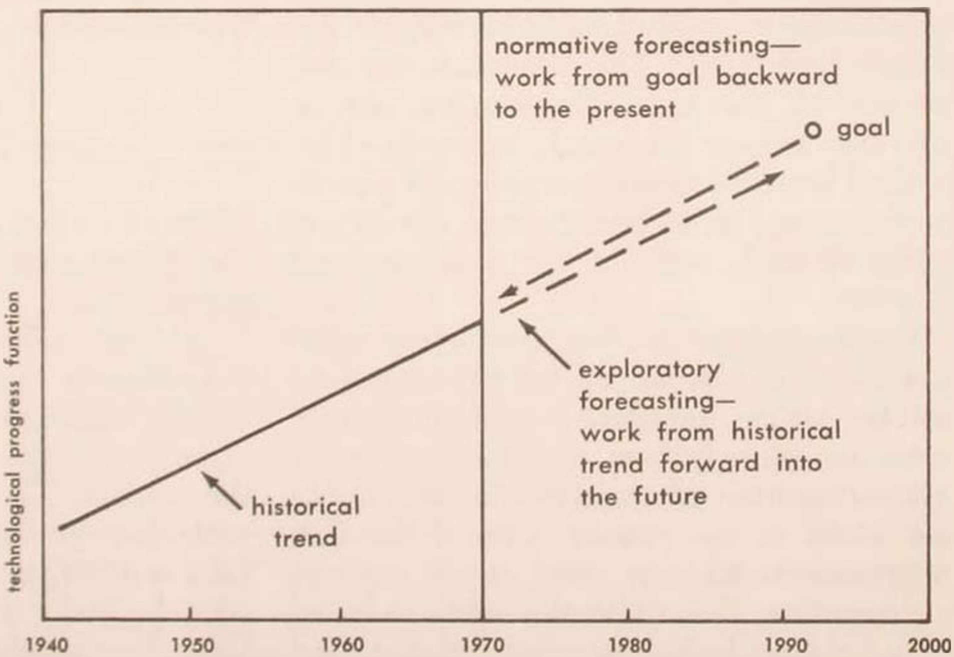
The methodology of technological forecasting can be divided into two broad classifications corresponding to two philosophical viewpoints of the technological process. One, called the ontological view, is that science and technology change in response to scientific and technical opportunities. In the ontological view, technology is seen as a self-generating process, and thus, if one observes this process and gathers appropriate data on its past and present behavior, conclusions can be drawn concerning its future course. The other school of thought, called the teleological view, holds that science and technology change in response to social, economic, political, and other factors in the total environment. This view sees technology more as a servant or by-product of society.

Thus, the forecasting method used depends on whether technological change is seen as being influenced primarily by endogenous variables or determined by exogenous variables. As a result the experts classify technological forecasting methods according to (1) exploratory forecasting corresponding to the ontological view or (2) normative forecasting corresponding to the teleological view. One could also think of exploratory and normative forecasting as analysis according to the "pull" of objectives versus the "push" of opportunities. (Figure 1) Exploratory and normative forecasting can also be viewed as analogous to reactive and formative planning, respectively, which were previously discussed.

exploratory forecasting

Exploratory forecasting treats technological change as being subject to an internal opportunity-oriented law of development. This force is primarily determined by pressures generated by a competitive market.

Figure 1. Exploratory and normative forecasting



The historical growth of horsepower in automobiles, increased speed of aircraft over time, and growth in substitution of synthetic materials for wool and cotton are all examples of phenomena that could be analyzed with an exploratory forecasting approach. The various exploratory technological forecasting methods generally in use now or under development are listed in Table 1.

Table 1
Exploratory Technological Forecasting Methods

Intuitive forecasting

A. Individual
B. Consensus
   1. Polls
   2. Panels
   3. Delphi

Trend analysis

A. Trend extrapolation
B. Correlation studies

Use of models

A. Analytic analogies
B. Interactive simulations
   1. Feedback models
   2. Cross-impact matrices

One of the more recently and frequently used methods of intuitive forecasting is the Delphi technique.[3] This approach was developed at the RAND Corporation and is still the subject of much research. The method basically combines polls and panels in such a way as to benefit from the strong points of each, without the disadvantages of either.

Trend analysis is very commonly used in exploratory forecasting, but this approach can be highly judgmental and ultimately relies on such factors as choice of scale and recognition of appropriate constraints and limits in the process. One of the first requirements for any good trend analysis is recognition that the real world can more often be described as an exponential, rather than a linear, process. This stems from the fact that often the process of technological innovation starts slowly as ideas are formulated and theory is developed. Later, the growth accelerates, and, as maturity sets in, growth changes to virtual linear change. Eventually, the growth exhibits asymptotic behavior as practical limits are reached. Because this pattern is so common, the use of semilog paper for plotting trends is recommended for purposes of forecasting. With such a graph, early and middle growth trends of a process show up as straight lines. As obsolescence or maximum limits in growth are approached, the trend lines change slope and curve in a discernible manner. (Figure 2)

Exploratory forecasting can use mathematical models in several ways. One approach is based on analogies of technological change to other growth processes. One of the better known analogies is based on the Pearl formula, also known as the logistics curve. The name of the formula comes from Raymond Pearl, who formulated it to describe growth of a population in a limited environment, such as fruit flies in a bottle, yeast cells in a fixed nutrient medium, and white rats in a finite space. The formula is

$$P = \frac{P_o}{1 + A \exp(-kt)} \qquad (1)$$

where P is the population at time t, P_o is the initial population, and A and k are parameters.

Another model involves the notion of cross-impact matrices. (Figure 3) This matrix examines the interactions among three events E_1, E_2, E_3, shown as rows of the matrix. These events have associated with them probabilities P_1, P_2, and P_3 that they will happen in years Y_1, Y_2, and Y_3, with $Y_1 < Y_2 < Y_3$. The three events also form the columns of the matrix in chrono-

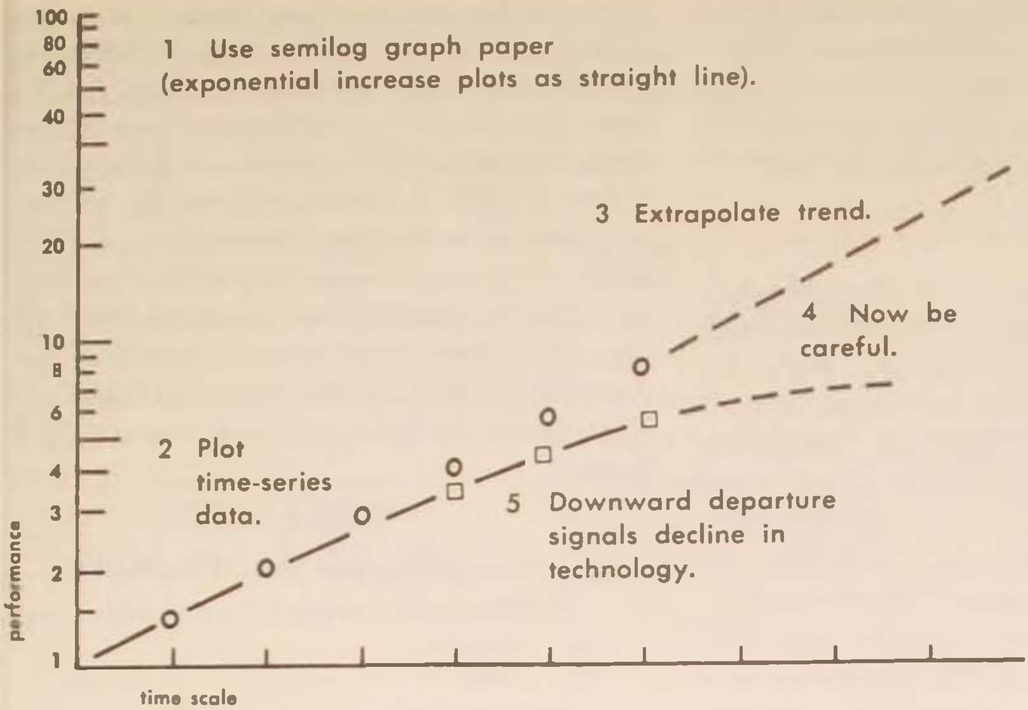


Figure 2. Basic procedures for technological forecasting by trend extrapolation

logical order from left to right. Each cell of the matrix indicates an interaction between the events in the corresponding row and column. The impacts are shown in terms of mode, strength, and time lag. For example, if E_1 occurs, its mode of impact is to enhance the likelihood of E_2 by 10 percent, and the impact is felt immediately, without a time lag.

The cross-impact matrix technique seems to be almost the exclusive purview of technological forecasting. This approach is similar to a simulation of interactive processes; e.g., a battle or war game. However, it has

Figure 3. Concept of cross-impact matrix

Event	Year	Probability	Events: E_1	E_2	E_3
E_1	Y_1	P_1	X	Enhances by 10%, immediate.	Decreases prob. by 5%, 5 years.
E_2	Y_2	P_2	Decreases probability by 20%, 2 years.	X	Prevents, 3 years.
E_3	Y_3	P_3	Delays by 4 years.	Enhances by 30%, 1 year.	X

two features that many other interactive models do not have: (a) nonstationary probabilities (they change with time or are dependent on preceding events) and (b) the time-lag effect of one event on another.

normative forecasting

Normative forecasting treats technological change as responding to outside stimuli such as economic and social demands. With this view, technology is seen as responding to society's needs. To some extent, normative forecasting is the planning of a road map for the future. Possible, or perhaps desirable, pathways to the future are identified, for the process is goal-oriented. Hence, normative forecasting is done with the view that technology responds to the pressures of a unitary, rather than a competitive, market.

The methodology of normative forecasting can take many forms. Since normative forecasting is the process of determining preferred alternatives for reaching the future, many of the methods of operations research should find application quite easily. Table 2 gives a breakdown of the various methods of normative forecasting cited in most of the literature. Very little has been reported on possible use of other methods; e.g., queueing theory or mathematical programming, thus presenting challenge and opportunity to the operations research profession.

Table 2

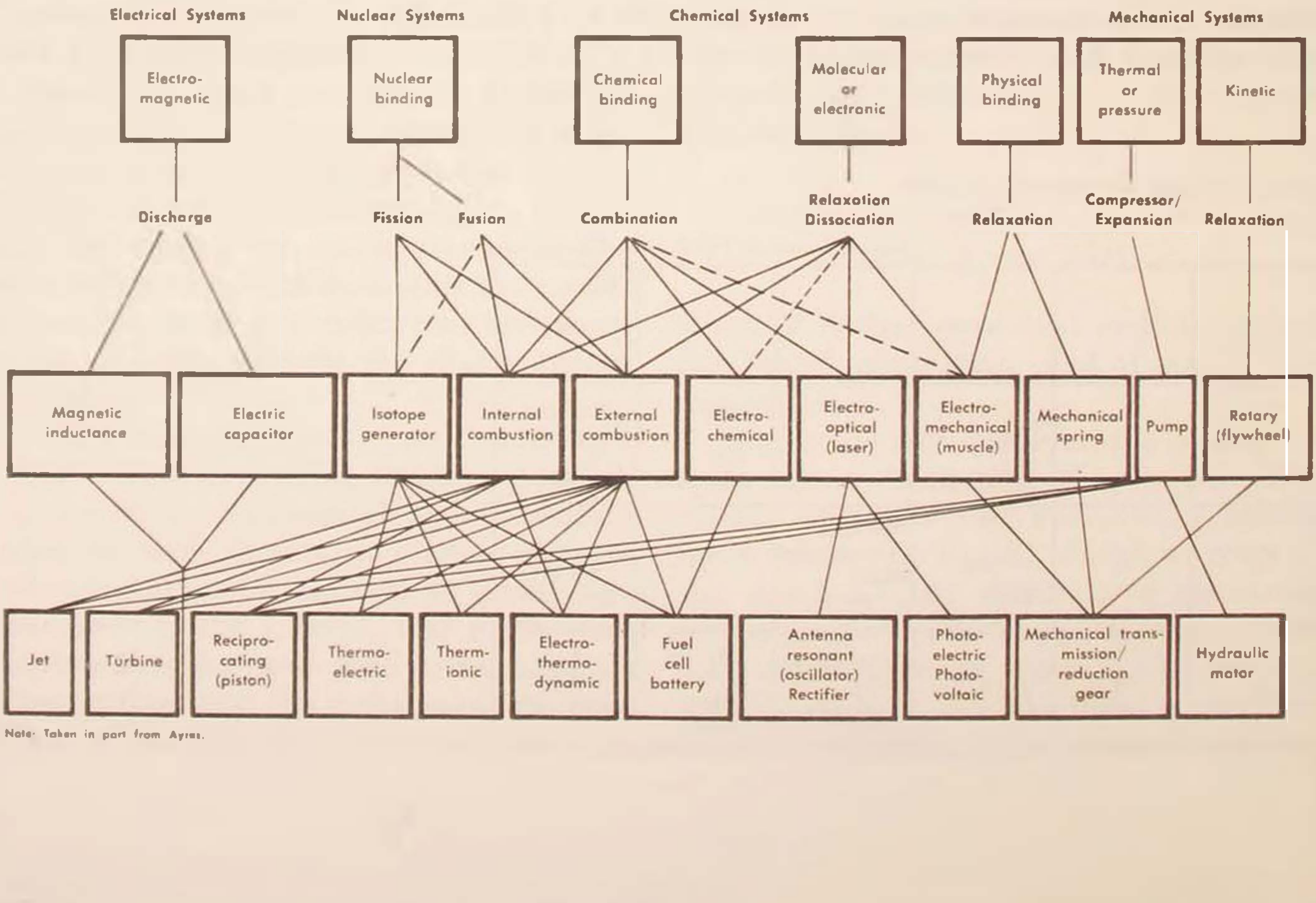
Normative Technological Forecasting Methods

Morphological analysis
- A. Schematic
- B. Matrix

Relevance trees

Mission flow diagrams

Figure 4. Morphological network for sources of propulsive power



Note: Taken in part from Ayres.

Stator \ Rotor	Passive	Permanent magnet 2-pole	Electro-magnet DC, 1-pole	Electro-magnet DC, 2(N)-pole	Electro-magnet AC, 1-pole	Electro-magnet AC, 2(N)-pole
Passive	X	X	X	X	X	Inductive conjugate?
Permanent magnet 2-pole	X	X	Homopolar (PM)	X	X	DC (PM) (with commutator)
Electro-magnet DC, 1-pole	X	Homopolar conjugate (PM)	X	Homopolar conjugate (EM)	X	X
Electro-magnet DC, 2(N)-pole	X	X	Homopolar (EM)	X	X	DC series/shunt (with commutator)
Electro-magnet AC, 1-pole	X	X	X	X	X	AC Homopolar conjugate?
Electro-magnet AC, 2(N)-pole	Inductive (squirrel cage)	Inductive synchro (PM)	X	Inductive synchro (EM) (slip rings)	AC Homopolar	X

Figure 5. Morphological matrix

Morphological analysis is a systematic procedure for collecting, counting, indexing, and identifying all possible alternatives, to achieve some technological capability. Robert Ayres discusses the basis for morphological analysis and illustrates two methods of graphically displaying the combinations of possibilities in achieving a functional capability. A schematic approach and a matrix approach are presented in Figures 4 and 5, respectively. With the schematic technique, one can define most favorable or promising paths of development; and with the matrix approach, one can identify any opportunities that are promising or have been overlooked or show no promise at all.

A model based on a detailed hierarchy of methods of achieving a specific set of goals is called a relevance tree. Such an approach can be used for selecting projects for a research program, designing a budget, or any number of activities. This is one method of mapping out contingencies, prerequisites, and alternatives. To some extent, it could be thought of as the reverse of a decision tree. Instead of outlining all possible paths resulting from a sequence of decisions, a relevance tree maps all possible paths leading to an end result. In some applications, a relevance tree analysis is equivalent to mathematical programming, because the objective is to determine the optimal strategies, or allocation of resources, for a research or technology program within certain well-defined constraints. As an example, a schematic representation of a relevance tree for an automobile technology program is shown in Figure 6.

Mission flow diagrams can be viewed as mapping all possible contingencies. Thus they are similar in many respects to decision trees, mentioned in the discussion on relevance trees. A decision tree maps out possible contingencies resulting from decisions taken in some sequential order. Similarly, a mission flow diagram identifies all paths and forks in the road, so to speak, resulting from a sequence of events. It is a systematic

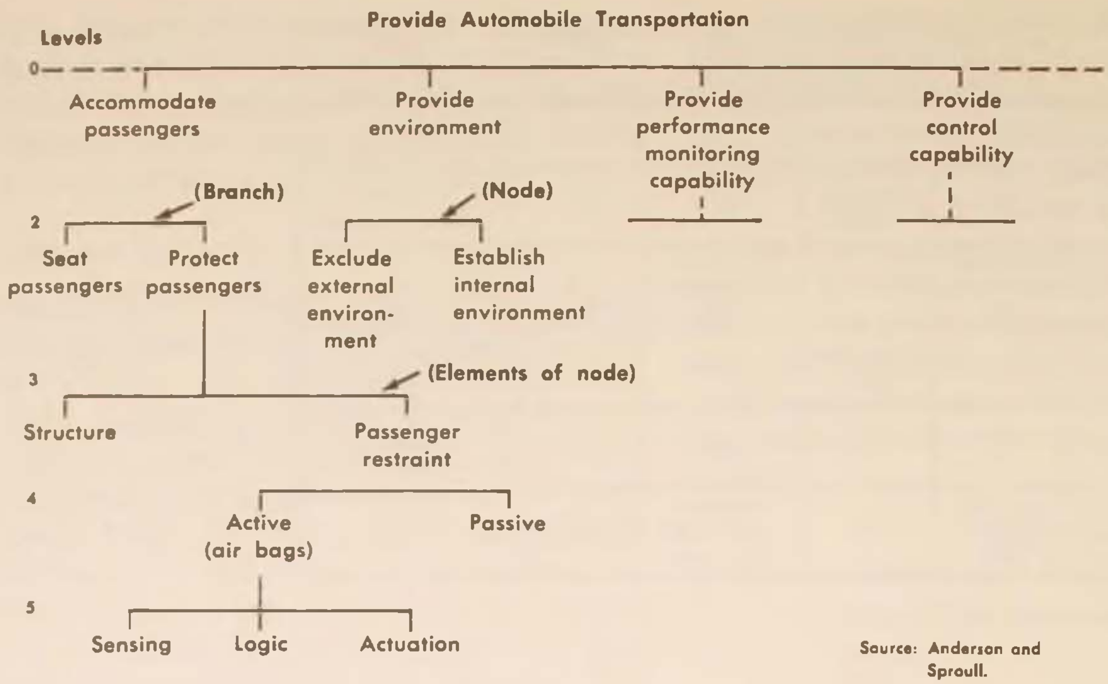


Figure 6. An example of a relevance tree structure

way of identifying all possible future scenarios.

Use of Operations Research Methods in Technological Forecasting

Operations research methods used in addition to the more common technological forecasting techniques are certain applications of decision and game theory, optimization and allocation techniques, and models and simulations. Such methods can be useful for embellishing an existing technological forecast based on conventional forecasting approaches.

Wehrner von Braun, writing in *Astronautics and Aeronautics*, engaged in some "blue-sky" thinking and offered the following technological forecasts:

a. Laser transmission lines carrying thousands of TV channels and billions of telephone conversations simultaneously, with satellites acting as a switchboard network, will be operational. They will enable instant communications between any people anywhere, thereby allowing homes to be communications centers, circumventing the need for offices, banks, retail stores, postal services, newspapers, and even transportation networks.

b. Solar collections will exist in orbit, capturing the sun's energy and beaming this power to enormous antennas on earth, from which the power will be distributed.

c. Manned space stations in orbit will provide the capability of manufacturing products in zero-g environment; e.g., perfectly round ball bearings and new types of alloys and optical glass that cannot be made under the influence of earth's gravity.

d. Long-term prediction (and later control) of the weather through a system of meteorological satellites will be possible. Also, inventory and analysis of earth resources and physical conditions at all times from the same satellites will be accomplished.[4]

We could view each of these forecasts in at least two ways. One view would be that each is the result of an exploratory exercise, and the use of additional analysis techniques could then serve as a "fine-tuning" activity; that is, we could double-check the forecast by using an independent analysis approach, which may result in a recommended modification of the forecast. Another view would be that each of the forecasts represents a stated set of goals and thus provides the basis for subsequent normative forecasting activity. A normative forecast would identify preferred alternatives in achieving these technological capabilities. This would constitute forecasting at a lower level; e.g., projecting requirements for subsystems, support facilities, and the like.

Let us take one of von Braun's forecasts and illustrate the use of some of the more common operations research methods. The forecast we will use is the one pertaining to manned space stations used for manufacturing purposes. Furthermore, let us put a time dimension on this forecast and say that 1990 is the projected date for operation of the space station.

For the first example, a network analysis, perhaps of the PERT type, could be used to determine whether indeed it would be possible to accomplish this capability by 1990. Before the network is laid out, a set of activities and/or necessary events would have to be defined. As a first cut, a rather gross network could be used for determining critical paths, total project time, or areas where further development at the subsystem level is needed. Concerning this last point, once a critical subsystem technology is determined, another network pertaining only to that subsystem can then be devised. This process could be repeated at progressively lower levels until all relevant activities were accounted for.

This process could be used in either an exploratory or normative approach to forecasting, either determining when to expect total project completion or establishing the total set of technologies needed in order to meet a specified completion date. This can also be true of other operations research methods. For example, consider how a queueing analysis could be useful in sharpening our forecast. An elementary queueing analysis, of the type found in textbooks, addresses the problem of the cost trade-offs in server capacities, numbers of servers, and the number of customers waiting in line. Similarly, a queueing analysis could be structured concerning the trade-offs in space station manufacturing capacity, numbers of space stations, and unfilled orders for the manufactured goods. The implications of such an analysis could be significant: it could identify shuttle technology requirements, required command, control, and communication networks for coordinating manufacturing operations, and the necessary system for launch operations and facilities.

For augmenting the forecast, replacement models or renewal theory can be applied to solve the typical problem of when such items as light bulbs or trucks should be replaced, whether before or after wear-out actually occurs. The space station operation would certainly have problems associated with wear-out and replacement.

Optimization techniques and allocation methods could also be applied to this forecast. For example, linear programming could be applied to determine preferred space station fleet sizes and unit designs of both space stations and shuttle systems.

Many of the technological forecasting methods are common to operations research practice; e.g., Delphi, trend extrapolation, mission flow diagrams, and relevance trees. Other methods of technological forecasting represent areas where operations research has not been extensively applied heretofore; e.g., morphological analysis and application of certain types of simulation. Computer simulations of battles or other competitive processes could be applied to technological forecasting problems. Such a simulation would address the possible outcomes for a technological base resulting from competition between two or more technologies. To set up the scenario for such a simulation would involve a morphological analysis to determine all possible technological alternatives. A flow chart of such a simulation for the space station example is shown in Figure 7.

The Challenges

Technological forecasting is a new field that represents a growth area for operations research. It can become an area of activity similar in scope and depth to many other fields that have heavy operations research flavor; e.g., transportation science, inventory control, quality control, econometrics, decision sciences, and management information systems.

Thus, operations research practitioners have several challenges:

- To become more aware of technological change, in terms of both the state of the art itself and the impact it has on society.
- To be increasingly aware of how conventional analysis methods can be applied to improve forecasts.
- To improve and extend the methods of operations research—e.g., simulations and algorithms for cross-impact studies—for application to forecasting studies.

Technological change, with its impact on

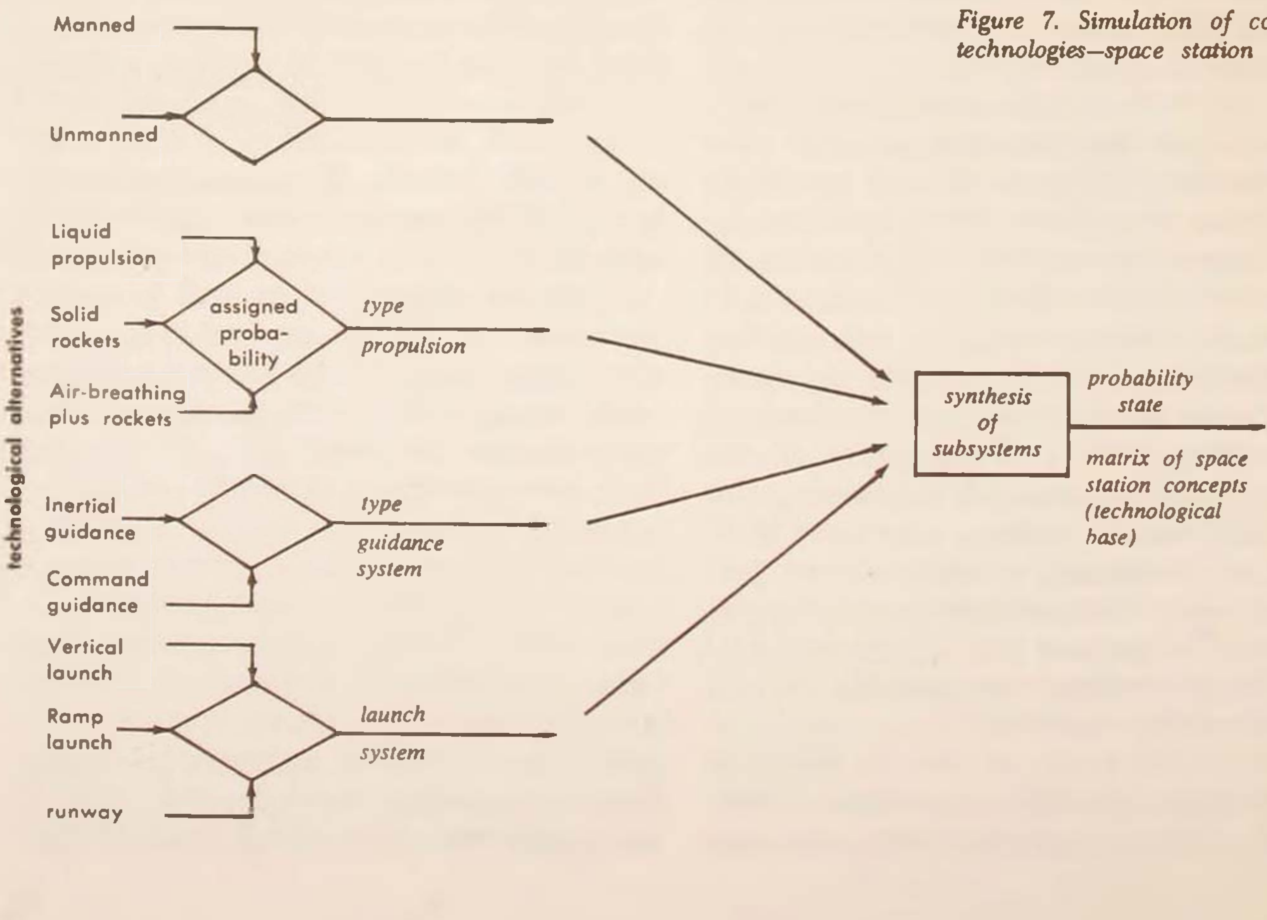


Figure 7. Simulation of competing technologies—space station example

society and civilization as a whole, is one of the key issues of our time. Technology assessment and technology forecasting have been recognized as study activities and growing fields of endeavor that will be with us as long as the basic values of our present civilization stay as they are. These values are characterized by some as materialistic, but this is an oversimplification. As contrasted to ancient and medieval times, the values of the modern era, starting with the Renaissance, are based on the premise that man has some control over his destiny and that he should use nature and the earth's resources to improve his lot, rather than being a servant of nature. In recent years, this value system has been extended somewhat and now includes the notion that man is a custodian of nature and has responsibilities for conserving the resources of earth. Still, technology can be viewed as the instrument for both improving human conditions and insuring the conservation of nature. As long as this view holds, technological forecasting will be an integral part of the process of change. The challenge to analysts is clearly there.

Aeronautical Systems Division, AFSC

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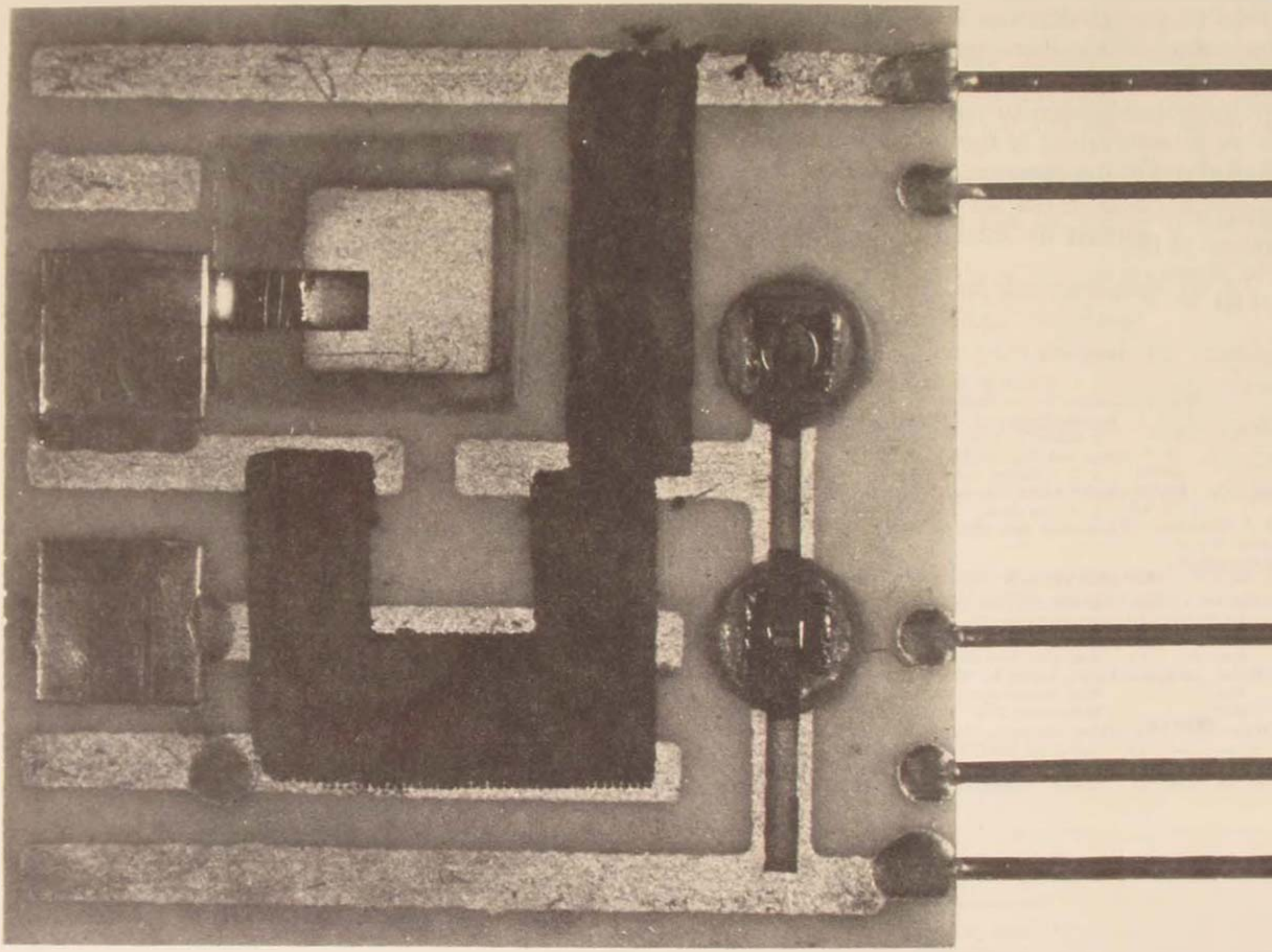
". . . microminiaturization . . . could provide the capability for development of sophisticated built-in test and communications capabilities in all future weapon systems."



LOGISTICS SUPPORT FOR THE EIGHTIES AND AFTER

Walter M. Wilson

WE are currently living in an era of outstanding technological advancements. New developments and discoveries are being made almost daily. In addition, current trends toward more complex and costly weapon systems, together with increased budget limitations, present new constraints for Air Force planners to consider. There is little reason to believe that problems created by these trends will change through the seventies or into the eighties. Consequently, logistics planning must be predicated on concepts that take advantage of modern technology to enhance weapon system mobility and provide the most effective logistics support of reduced weapon inventories of increased complexity.

The purpose of this article is to present one of many possible concepts of weapons support. Its intent is to stimulate thought and discussion on how we can cope with the future Air Force logistics environment.

Since achieving status as a separate service, the Air Force has been plagued with uncertainty, which has produced a yo-yo effect on logistics resources. In times of heightened tension, increased operational activity has resulted in panic buildups in logistics. Correspondingly, as soon as tensions were relieved, there has been accelerated decrease in logistics support. Korea, Berlin, Cuba, and now Vietnam are examples of this build up, then tear down, syndrome.

The Southeast Asia (SEA) buildup, which started in 1965, presented both operational and logistic support problems. Increased combat requirements necessitated the expedited building of six new air bases and the significant upgrading of thirteen others. This activity severely strained both the operational and logistics arms of the Air Force. Operationally, the Air Force was hard pressed to provide the required aircraft, combat crews, and direct support personnel with associated equipment and still maintain a programmed combat reserve and training capability to meet other threats. Also, even though units were previously programmed to have short-time deployment capabilities, the magnitude of the effort created problems of personnel availability, equipment shortages, and transportation scheduling. Logistics support presented even more complex and greater challenges.

Beginning early in the 1950s, the Air Force converted to the base self-sufficiency maintenance concept to support peacetime operations. This concept envisioned the location of sufficient people, equipment, and spare parts at operating-base level to repair most of the components required by the weapon systems they possessed.

Early in the Southeast Asia buildup, it was decided that the bases would be constructed in stages and be manned and equipped in basically the same way as zone of interior (ZI) peacetime operating bases. Initially, tent city camps were erected and aluminum runways and parking areas constructed. Then aircraft were deployed and started flying combat missions. Next, temporary buildings were established to house field maintenance and other support facilities. Meanwhile contractors, working under Navy supervision, were busy building permanent (concrete) runways, buildings, and support facilities.

Even with all of these actions taking

place as concurrently as possible, it took from two to three years to complete bed-down of a single installation; but the most serious problem of all was that this caused the Air Force to invest in facilities it would have to abandon when the units were re-deployed to their peacetime operating bases. With the subsequent Vietnamization program, some of these facilities have now been turned over to the Vietnam Air Force, and some will be converted to commercial industrial facilities. However, this type of support from future deployments of a similar nature might not be required and could result instead in abandonment or destruction of facilities involved. Also, they cost too much to establish and operate and take too long to build.

A typical SEA base, for example, required 3,400,000 square feet of aluminum matting; 1,500,000 square feet of pierced steel planking (PSP); 60,000 line items of equipment and spare parts; 600 vehicles; 120 functional packages (shops, mess halls, billets, etc.); 16 inflatable shelters; 80 combat aircraft; and housekeeping and administrative supplies to support 4400 personnel. At the height of the buildup, the Air Force had over 85,000 personnel in the SEA area, and their logistics resupply support averaged over 3 million pounds per month, not including munitions. A major point to remember is that, through the initial buildup and subsequent follow-on period, the bases were established and units supported as if they were permanent peacetime operating bases.

current ways of doing business

To understand fully the rationale for those actions, one must look at our current methods of doing business.

There are many functions related to logistics support of operational forces, but the majority of these can be categorized within the functional areas of maintenance, supply, distribution, and base support. Facilities are included within the base support function. Of all these, maintenance is the predominant or driving function. As maintenance requirements increase, there is a corresponding increase in supply, distribution, and base support. Likewise, a decrease in maintenance requirements will be reflected in reduced activity in the supply, distribution, and base support functions. Therefore, as maintenance goes, so go all related logistics functions.

The primary activities within the maintenance function are problem diagnosis to identify malfunctioning systems, removing and replacing inoperative components, and repairing items. As Air Force weapon systems became more complex, the diagnostic problem became more difficult, generating increased requirements for more highly skilled technicians and sophisticated test equipment. The current "maximum base maintenance self-sufficiency" concept is a product of this environment. Under this concept it was reasoned that since highly trained technical personnel and equipment were needed at the base for diagnostic testing they could also be used to repair faulty equipment. Therefore, equipment and spare parts were positioned on each base to repair most items related to the prime weapon system. Where the repair capability is not available at the base, reparable items are returned to an Air Force depot or a contractor's facility for overhaul.

Although the maximum base maintenance self-sufficiency concept has met past requirements for sustained operational support, it has also generated or contributed to many of the problems we are experiencing today. It generates a requirement for a full range of maintenance facilities, thousands of support people, and 35,000 to 40,000 line item base supply accounts no matter where the base is located, whether it be in the continental United States or overseas. It also has increased the number of personnel, amount of equipment, and spare parts at main operating locations each time a new weapon system enters the inventory. Big bases overseas have been a particular problem in that they have increased distribution requirements that have resulted from the stationing of large numbers of Air Force personnel and dependents on foreign soil and have increased the U.S. balance of payments problems. The maximum base maintenance self-sufficiency concept has also fostered the "hoarding" syndrome, where bases are reluctant to return reparable items even when they exceed or overload their repair capabilities. This hoarding of items, of course, creates critical shortages and places increased requirements on the logistics support system. If the Air Force is to remain a viable and dynamic force in the future, less expensive methods of providing logistic support must be devised and implemented.

projected hardware and management systems advances

Before I postulate a logistics concept for the future, let us review some of the technological advancements that are currently taking place or are projected for the 1980 time period.

Microminiaturization. There is an extremely strong trend today toward microminiaturization, particularly in the electronics area. This trend could provide the capability for development of sophisticated built-in test and communications capabilities in all future weapon systems.

Improved communications. In the area of communications, a 20 to 1 reduction in the size of electronic components in new systems is expected by 1980. More instantaneous, reliable, and usable data will be available to the users. The use of "fail safe" satellite communications systems to expedite the transmission of logistics data will greatly enhance support effectiveness.

Design for support. Forecasts are that reliability indices of components will improve tenfold between 1970 and 1980. Mean time between failures will be long enough to permit hermetic sealing during manufacture, with assurance that equipment will have an adequate span of military field life.

Coupled with increased reliability, there will be a corresponding increase in equipment maintainability. Remove and replace maintenance will be the order of the day not only for components but also for items within components. All this will be accomplished without degradation in performance.

Enhanced distribution. There will be a dramatic increase in the Air Force airlift distribution capability as additional C-5s join the operational fleet. Furthermore, additional backup capacity will be available in the Civil Reserve Air Fleet now that the airlines are increasingly utilizing the larger jumbo jets.

Concurrently, improved in-transit control techniques will provide complete, continuous, and real-time visibility of in-transit materiel. In addition, standardizing packaging systems and containers designed for ease of handling by all modes of transportation will provide protection and easy offload accessibility for DOD materiel.

Electronic data processing equipment. Computers are a phenomenon that appeared in the early 1950s. From the beginning, the Air Force has been a leading proponent in their use.

Current computers in the Air Force Logistics Command (AFLC) are due for replacement by third-generation hardware in the near future, and those in other elements of the logistics function are also being updated. The new AFLC hardware, with its

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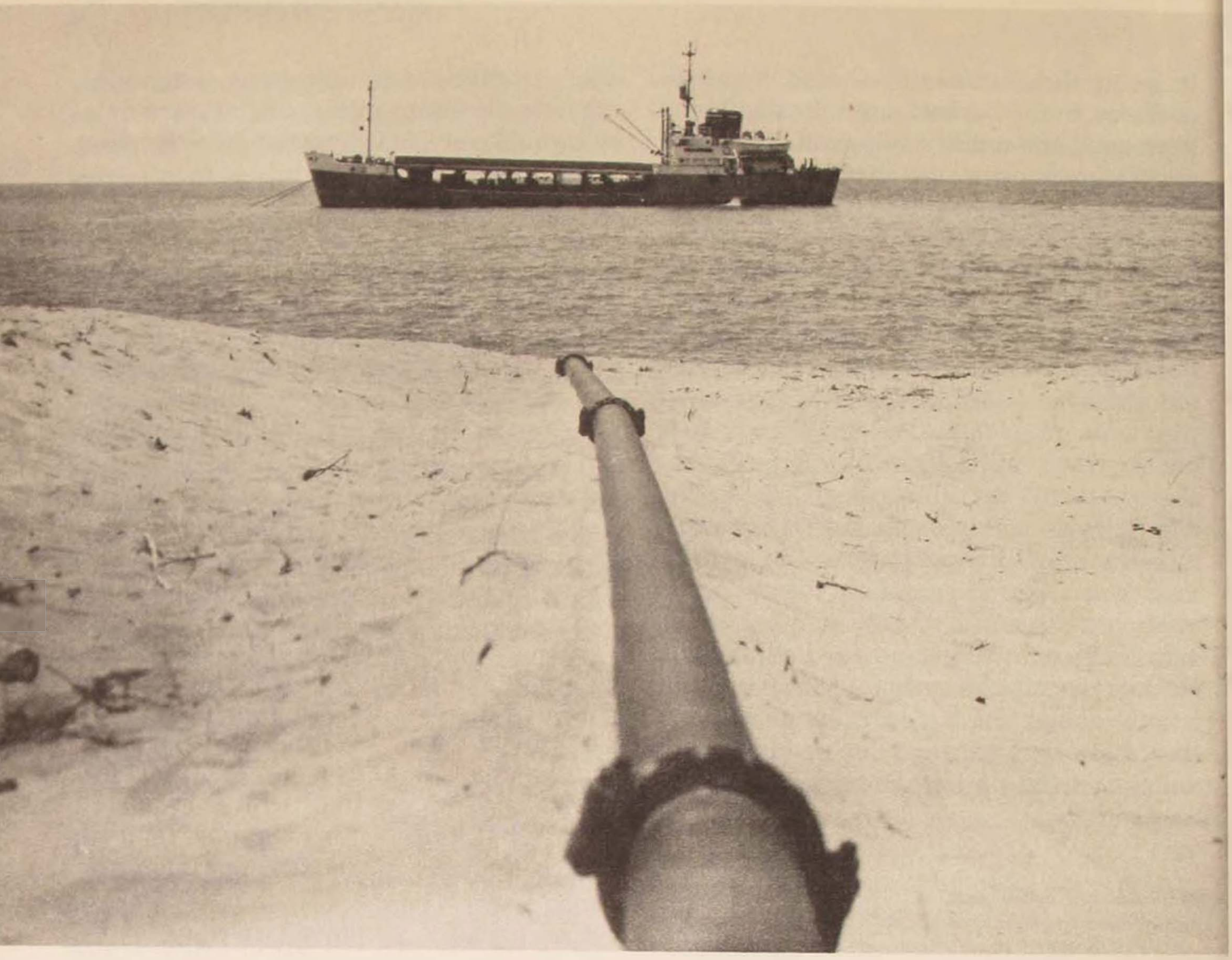
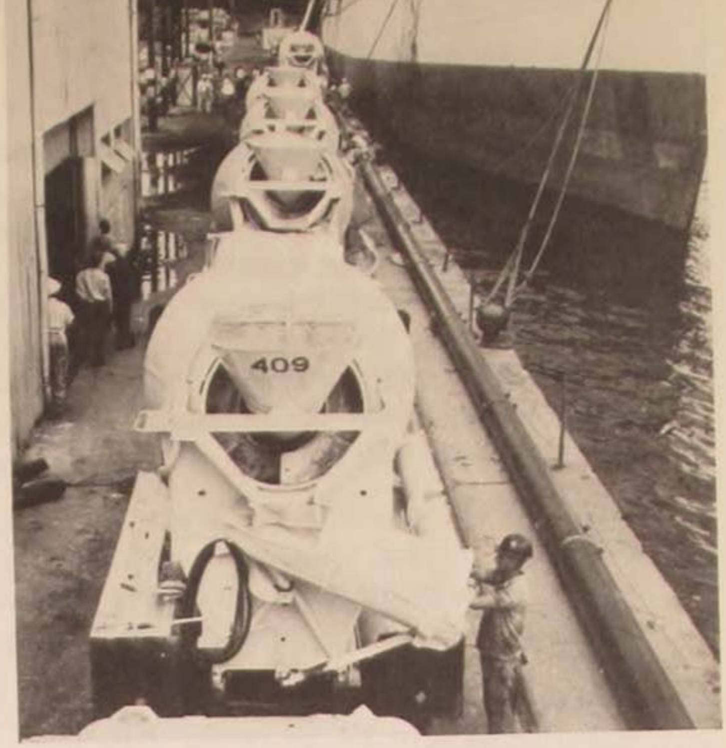


Southeast Asia—1966

U.S. ship delivers JP-4 fuel from the harbor near Phan Rang Air Base, Republic of Vietnam. . . . Vietnamese laborers, with USAF supervision, lay aluminum matting for the first runway built at Tuy Hoa AB. . . . An Air Force PRIME BEEF framing crew raises the steel skeleton of a prefabricated building at Tan Son Nhut AB. . . . Cement mixers are loaded aboard a ship destined for SEA for construction of an air base as part of Project Turn Key. . . . Bulldozers push through the sand to a landing ship with building materials for Tuy Hoa.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resultant management systems, is known as the Advanced Logistics System (ALS). This system is laying the groundwork for machine-to-machine capabilities as well as providing a direct interface between user and machines. The results will be an ever increasing spiral of expanding computer applications, with an accompanying rise in data processing capabilities.

A New Logistics Concept for the Future

Now that we have reviewed the technology that will be available, let's look at a logistics concept that could exploit this technology, rectify many of today's problems, and allow the Air Force to cope with its environment on into the 1980s and beyond.

diagnostic center concept

As previously indicated, microminiaturization will enable the built-in diagnostic capability to become a way of life, and it should be considered for use in each new weapon system and all major equipment the Air Force receives. Then, by establishment of an electronic link between this built-in diagnostic capability and a diagnostic center computer, it would be possible to activate a signal that would pass through the weapon system or equipment and initiate all required test and related logistics actions. This signal could also do the operational reporting required by the operating command or higher headquarters.

In operation the system would work in something like the following manner. The signal would generate at the aircraft, either on the ground or in flight. When the signal is received at the operating base, it is automatically transmitted to the diagnostic center, where it is fed into a central data computer. By comparing signals received against previously prepared programs, the diagnostic center computer is able to indicate the serviceability of the weapon or identify problem areas and pinpoint item failures. This information is then transmitted back to the weapon and operating base. In a high majority of instances, only communications between the weapon and the diagnostic center computer, without human involvement, should be necessary. Where the diagnostic center computer cannot handle the problem, appropriate data could be relayed to a maintenance expert at the diagnostic center; he, in turn, through a communication link, is in touch with the base maintenance control technician, who has direct access to the weapon and the problem. This type of diagnosis could be performed on one or any number of aircraft simultaneously, whether in the air or on the ground.

component repair

Systems of the future could be designed for remove-and-replacement of components with off-equipment components repair being accomplished at specialized repair activities. The forward base of the future would then accomplish only remove-and-replacement of unserviceable components, no component repair.

area support point

With the diagnostic center performing the troubleshooting and equipment being designed for remove-and-replacement, any further maintenance of components would be done at a specialized repair activity. This arrangement would preclude unnecessary logistics support responsibilities at forward locations, reduce materiel and manpower at operating bases, and give the forward commander more time to concentrate on mission accomplishment.

With the removal of many of the currently assigned maintenance functions from forward locations, a full range of repair or support items at each base would be unnecessary. Under LOGCON 80, base stock would be reduced to just a few days' supply of high-consumption items. To ensure rapid response for items not stocked at the base, or resupply of high-consumption items, an area support point would be established at a centralized base in the geographic area. This base would support itself and act as the area support point for five or six other bases located nearby.

The area support point concept would enable us to take advantage of economies of scale by reducing the number of individual items needed in an area to support a given number of bases. For example, if under the present system two of a given item are required at each of ten bases to meet requirements for a total of 20 items, by using the area support concept we might be able to provide the same support with a third or half that number. In addition, the area support point could provide a wider range of limited-availability or quantity items than could have been stocked at each operating base. This then would provide each base with access to more stock than under the present system while reducing total Air Force materiel and personnel support investments appreciably. Stockage at the area support point would also include pipeline time from the suppliers and predetermined war readiness materiel.

The area support point would act in a manner similar to that of a neighborhood grocery store, servicing assigned bases as the store does neighborhood customers. Serviceable materiel would be provided by the area support point, and reparable components would be returned to the area support point for consolidated shipment back to the applicable repair activity.

The area support point would also have a selected maintenance capability, consisting of men and materiel that could be deployed to the bases to accomplish essential functions such as battle damage and facility repair, emergency maintenance, and other functions as required.

flying resupply

Under LOGCON 80 we would make extensive use of a flying resupply service for both overseas and ZI installations. This is, in essence, an expansion of the current Logistics Airlift (LOGAIR) system in the ZI. The flying resupply service would provide daily service from the area support point to each operating base.

It would operate much like a milkman who shows up at approximately the same time each day to provide the next day's needs. The flying resupply service would also bring in technicians from the area support point to accomplish nonrecurring maintenance or repair that must be performed on site.

logistics

With the instant visibility of logistics information that will be available in the environment of the 1980s, it will be possible and probably very desirable for a logistics manager (LM) to manage logistics worldwide. Since the diagnostic center would decide what is damaged or consumed and what is required to fix it, the diagnostic center would determine the majority of requirements. This information could then be provided to the LM. With remote consoles on the base connected to a central logistics computer, the LM could also control movement of all materiel at both the bases and the area support points. If a requirement did generate at the base, base personnel could immediately communicate this information to the LM through the area support point. With all materiel requirements flowing to the LM, he could order the materiel, pay the bill, and maintain the accountability.

This system would reduce forward base logistics support resource requirements (men, materiel, and money), give much greater materiel asset control, and provide more accurate and timely logistics visibility and status of Air Force units. Also, since most of the logistics support would be located out of the combat zone, a unit could evacuate a forward base during an emergency without having to abandon or destroy the majority of its logistics support capability, as would be the case with the current logistics system in today's combat environment.

The Concept in Action

Now that we have identified the various elements of the LOGCON 80 concept, let's combine them into an integrated LOGCON 80 support system in action.

To begin with, the diagnostic center and certain other command levels must have access to operational data. Each time the aircraft's built-in test equipment is activated, either in the air or on the ground, a signal would be relayed to the base, the major operating command, the theater headquarters, the area support point, and the system manager. This feedback would provide needed operational data and constitute an operational history file on each individual weapon.

During systems check or mission performance, the built-in test equipment would continually monitor the systems and subsystems on board the aircraft. When a systems check reveals a deviation from the norm in the fire control system, the test results are transmitted to the diagnostic center, which diagnoses the problem as a failure on the part of item X and, in turn, notifies the flight crew and base of the condition. The diagnostic center then notifies the base to replace the item and at the same time informs the supply component of the logistics manager that the base needs one each of item X. After mission completion, when the item is replaced, the built-in test equipment is reactivated to ensure that the system is once again in a serviceable condition. The diagnostic center also provides the base with a facsimile of the remove-and-replacement instructions, thus eliminating the need for maintenance publication libraries at forward locations.

At the same time the base is told what maintenance action to take, it will be told the corresponding supply action. The logistics manager's computer then checks its worldwide stock records. If item X is available at the base, the computer notifies the area support point to replenish item X at the forward base since it is a high-consumption and mission-essential item. If the item can be repaired, it is directed to be returned to the area support point. The next mission of the flying resupply service then returns it to the area support point for subsequent consolidated shipment back to the appropriate specialized repair activity.

Knowing the base's aircraft flying-hour program and personnel population, the system manager will be able to automatically direct movement of the daily support needs such as food, clothing, and fuel to the forward bases. When a unit moves into combat, the logistics manager will be able to

Among the technological advances making it mandatory that today's operational and logistics personnel define a new logistics process is integrated circuitry. The low-cost, highly reliable, and versatile integrated circuit that resulted from Air Force research begun in the early fifties is found in all military and commercial electronics hardware today.

compute and control movement of needed war consumables such as fuel and ammunition.

I HAVE INDICATED that anticipated future economic constraints and technological advances make it mandatory that today's operational and logistics personnel define a new logistics process—a process that will take advantage of improved technology, be economical, and be responsive within the environmental realities of the 1980s and beyond. LOGCON 80 could provide such a process. It is recognized that any new logistics concept such as this would impact on current Air Force policy, missions, and organizations. How much can only be determined as comparisons are made against old ways of doing business versus LOGCON 80 recommendations. Whether LOGCON 80 is the best logistics concept for the future environment, of course, can only be determined during these detailed studies. It is essential that such studies be accomplished in the very near future.

Hq Air Force Logistics Command

Constructive comments concerning this article or suggestions the reader may have on other possible logistics support concepts should be forwarded to Headquarters Air Force Logistics Command (XOXX) and the Office of the Assistant for Logistics (AF/LGL), Washington, D.C. 20330.

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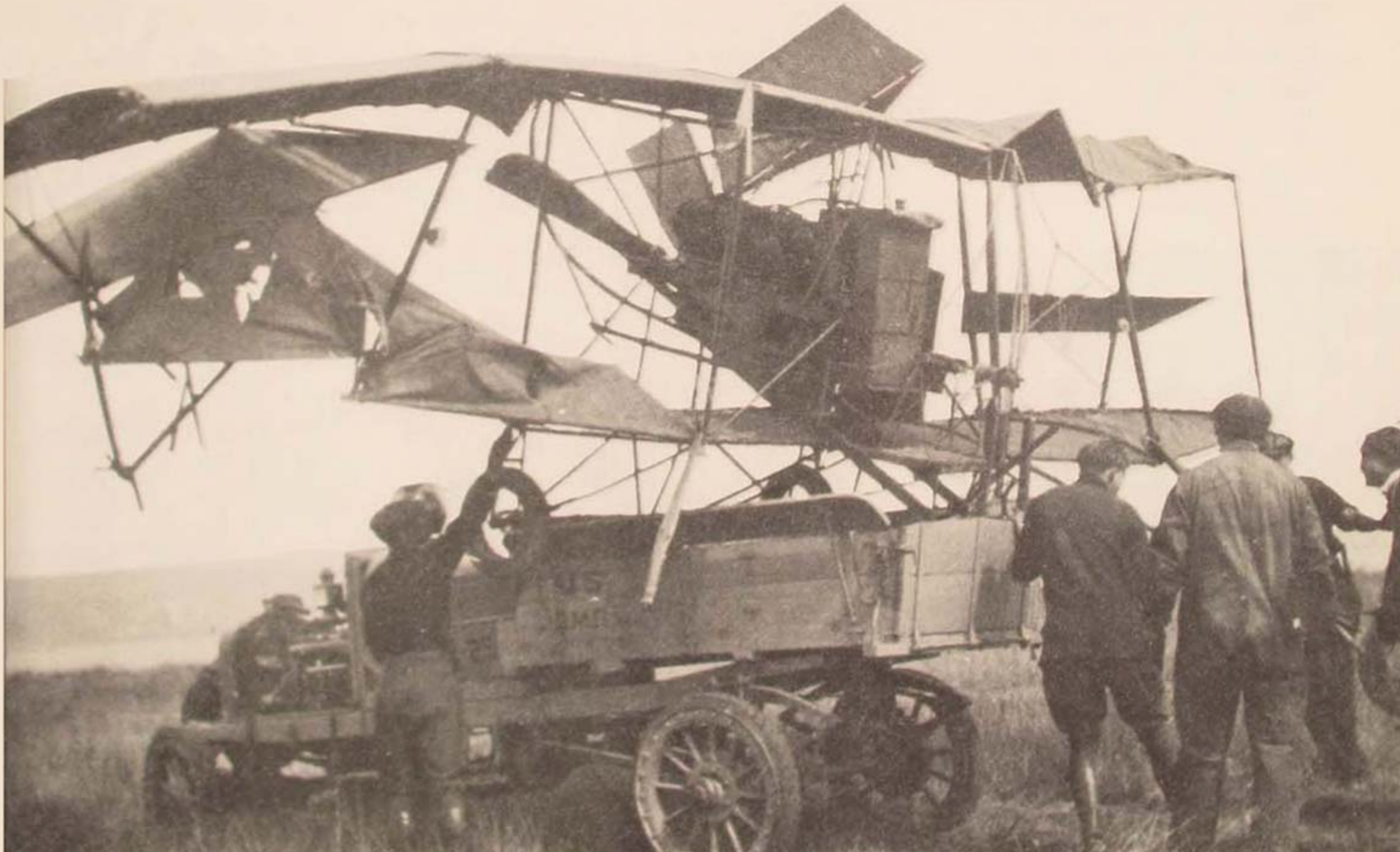
STALL STALL/SPIN SPIN SPIN

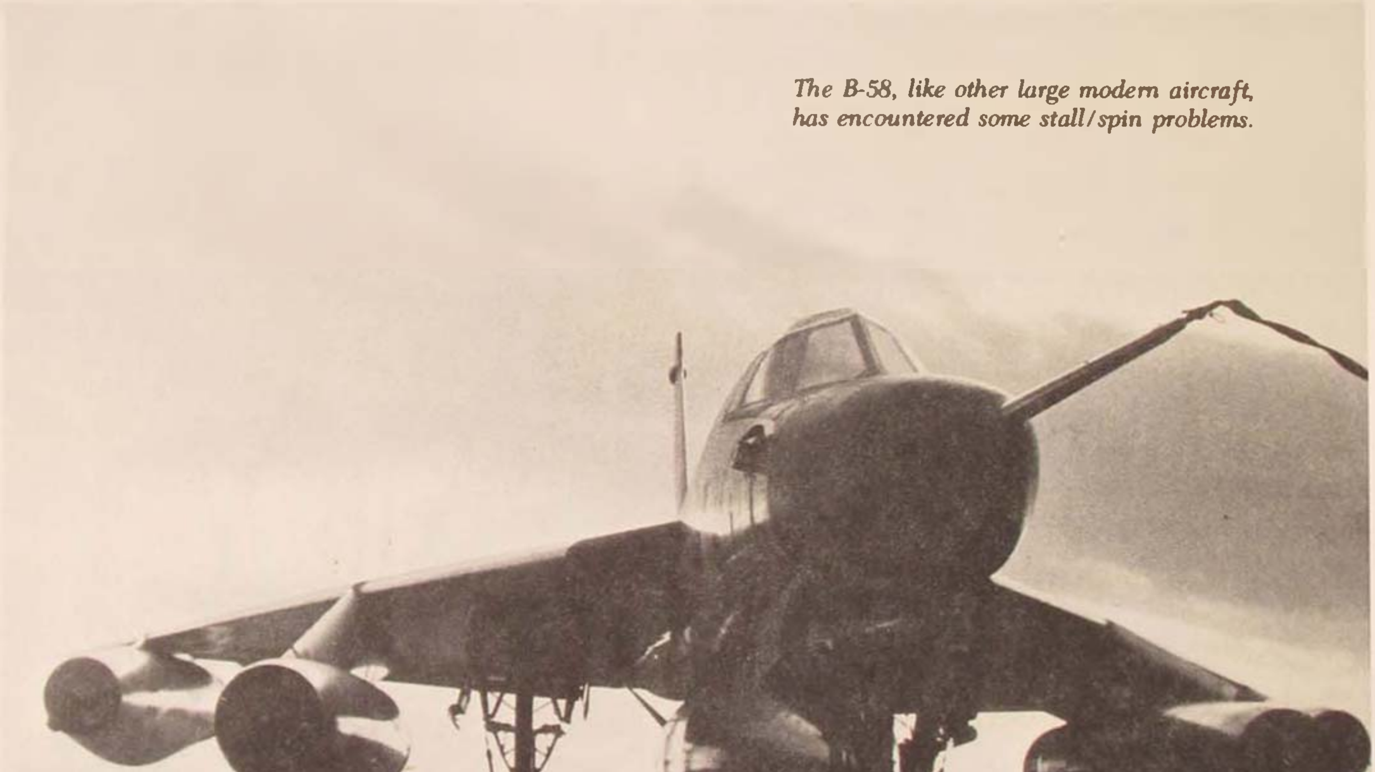
seventy years later

ROBERT J. WOODCOCK
THOMAS J. CORD



THE early glider flights of the Wright brothers often ended by dropping off on one wing, out of control, with a wingtip eventually striking the Kitty Hawk, North Carolina, sand in a rotary motion. While the low altitude of these flights prevented motion from developing fully, it seems clear that these were departures into incipient spins.

In those earliest days of manned flight, the spin was as dangerous as it is today. When the Wright brothers first tried warping the wings to roll into a turn, they found that the banking was accompanied by a dangerous tendency to diverge in yaw at high angle of attack.[1] Adding a fixed vertical fin helped stabilize the 1902 glider, but the loss-of-control problem persisted. Orville Wright reasoned that a hinged vertical rudder could produce a counter yawing moment to keep the yaw from starting and thus enable the flyer to retain control. This was tried first with rudder deflection connected to the wing-warp control, then with the pilot controlling the rudder separately. The fix was effective but required the pilot's



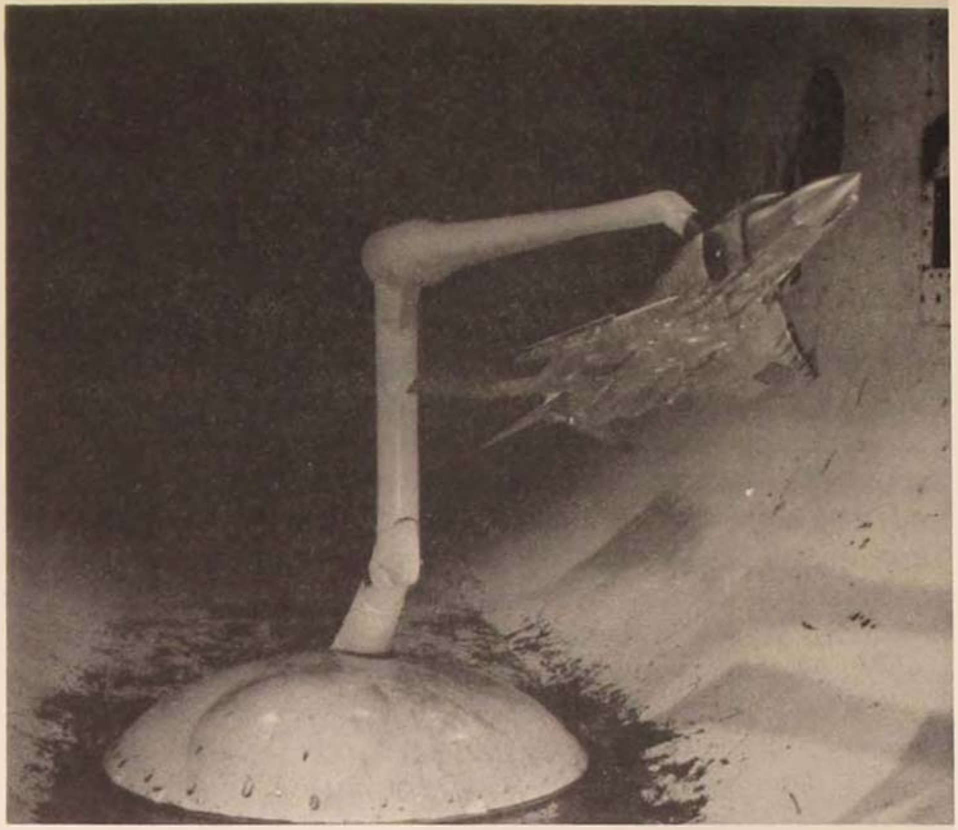
The B-58, like other large modern aircraft, has encountered some stall/spin problems.

constant attention. Proper spin recovery controls were not generally known until 1916, when F. W. Gooden, a British major, conducted flight test experiments on spin recovery procedures in a British F.E. 8.[2] For early airplanes the spin recovery technique was at least rational if not instinctive: forward stick and rudder opposing the yawing motion should stop the rotation and unstall the wing. With these recovery controls known, the spin was used as a maneuver to lose altitude without gaining airspeed.[3] Then in the mid-1920s, some of the more peculiar spin modes were recognized as problems. Accident summaries from that era[4,5,6] show spins involved in about three percent of all accidents reported and in twenty to thirty percent of the fatal accidents.

Analytical studies and dynamic wind-tunnel testing to reduce the stall/spin problem were reported as early as 1919. Autorotation was observed in the wind tunnels, and the first analytical prediction methods were developed by Glauert. About 1930, a method of determining the flight path and altitude of a spinning aircraft was put into use.[7] Rotation rates about and accelerations along the principal axes, as well as vertical velocity, were measured and recorded photographically. This information was used to define the motion of the aircraft, which could then be used in conjunction with the analytical prediction methods.

In the 1920s and 1930s several forms of testing were being performed. Because of the hazards involved in stall/spin flight testing, researchers were hesitant to use full-scale aircraft. One safety measure used in full-scale testing was the attaching of external ballast, which when released would cause the center of gravity of the airplane to move forward, thus returning the airplane to a controllable configuration.[8] In general, however, models were used for spin testing. One of the early spin models was dropped from the top of a 100-foot balloon hangar at Langley Field, Virginia. This proved an inadequate means of obtaining data, and soon vertical wind tunnels were being built to investigate spinning (1930 in the United States, 1931 in En-

The T-38/F-5A and F-5B encountered no spins during combat use in Vietnam.



gland). In 1945 the Army Air Force dropped an instrumented model from a Navy blimp to study spin entry and recovery.

As Aircraft Advanced

The stability and control of airplanes have remained important considerations as aircraft have advanced since the Wright brothers' flights. A degree of both qualities is needed for safe flight, and further stability and control requirements must be met in order for a pilot to perform assigned missions effectively. One critical region of flight is at high angles of attack, where the airplane is susceptible to stalling and possible spinning. Despite the long standing of stall/spin problems, loss of control at high angle of attack is a major factor in the accident rates of our current fighter aircraft such as the F-4 and F-111.

As jet aircraft were developed, the inertial characteristics of fighters in particular were changed to the point that spins and other post-stall motions became more troublesome and even required different recovery techniques. By the time of the 1957 Wright Air Development Center Spin Symposium,[9] most stall/spin problems were identified, some analysis methods had been developed, and the electronic digital computer provided a useful tool with which to examine the stall/spin problem.[10]

Then suddenly the emphasis was shifted to space. With little management interest and rather poor expectations of improvement, resources for stall/spin research were quite limited. Instead the Air Force tended to concentrate on performance improvements, which often have aggravated stability and control problems at high angles of attack. Today, a large and costly Air Force accident record and a renewed emphasis on maneuver capability have led to a larger concentrated effort to solve the problems

An F-4D model with leading-edge slats is tested at high angle of attack in the 12-foot wind tunnel at NASA Ames Research Center, Moffett Field, California. . . . A B-1 free-flight model simulates the flight characteristics of that aircraft through tests in the 30 × 60-foot wind tunnel at NASA Langley Research Center, Virginia. . . . A lightweight fighter drop model tests launch and recovery techniques at the Air Force Flight Dynamics Laboratory, Wright-Patterson AFB, Ohio.

associated with aircraft operating in the stall/spin flight regime.[11]

Large aircraft have also experienced stall/spin problems. For example, several B-58s were lost in spins. Automatic trimming of the control-stick force was mechanized in such an insidious way that an inattentive pilot might not be aware of a slowdown to stall speed. Trouble with fuel management could result in an extreme aft center of gravity, at which B-58 stability and control were deteriorated. On long flights the C-133 would climb to an altitude approaching its absolute ceiling. Poor stall warning and a vicious stall while trying to fly there are thought to have caused the disappearance of several C-133 aircraft. It has become customary to require analysis and spin tunnel testing of all military airplanes even though flight demonstration of large, low-maneuverability types is limited to stalls with only moderate control abuse.[12]

Systematic design data for high angle of attack do not exist; in fact, even aerodynamic force and moment data on specific configurations of current interest are sparse. And there is only a limited degree of confidence. The problems are highly nonlinear in nature, and details vary extensively with aircraft configuration. Since spins and post-stall gyrations are no longer useful maneuvers but are to be avoided, there is a great tendency to forget about them unless and until frequent incidents occur. Because of the danger, spins generally are not tested intentionally in flight until well into the production run of an airplane. By then, changes have become very costly to make.

As with most technical areas, stall/spin technology has a particular set of terms that must be precisely defined before the subject can be clearly understood. The following definitions will hold for our purposes.[13]

stall: The peaking of aerodynamic lift, occurrence of uncommanded aircraft motion about any axis, or onset of intolerable buffet or structural vibration, due to airflow separation induced by high angle of attack (α). The least angle at which one of these phenomena occurs is the stall angle of attack.

post-stall gyration: The uncontrolled motions about one or more airplane axes following departure from controlled flight. This motion normally occurs at and above the stall angle of attack, though lower angles may be encountered intermittently.

spin: A motion characterized by a sustained yaw rotation, with α greater than the stall angle. The spin may be erect or inverted, flat (very high α, 70 to 90 degrees) or steep, and may have oscillations superimposed on the rotary motion.

The military specification[14] for flying qualities defines good high-α characteristics in terms that are qualitative rather than quantitative. The airplane must exhibit adequate stall warning, and in addition the stall must be easily recoverable. We require resistance to violent departures from controlled flight, which might induce post-stall gyrations or spins. There are also requirements for recovery from attainable post-stall motions. The definitions of good high-angle-of-attack characteristics will differ for the various classes of aircraft; but with respect to fighter aircraft, a pilot should not have to worry about loss of control while flying within his useful maneuver envelope. Current research will lead, we hope, to quantitative requirements that will be of more use in the design stage for all classes of airplanes.

Generally post-stall design and testing have emphasized spins and spin recovery, taking the point of view that assurance of recoverability from the worst possible out-of-control situation guarantees safety. This philosophy falls short in several respects. Resistance to departure has not been emphasized adequately. The motions can be disorienting, and recovery control inputs like ailerons with the spin are unnatural. And as airplanes grow larger and heavier, altitude loss becomes excessive. F-111 instructions, for example, are to eject if spin recovery has not commenced upon reaching 15,000 feet altitude. Spins and spin recovery should not be neglected, but emphasis needs to shift to departure resistance and early recovery.

Flow separation is the common cause of departure. A sharp, highly swept wing leading edge is conducive to leading-edge separation, while trailing-edge separation is typical of a wing having a blunt leading edge with little sweep. Unsteady flow effects are poorly understood for the three-dimensional case of interest for real airplanes. Vortices shed from a slender, pointed nose or from the wing-fuselage juncture, for example, can deteriorate flow over the tail, affecting both stability and control. Separated flow over ailerons can destroy their effectiveness. At high angle of attack, deflection of roll control often produces large yawing moments, too. Asymmetric moments may also result from sideslip or very small configuration asymmetries. A typical fighter has low rolling inertia, which tends to force rolling to be about the x body axis rather than the flight path; this characteristic tends to convert angle of attack into sideslip (β) cyclically as the airplane rolls. But other inertial factors have a stabilizing tendency: some departures occur near the angle of attack at which the effect of the factor expressed by the formula

$$C_{n_{\beta,\ dyn}} = C_{n_\beta} \cos \alpha - \frac{I_z}{I_x} C_{l_\beta} \sin \alpha$$

becomes zero. The aerodynamic rolling-moment derivative C_{l_β}, being normally of different sign, will tend to augment the static directional stability, C_{n_β}. I_x and I_z are the moments of inertia about the airplane roll and yaw axes, respectively; α is the angle of attack.

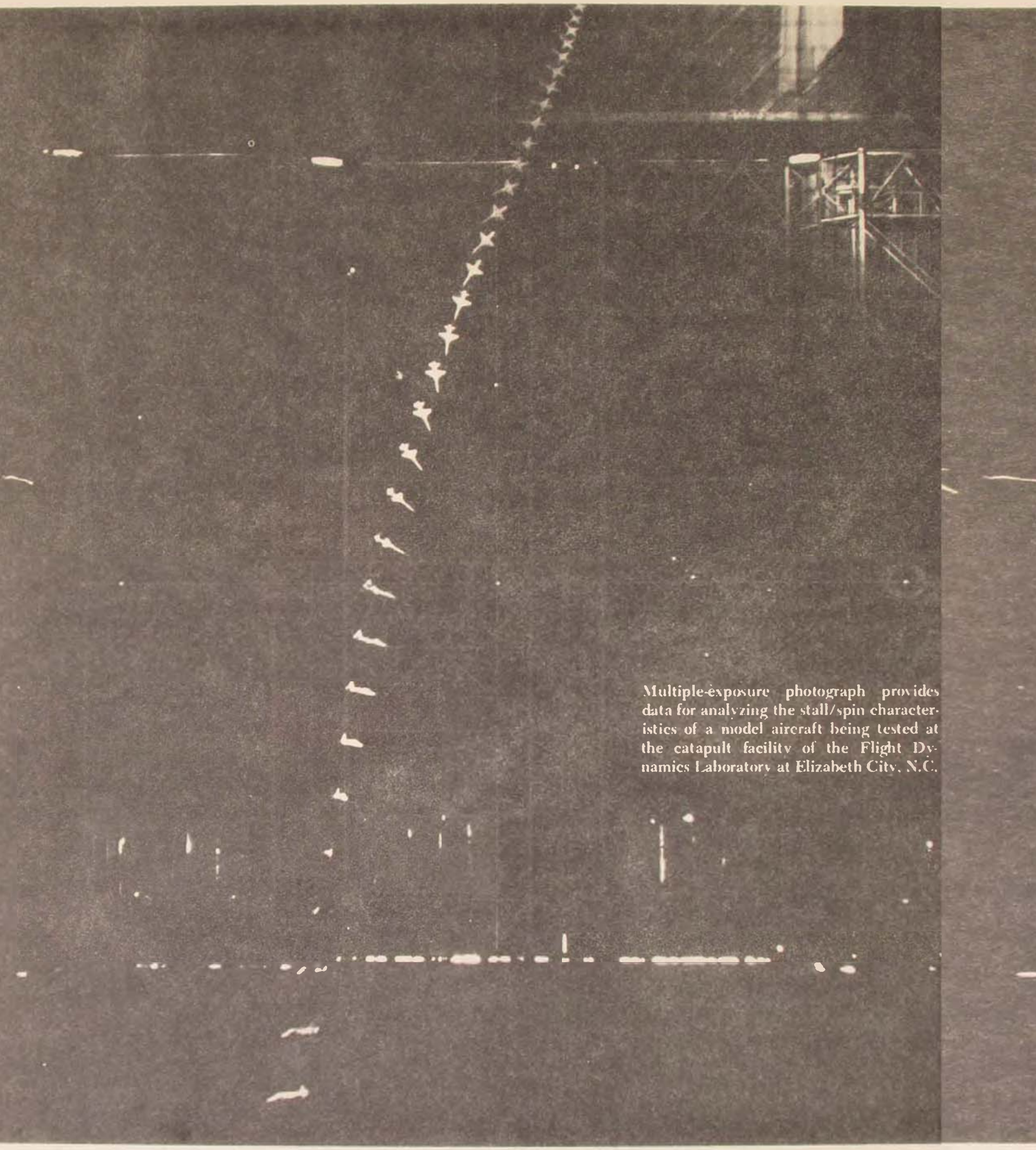
Status of Technology

Recent studies of current Air Force fighters have developed additional insight into their high-angle-of-attack problems. Also, initial F-14 and F-15 flight results show that substantial improvements can be secured by concentrated design attention, but neither of these airplanes has yet been fully evaluated. In any case, the design effort is very large, trade-offs are uncertain, and confidence is unsure until after thorough flight demonstration. There remains the need to establish definitive requirements and develop a greatly expanded basis for aerodynamic and flight control design. To that end, improved design methods and criteria are being sought for the high-α characteristics of present and future aircraft. The following is a short description of various areas of technology being developed to minimize the high-angle-of-attack problem. More detailed information may be obtained from the document listed in note 11.

Except for a few rules of thumb, analytical stall/spin work is based on the mathematical equations that describe the motion of an aircraft. The general equations of motion involve both inertial and aerodynamic nonlinearities. For the large-amplitude motions associated with stall/post-stall flight, linearization of the equations is of limited value, while using the nonlinear equations makes generalization difficult. Some attempts are being made to rewrite linear equations by changing the reference axes,[15] to give perturbations about a steady spin,[16] or to change the form of the aerodynamic description of the aircraft. But in most cases the nonlinear equations are used in order to describe the motion adequately. The primary reason for inaccurate prediction of high-angle-of-attack characteristics is the quality of the available aerodynamic data.

For most configurations, static wind tunnel data are scarce at high angles of attack. Dynamic data are even harder to obtain. For such data as are available, after corrections for tunnel wall effects, tunnel blockage, etc., the remaining effect of disparity of Reynolds number (an indicator of viscous flow effects) can be estimated only uncertainly. We still do not understand some of the phenomena well enough to predict their severity or even their occurrence. In order to estimate aerodynamic forces and moments, it is necessary to predict flow separation lines and pressure distributions in three-dimensional subsonic flow. At this time, more often than not the high-α data must be fudged in order to get analytical predictions to agree with flight-time histories.

The principal U.S. source of high-α static aerodynamic data at high Reynolds number has been the National Aeronautics and



Multiple-exposure photograph provides data for analyzing the stall/spin characteristics of a model aircraft being tested at the catapult facility of the Flight Dynamics Laboratory at Elizabeth City, N.C.

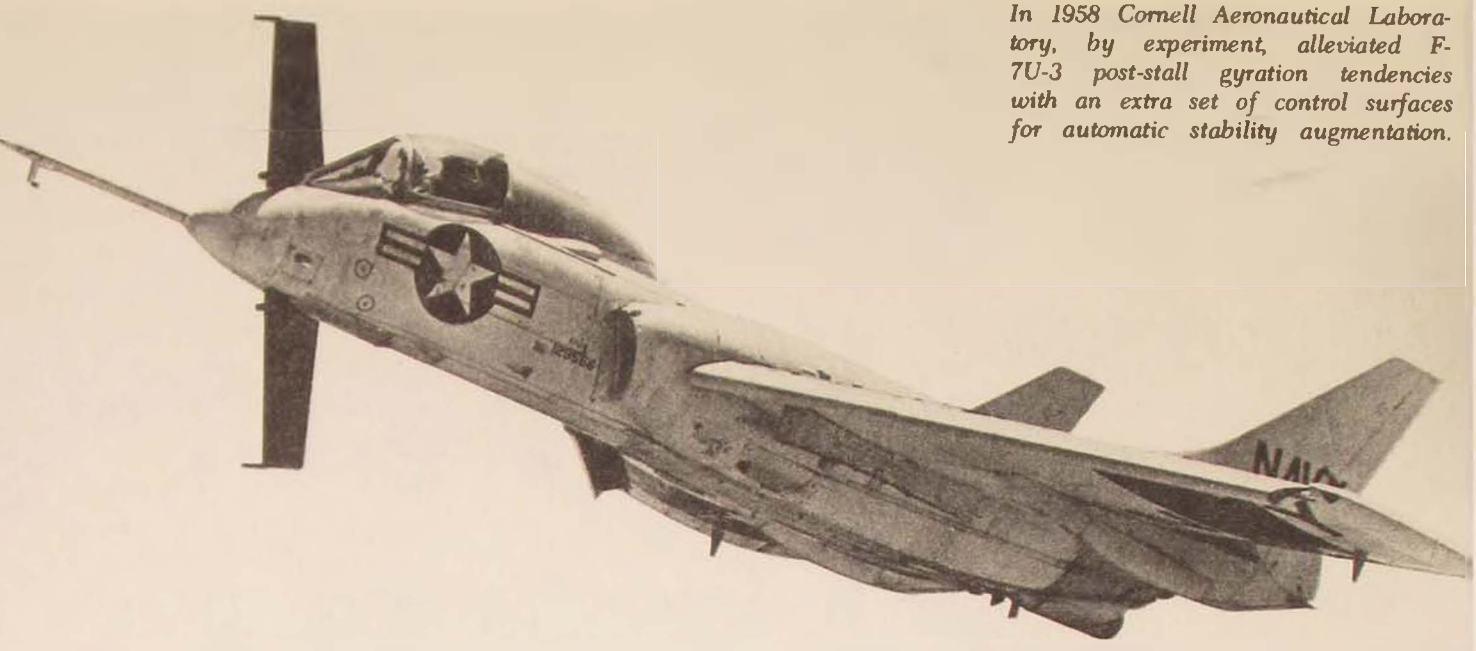
Space Administration Ames 11-foot and 12-foot wind tunnels. Although flow irregularities and mount limitations there have limited the validity of data taken, these deficiencies are to be rectified. The Arnold Engineering Development Center 16-foot transonic tunnel also has a high Reynolds number capability, but no existing facility can reach the flight Reynolds numbers of full-scale airplanes. Still, exceeding a critical Reynolds number appears to be the most important test requirement. NASA has had a small rotary balance in the spin tunnel and now is employing a new rotary balance in the Langley 30-foot by 60-foot tunnel. Rotary and oscillatory dynamic testing are expected to produce different aerodynamic results. NASA Ames is also working on improved dynamic wind-tunnel testing apparatus.

The steady spin and recovery can be investigated in a vertical wind tunnel, but the dynamically scaled spin-tunnel aircraft models are rather small. Moreover, a more fundamental limitation is that the models are tossed into the tunnel much as a Frisbee is launched; thus little can be learned about the prespin phase of stalled flight. Also at NASA Langley, models of about 3-foot span are flown in the 30-foot by 60-foot tunnel, with power and control signals transmitted through an umbilical cord. This method enables 1-g stalls and initial departures to be studied in conditions resembling free flight.

Free-flight model testing has also taken the forms of catapulted models (recorded by multiple-exposure photos) and radio-controlled models dropped from blimps, lightplanes, or helicopters. The last has been used for some time by James Bowman of NASA Langley, with motion data radioed to the ground and motion-picture coverage. The time scale for these approximately one-seventh-scale models is very short; but even so, entry and recovery techniques can be investigated. Free-flight-model test results have been found quite generally to agree qualitatively with full-scale results despite Reynolds number differences. But from cost and time considerations, most of these tests have followed, rather than preceded, full-scale tests at high angle of attack.

In design development, drop model testing can be coupled with recently developed parameter identification techniques to supply both the aerodynamic description and an indication of the real airplane behavior at high angles of attack. A large scale model can allow both a better match of Reynolds number and the internal volume required for extensive telemetry equipment and sensors. Telemetry is used to gather detailed data for later analysis and possibly also for modeling an active flight control system. The model can enter stall/departure from maneuvers as well as from 1-g flight, and the entire motion from onset through recovery can be experienced. The quickened time scale, however, will not permit a direct pilot evaluation of flying qualities. The model can be used to provide information at extreme flight conditions, with no danger to the pilot. Variations of this technique are currently being pursued by the NASA Flight Research Center (F-15), Air Force Flight Dynamics Laboratory (Lightweight Fighters), NASA Langley Research Center (various models), and the Royal Aircraft Establishment, Bedford, England. At Langley, smaller models with simpler instrumentation and controlled with hobby equipment are being investigated to see how much can be learned from a minimum-cost drop model program aimed at general aviation.

In an attempt to understand the aerodynamics of departure and post-stall motion, flight data are being regressed to determine coefficients of the equations of motion. Pertinent parameter identification



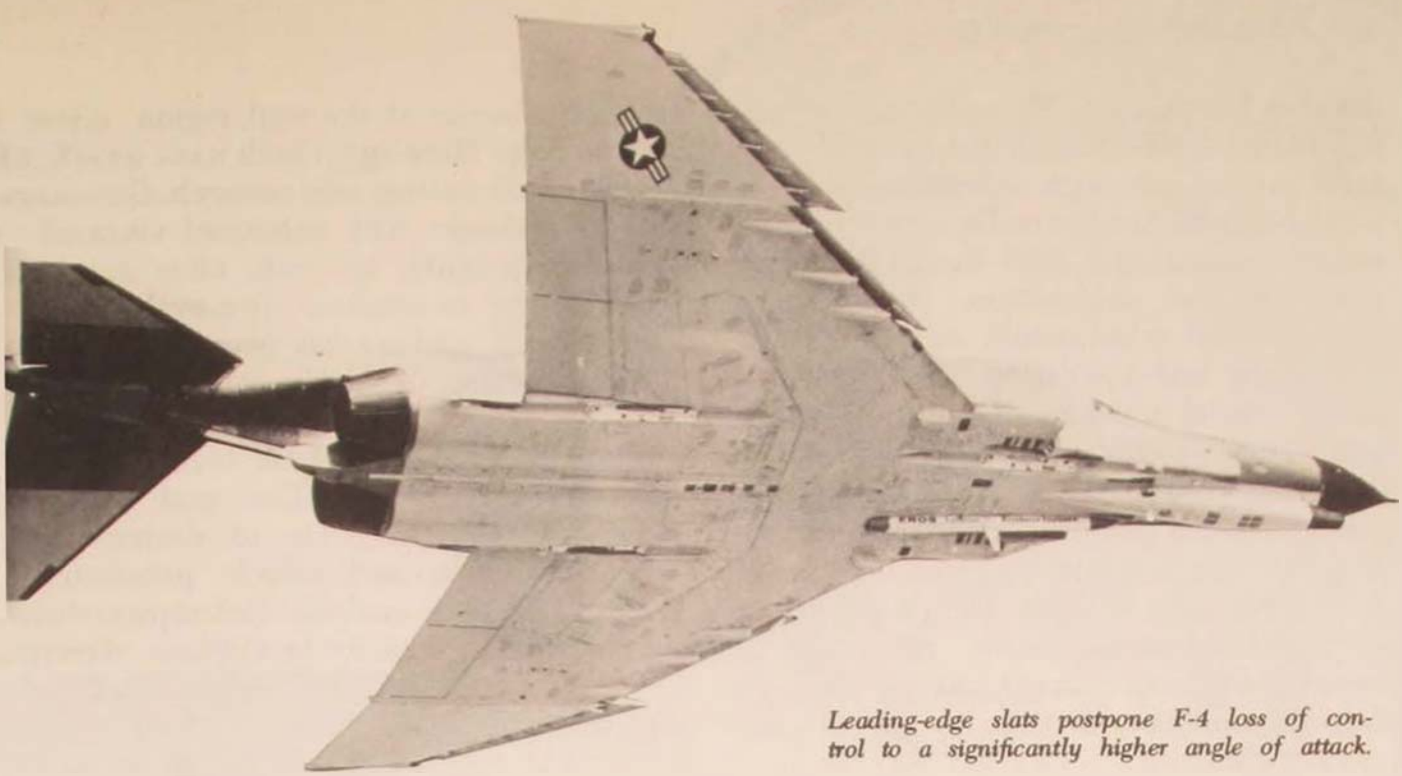
In 1958 Cornell Aeronautical Laboratory, by experiment, alleviated F-7U-3 post-stall gyration tendencies with an extra set of control surfaces for automatic stability augmentation.

techniques range from analog matching of time histories to Kalman filter and maximum likelihood estimates. A conference was held in May 1973 at Edwards AFB, California, to discuss developments in this expanding field. The hope is that this inverse approach will give insight on the form the equations of motion should take. Low-angle-of-attack flight (approximately linear aerodynamics) can now be treated quite satisfactorily, but the nonlinear regions of stall/spin are just now being explored. By applying these techniques to both model and full-scale flight test results, analyses and simulations may be given an updated aerodynamic description of the test configuration. This updated simulation can then be used to plan the remainder of the flight test program more effectively.

If aerodynamic data can be made adequate for the flight conditions to be studied, much can be done to aid design with both linear and nonlinear analysis of the equations of motion. Primary interest is in (1) development of design guides that will help locate potential problems early in the design stage of future aircraft; (2) establishment of quantitative handling-qualities criteria for high-angle-of-attack flight regimes; (3) definition of control laws for improvement of high-angle-of-attack characteristics through the automatic flight control system; and (4) further identification of good and bad aerodynamic configuration factors and the ways in which they affect the flow and aerodynamic forces.

The Outlook

The increased attention now given to stall/spin characteristics is in itself a major step forward. Relatively simple fixes have been found which, while not eliminating stall/spin problems, have provided significant improvement. Such a fix is the F-111 Stall Inhibitor System, which has been flown. While the flight-test program stopped short of extreme maneuvers, the combination of additional directional stability augmentation and a high stick force gradient



Leading-edge slats postpone F-4 loss of control to a significantly higher angle of attack.

in pitch near the limit angle of attack appears to be an effective departure deterrent. For one thing, the stability augmentation forces the airplane to roll more about its flight path than about its body x axis. Leading-edge slats delay both buffet onset and departure of the F-4 to a higher angle of attack. Air Force Flight Dynamics Laboratory's Tactical Weapon Delivery (TWeaD) program demonstrated the effectiveness of improved stability augmentation at angles of attack below departure for a standard F-4. On a simulator, Calspan Corporation has demonstrated that a somewhat more sophisticated change in the flight control system can essentially eliminate A-7D departures; and Vought independently has derived an aerodynamic modification, a wing leading-edge extension next to the fuselage, that gives significant improvement. The F-14 also uses the flight control system to improve departure resistance: "The magnitude of the yawing moment required for a spin cannot be developed when the stick is laterally centered at spin angles of attack."[17] A highly successful example of effective control-limiting is the T-38/F-5, which has a potential unrecoverable flat spin mode. While stabilizer authority is adequate for other uses, it is limited to the extent that, in flight test, only abrupt full aft stick held for a long time would develop a spin. Spins have not been encountered at all in T-38/F-5A,B operational use.

We feel strongly that, despite the possible capabilities of a flight control system, there is no substitute for careful aerodynamic design. Nevertheless, other factors may dictate use of the flight control systems to prevent departure from controlled flight. Air combat effectiveness, excessive altitude loss, possible pilot disorientation, and perhaps an unnatural recovery technique are some considerations in further limiting airplane motions.

In summary, then, it can be said that, to improve aerodynamic design capability, the Air Force and NASA are starting to develop better tools. Nevertheless, advancing high-α aerodynamic theory is a long-term project, although intermediate results will be helpful. Studies under way or planned entail fundamental flow theory including viscid-inviscid interaction, with highly instrumented wind-tunnel models to provide data and validation. Also, new dynamic model mounts are in prospect for wind-tunnel testing, and free-flight models are being improved at both ends of the cost spectrum. Simple, less expensive free-flight testing of relatively small models can be helpful early in design, while the effects of stability augmentation, etc., can be investigated with larger, more elaborate free-flight models in time to aid the full-scale flight tests.

Although flying qualities in the normal flight regime can be specified quantitatively in great detail, the complications of nonlinearities and coupled motions near the stall region have precluded the statement of criteria that could be very helpful to the designer. Qualitative statements of general aircraft behavior at the stall region are of limited help. Here again both NASA and the Air Force are starting new research. Ground-based simulators with enhanced visual or motion capability, or both, offer a safe, efficient way to conduct pilot evaluations. Pilot-vehicle analysis has been instrumental in recasting dynamic requirements for lower angles of attack, and now we are attempting to extend these techniques to the stall/spin region. The goal of the flying-qualities efforts is to derive and quantify motion and vehicle parameters and to develop analysis techniques that can be related directly to airplane design.

On the other hand, we realize that "design trade-off" is a synonym of "compromise." Thus we will never be rid of stall/spin problems even if we should come to understand the phenomena thoroughly. But there are several approaches that need to be followed in order to make these design trade-offs possible on a basis approaching rationality.

Air Force Flight Dynamics Laboratory

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THE MILITARY LEADER
A Financial Manager

Jerome G. Peppers, Jr.

THE RISE in the cost of living for American society is also reflected in the rising cost of business and governmental operations. Inflation affects the Department of Defense budgeted dollars, yet Defense must provide adequate salary for its military and civilian employees in order to retain the numbers and skills required for mission ability. At the same time, the Department of Defense is not likely to receive budget increases to accommodate rising costs. Effectively, then, the DOD faces level or decreasing budgets in coming years with no foreseeable diminution of mission requirements. The need for improved financial management at all levels has never been so urgent or so definitely required.

The cost of labor (people) has risen dramatically in the sixties and seventies, military and civil service pay and allowances roughly doubling in that time. The fiscal year 1973 budget reflects 60 percent of that money spent on people-related items such as salary and retirements.[1] Concurrently, the costs for new weapon systems and support items and for supporting supplies have risen. Because of these rising costs, fewer and fewer budget dollars are available for the purchase of goods and services. Defense management is aware of this budgetary constraint, but more management concern, action, and emphasis will increasingly be necessary at each managerial level for financial considerations in management decisions.

Financial management is more than an accounting system and more than fund control. Adequate accounting systems are necessary for any complex organization's financial management efforts, and fund control is necessary in Defense to meet legal requirements for statements and accounts to the Congress as to how budgeted monies were spent. Even so, the accounting systems and fund control are of little real value if management does not give sufficient consideration to current and future costs when making decisions and establishing programs. Financial management really requires the manager to consider his costs of operation, the alternatives available to him, the costs of those alternatives, and the need to make economic choices from arrayed and evaluated alternatives. All this, of course, must be done intelligently so that low cost today is not reflected in inordinately high cost tomorrow.

The Department of Defense does not aim to make a profit, but it is in business to provide a vital service to American society. We operate with budgeted monies provided from taxes paid by the people. It is public money and should be handled with every practical assurance that it is wisely spent. Every decision to expend public resources should be a cost-effective decision. The action decided upon should be essential, and the manner of accomplishing it should be an economical application of resources. The "profit" in a military unit might then be said to be the assurance that we have provided national security at the lowest feasible cost, giving the people the best possible use of the dollars allocated for that purpose.

This charge for cost-conscious management was reflected in our early history by Thomas Paine, who wrote: "Public money ought to be touched with the most scrupulous conscientiousness of honor. It is not the produce of riches only, but of the hard earnings of labor and poverty. It is drawn even from the bitterness of want and misery. Not a beggar passes in the streets whose mite is not in that mass."

Paine's comment, appropriate for his time, is just as applicable today. Every member of society contributes to public monies, and those public monies are allocated to governmental agencies for the public good. The managers of governmental organizations are charged with the moral responsibility to insure that budgeted money is wisely spent on those things essential to the accomplishment of their public service.

Faced with the prospects of level or decreasing budgets, military managers must grow increasingly capable in financially efficient ways. We must become more deeply involved in the financial considerations of our management activity and be more certain than ever before that our decisions and action recommendations are financially sound and cost effective. The overall intent is to manage to attain and maintain military effectiveness at the lowest practical cost in consideration of both current and future requirements. It is to this end that this article is devoted.

A MAJOR CHANGE in federal expenditures for defense occurred during and after World War II. The U.S. had always operated with a mobilization concept prior to this time. That is, the technology of war and the weapons available permitted time to mobilize for war using as a base the small, relatively inexpensive regular military forces as the core. World War II, the cold war, and rapid change in technology altered this situation. Mobilization could no longer be timely, and we adopted the concept of forces in-being. This meant large regular forces, full-time, equipped with expensive and sophisticated weaponry. The resultant military budgets were of unparalleled peacetime scope. It was during this time that the Department of Defense came to be the largest single consumer of Congressionally allocated funds—a condition that resulted in considerable pressure from the Congress, society, and within the Defense establishment for significant improvements in financial management.

Secretary of Defense Robert S. McNamara and Charles J. Hitch, Assistant Secretary of Defense (Comptroller), began action to align defense planning, programming, and budgeting in the early sixties. The Five Year Defense Program became, in effect, a beginning of program budgeting for defense. New and strong emphasis came to bear on costs and cost analysis, but there were still problems with coordination, with the relationships of requirements and costs/programs and costs, and so on. The need was for a process that would relate and tie together the management acts of planning, programming, budgeting, and accounting in a meaningful and useful manner.

In 1965 Robert Anthony became the Assistant Secretary of Defense (Comptroller) and began emphasizing the concept that came to be known as Project PRIME, an acronym for *Pri*ority *M*anagement *E*fforts. PRIME had two main objectives:

- the integration of programming, budgeting, and management accounting so that terminology and information in all three would be consistent;

- the development of more meaningful information on the consumption of operating resources, with the major focus on expenses incurred by operating units in the carrying out of their missions.

The intent of PRIME was ultimately to charge an organization with as close to 100 percent of its incurred expenses as would be feasible, thus changing the emphasis from pure fund control to financial management concern. PRIME intends to bring recognition to the real costs of operation. The funding processes of our government seem, today, to provide operating units with resources, systems, and services that carry no cost identification. These are often considered "free" by the managers who receive and use them, and there is little incentive for their efficient use. Many times a military department or major command will centrally fund and manage certain programs or support for operating units. The managers in the operating units have no visibility for these costs, and the lack of visibility likely causes wasteful use. PRIME's objective of ultimately charging an operating organization with 100 percent of its expenses could, in the long run, change the centralized concept of defense management to a concept of decentralized management. At any rate, whether or not PRIME has that result, defense managers are going to acquire, in time, more cost visibility and more accountability for efficient operations.

A manager in defense organizations today finds he is working with the partial implementation of a financial management effort identified as "resource management." Resource management is intended to provide managers the methods that will enable them to acquire resources (men, money, material things), manage those resources, and provide data for information systems about what was done, by whom and for what purpose, and what it ultimately cost. Of significant importance is the objective to establish standards of "should cost" for comparison with experienced cost, to measure performance against plan. Even though the resource management systems currently in use are incomplete and in some areas embryonic, they are an essential step toward more rational and efficient use of resources in the Department of Defense.

current environments

Every organization must function within and react to a variety of environments including the physical, geographic, economic, political, and many others. Intelligent management stays attuned to the environments in which it must function and tries to satisfy the desires of those environments so that resources will continue to be made available and the unit's product or service will continue to be used. This is as true for defense managers as for managers in any other organizational entity.

The environments impacting upon the Department of Defense are not totally friendly. American citizens are reflecting some restiveness about the burden of costs for national defense and how we manage the expenditure of billions of dollars each year. Some political bodies and people are plainly stating their dissatisfaction with the efficiency of defense managers in using resources. The fluid and changeable international situation creates other environmental pressures. The point is that defense managers must be more sure than ever before that they are intelligently and efficiently using resources for essential needs and that their actions can stand evaluation and scrutiny.

Over the years critics have amassed dramatic illustrations of resource expenditure in the Department of Defense to defend their positions. Much publicity has been generated by reports of cost overruns, excessive purchases, provisioning of special benefits for certain groups, and so on. Many of these may be reasonably defended, but their defense rarely gets the publicity given the charges. Others are not rationally defendable. As a result, a certain set of the environments in which Defense functions has become, if not hostile, somewhat critical. As managers in military units, we should not bury our heads and hope for the best. Rather, we must act decisively to insure that unit responsibilities are met through intelligent use of resources.

Financial management alone will not solve these problems. However, management without financial considerations can do nothing but add to the problems and create more. It needs to be re-emphasized that financial management is a state of mind in which efficiency receives adequate consideration along with effectiveness. In military situations, of course, there are times when survival is at stake, and when this occurs, costs hardly matter. But such situations are rare. In the bulk of our experience, costs do matter and should be of concern. We should be working to satisfy the implicit and explicit requirements of our environments through financially responsible management.

Financial management in the Defense Department must serve many purposes. It must produce a budget in a form acceptable to the Congress. It must account for funds in the same manner for which they were appropriated. It must provide the financial information required by other agencies of the government—the Office of Management and Budget, the Treasury, and the General Accounting Office. Of major importance, the financial management system must provide data needed by top management to make crucial decisions, such as those on the major forces and weapon systems needed to carry out principal missions.

The result of all this, for the local manager, is a defined mission or set of missions and an operating budget. The operating budget is an approved program that authorizes designated responsible individuals to consume resources for mission needs. This, then, is the reason for being and imposes the operational resource constraints on the individual military units and commands.

the importance of budgets

Resources are not unlimited, and they have lead-time requirements. In other words, we cannot perceive today a need for men, money, or material items and expect them to be immediately available to us. Rather, we perceive the need, state the requirements, and wait the time necessary to obtain or produce the resource and get it to its place of intended use. Managers must consider their resource requirements well in advance and insure that they can be obtained within the constraints of limited accessibility. Unavailable resources, or demands for more than is available, doom the manager to less than optimum success, often to failure.

Budget processes aid managers in their efforts to obtain resources for continuing success and efficiency. Budgeting must begin at the lowest level of organizational structure. The proposed budgets from lower levels (to meet objectives assigned by higher levels) must be consolidated and added to as they go up the hierarchy, so that at the top the accumulation represents the needs of all. A major budget, such as for a major military command, is a collection of the smaller budgets for its constituent elements.

A budget, being a presentation of resources required for successfully accomplishing assigned objectives within a stated time period, is a vital tool for financial management and must not be overlooked at any managerial level. It serves to coordinate goals and resources as well as organizational elements and divisions. Further, it provides a means for measuring unit effectiveness and efficiency and also permits self-evaluation of managerial activity. It demands a look into the future, which enhances the manager's opportunity to make better and more cost-effective decisions. The approach to the future requires that the manager forecast the expected situations for the time frame in consideration. He can forecast what is likely to happen and what should happen and compare the two. The difference between what is likely to happen and what should happen offers him the opportunity to advance those things he wants to happen and hinder those he does not want to happen.

An approved budget is top-level concurrence with the stated objectives and an authorization to acquire and use the resources to attain them. However, an approved budget is also a limit on expenditures. That is, we may spend to the extent of the budget if necessary, but we need not spend it all. In other words, if an objective can be attained with less than the planned expenditure of resources, we should not seek out other means of expenditure solely to use up the budget limit. Unfortunately, some of our external criticism stems from the belief that governmental managers often do spend to insure that the total budget is used. This has been identified as the "June syndrome," since it is most likely to occur in that time period just before the fiscal year expires. The point, again, is that an approved budget is a maximum limit on spending and not an invitation to unnecessary spending. At the same time, a budget must be sufficiently flexible to permit managing. It must not be set in concrete but must recognize that conditions, situations, and resource requirements may change. Management must be able to adapt to changing situations and not be bound by budget detail to impossible ones.

some cost considerations

Financial management demands that managers know something about costs. There is a great variety of cost identifications—far too many, and often too specialized, for consideration of them all here. However, some costs deserve mention because they are important to the frame of mind necessary for financial responsibility. The interested manager, thinking and planning for his future effectiveness, will investigate these further and learn more about their applicability to his management efforts.

Sunk costs are costs that will not be changed by a decision. The importance of this identification is that those things which will not be changed by a decision should not be considered when making that decision. Sunk costs are already incurred and cannot be altered by decision now or in the future. A desk on hand, for example, reflects a sunk cost that cannot be changed no matter how much we might now wish we had not bought it. Sunk costs might be termed historical costs. We cannot change them now, but we might use them to forecast some future costs, and we might analyze them occasionally to help develop our financial management ability. Future costs are not yet sunk because they can still be changed by decisions. So, managers should learn to recognize sunk costs and adapt to the concept in decision considerations.

Management is a process involving the constant comparison of alternatives. The manager's selection from alternatives is called decision-making. It is obvious that when there are no alternatives there are no decisions. Hence, whenever we must make a decision, we must always have at least two alternative methods for getting the desired results. Most often we find more than two alternatives, and then decision-making becomes more complex. Two forms of cost considerations that must be included in cost-effective decision processes are *differential costs* and *opportunity costs.*

A vital aspect of decision is the comparison of costs of alternatives. Those costs that will not change between alternatives are of equal consideration. However, some costs will differ from one alternative to another and are called *differential costs*. Differential costs that reflect an increase are incremental costs; those that show decrease are decremental. For example, if it would cost $15 to produce a certain result and $25 to double that result, the differential cost would be $10, an incremental cost. If a change in operating processes in a unit would cut costs by an estimated $7500 per year, the new processes would show a differential cost of $7500 less than the old, a decremental cost.

Differential costs are also accounting costs; that is, they can be considered as additions to or subtractions from currently experienced costs depending upon which alternative management selects. The other cost factor that should be considered in decision-making, opportunity cost, is not an accounting cost. An accountant may be able to ignore opportunity costs, but a manager should not.

Opportunity costs reflect the sacrifices that result when one alternative is chosen over others. The manager making a decision will attempt to select the best alternative. Whichever selection he makes, he must forego that which might have come from the alternatives he did not select. The process automatically sacrifices some return from the unchosen alternatives, and the value of the sacrificed returns is the opportunity cost of the decision.

For example, if a manager has $1000 available for small equipment items and decides to buy two air conditioners in lieu of ten electric drill motors, he must recognize that his decision cost him the possible benefits from the ten drill motors. In this example the cost (in dollars) of that decision is not readily available, but it could be costed. In addition, that decision could cost his unit the increased production or production efficiency that the drill motors might have made possible. This, too, can be costed should the manager think it necessary. At any rate, every decision has costs in some sacrificed opportunities. A responsible manager will be aware that cost-effective decisions will include adequate consideration of such factors.

More immediately applicable are the fixed and variable costs in unit operation. *Fixed costs* are those that do not change with increase or decrease in the quantity or volume of output, such as the manager's pay and allowances and per diem rates. Many fixed costs do vary over a period of time, but the variability is not within the control of the manager or the unit, often resulting from Public Law, Executive Order, and the like. Fixed costs must be included in the total costing of a unit and its output because they continue to exist whether or not the unit produces.

Variable costs generally change with output. They do not always vary on a one-to-one correspondence to output, although they are usually thought of that way. For example, if it takes $7.25 worth of bits and pieces to update a gizmo, the updating of ten gizmos might require $72.50 worth of bits and pieces, and the variable cost would be in direct proportion to output. Troubleshooting an electronic circuit would likely result in *semivariable costs;* that is, we could arrive at a reasonable average labor cost for troubleshooting that circuit, but we would also know that the labor cost would vary depending upon the actual hours consumed, the skill of the technician, and other conditional factors of the job. The cost, while variable, would be fluctuating or semivariable.

Direct and indirect costs must also be considered. *Direct costs* are directly attributable to a product or service, as when supplies and labor are directly consumed in an engine overhaul. *Indirect costs* are not identifiable to a specific product or service; for example, the salary and allowances of a Chief of Maintenance would be an indirect cost of that engine overhaul. Of course, indirect cost at one organizational level can become direct cost at another. The salary and allowances of that Chief of Maintenance would be a direct cost to the wing in which he functions. If the cost can be directly assigned to the organization's operation, it can be considered direct. If it can only be assigned to the unit by allocation, it is indirect.

Sometimes costs are termed *controllable* or *uncontrollable*, according to whether or not the costs can be significantly influenced by the unit management actions. A decision whether or not to repaint a shop office is a controllable cost since it is probable that no higher level of management will force the painting should the manager decide not to repaint. But the hourly pay rate for a wage board employee, or the annual salary of a general schedule employee, is uncontrollable by local management; those costs are controlled by Public Law, pay board action, and the like. Uncontrollable costs must be used in forecasting and budgeting unless management action can reduce requirements. Even then, the individual costs are still uncontrollable although the gross total may be controllable.

All this may seem rather confusing, but the reader is urged not to think of these costs and their considerations as unimportant because they are not well understood by him. Rather, if confused, he should seek other writings and develop the opportunity to talk about them with more knowledgeable people. They are important, and he cannot hope to be a financially sound manager without coming to grips with these thoughts.

Professor Chauncey Dean, School of Systems and Logistics of the Air Force Institute of Technology, has prepared a helpful summary of cost distinctions for defense managers, shown in the accompanying table.

resource constraints

Managers succeed when they are able to marshal the needed resources at the right time and combine them into the product or service for which the organization is responsible. But resources are limited and always constrain the manager in some manner. If that were not the situation, we would be able to do anything we wanted whenever we wanted. We always find that we want, or would like, more than we have available to do the job. Hence, managers must learn, as they have, to get the jobs done within the constraints of limited resources.

Managers realize the limitations placed upon them by available resources. It may help to think of these limitations more definitively to assist managerial functioning. Hitch and McKean refer to resource constraints as *specific constraints* or *general constraints*.[2] Viewing them this way can be valuable to the manager's problem-solving and/or decision-making efforts.

Specific constraints are the limitations created by the very specific availability of a given resource. For instance, if a job that must be done by Friday requires the services of three skilled machinists but only two are available, the constraint is the specific shortage of one skilled machinist.

General constraints are usually dollar limitations that restrict total effort but not the quantities of specific items that might be obtained or used. With a $10,000 limit for expendable supplies, a unit is restrained by that dollar ceiling but is not limited as to how many pencils, nuts, or bolts it might buy within that ceiling.

Often, of course, combinations of these constraints face the manager. The Air Force functions within the general constraint of the budget and also within the specific constraint of a manpower ceiling imposed by the Congress. At lower levels the same constraint combinations apply in smaller orders of magnitude. But the manager needs to employ different techniques when problems involve the separate constraints. The same techniques would not normally be used, nor would the same considerations be given, to specific constraint problems as to general constraint problems.

Generally, the closer the problem to the here and now, the more applicable the specific constraints; the farther we look into the future, the more applicable the general constraints. In the earlier example, the specific constraint (a shortage of one skilled machinist) will prevent, or delay, that job accomplishment. It is not likely that we can get it done by Friday, but it would do us no good to charge this to the general constraint of the Congressional manpower ceiling. We must recognize the problem for what it is if we are to solve it. If the job does not have to be completed until this date next year, the problem assumes a changed dimension: we now have some time in which to overcome the specific shortage. Maybe we can adequately train someone to fill the need. Maybe we can contract the job. A variety of means becomes available when time permits action.

Constraint identification is important for financial management. Many problems turn out to be these constraints experienced in the operational environment. To solve the problems, we must identify them and take adequate corrective action. A reasonable management adage states that a problem correctly identified is half solved, which certainly applies to resource constraints. A job that cannot be accomplished because

Concept	*Antithesis*	*Purpose of Distinction*
Direct cost	Indirect cost	To separate those costs directly attributable to a product or service from those of a general nature
Variable cost	Fixed cost	To separate those costs which vary with output from those which do not
Controllable cost	Uncontrollable cost	To identify those costs which can be significantly influenced by a given manager
Implicit cost	Explicit cost	To assure full recognition of both opportunity losses and resource consumption
Incremental cost	Sunk cost	To separate those costs affected by a decision from those which continue unchanged
Functional cost	N/A	To identify costs by function for compatibility with the appropriation structure
Organizational cost	N/A	To permit aggregation of costs by organizational unit and chain of command for budgeting purposes
Activity cost	N/A	To identify costs with program elements for compatibility with the Five Year Defense Program

Cost distinctions for defense managers of the lack of a certain part, for instance, cannot be solved by blaming that shortage on the Defense budget. The means for correcting that specific problem are considerably different, as is the time required, than for changing the budget. A manager's time should be efficiently used, and correct identification of constraints will help assure that it is.

financial information

The Air Force provides a range of accounting systems to aid managers, some general aspects of which can be discussed because they are conceptually sound and relatively permanent.

Cost data must be collected from the lowest organizational element and from each succeedingly higher level for accumulation of organizational and program costs. Coding systems are provided to structure the generation and accumulation of data and permit them to be used in a variety of ways. Costs at each organizational level are based on collections from subordinate levels. As the data move upward through the accounting systems, they begin more and more to reflect full program costs.

It seems certain that in coming years all management levels in Defense are going to become more accountable and responsible financially. Additional emphasis is being given to efficiency, and efficiency improvements are almost impossible without financial considerations. Many requirements that have traditionally been accepted without question are now being challenged and evaluated for their contribution to mission capability. More of this must occur so that nonessential and unprofitable requirements may be eliminated or streamlined. When managers acquire visibility of the actual costs of their decisions and actions, they begin to question the necessity and value of some of the requirements created by themselves or imposed upon them by higher authority. Financial data inform the manager and encourage him to refine his evaluation of conditions and his methods of handling problems. Efficiency is improved through this process while the vital capability to perform in the national security role is retained.

We earlier stated that financial management is more than just fund control. Yet, fund control is an essential element of financial concern in the Air Force, and there is little question about its importance.

A cautionary restatement seems wise, though. The budget is a ceiling on expenditures, *not* a mandate to spend. A review of the management environment may lead one to believe there is little incentive for the Air Force manager to conserve funds and not spend when there is money available. There is no monetary return to him for financial responsibility, but there is moral return. All of us must satisfy ourselves that we are trying to do the best job we can. We must measure against our own mental standards of what we can be. The real incentive is the individual's personal satisfaction with his performance. We may not know how to measure this, but each of us undergoes some form of periodic self-evaluation, and the more we come to know about what we could do the more we are apt to feel the need for our own more responsible actions.

Financial information helps these self-appraisals, and we should insure that every data generation we control is accurate and reflective of actual conditions. The data can be of little help if that is not true. We make decisions and act on problems as a result of the judgmental workings of our minds. Our judgmental values are created from available information. The quality of information therefore has a lot to do with the quality of decisions and actions. That factor, alone, ought to convince us that all forms of reporting and recording must be accurate representations of the situational facts. Many managers at many levels must use the data. The effect is magnified a number of times and can be detrimental when the data reflect an unreal or untrue representation of what actually happened.

responsibility centers

A basic feature of financial management and its allied accounting systems is the concept of the responsibility center. A responsibility center is an organizational entity headed by a single individual who can control the expenditure of resources and to whom is assigned management responsibility and control authority. The senior maintenance manager may head a responsibility center, for example, and he may have several subordinate such centers under him. But all work centers in the maintenance complex need not be so designated, since many may not have the financial control authority that would make them responsible. This is not to say that the work center supervisors are not capable, and it is not to say that they are not responsible for cost-consciousness. They are. But they are not defined as responsible in this manner. An Air Force base would be a collection of responsibility centers, and each responsibility center would ordinarily have a collection of cost centers subordinate to it. The cost centers would be units whose functioning requires the expenditure of resources and the creation of costs in the accomplishment of mission-related or other-directed tasks.

Essentially, the responsibility-cost center concept addresses itself to the idea that financial responsibility cannot be properly accommodated only at high organizational levels. That is, decisions must be made at many levels depending upon what is going on, urgency, size of resources involved, impact upon the total organization, and so on. Routinely, daily activity in even the most complex units requires some immediate response capability, and decision needs cannot be delayed and deferred until the senior manager can get to them. It is for this sort of reasoning that we have organizational structures and hierarchies. The financial management concepts relate to those same needs. Each level of management delegates authority and accountability in certain degrees to subordinate elements so that necessary tasks may be accomplished readily and smoothly. Within designated limitations the subordinate manager is relatively free to act, but exceptions to those limitations create a need for the superior to be involved.

Problems arise because the subordinate manager expects to receive authority equal to his accountability for results. Senior managers usually think this exists, but almost always the subordinate feels his authority is not really adequate to run things. This divergence of perceptions results in conflict and some degree of dissatisfaction by both parties. The lack of aggressiveness at lower levels toward more active financial management may be traced in part to this conflict because it appears to the lower manager that accountability has been delegated but adequate authority has not. It is not an insurmountable problem, but managers must learn their role and recognize that the same relationship may also exist between themselves and their subordinates.

It is easy to say that if I am not given full authority to do as I see necessary I cannot really be held responsible for results. But this is a departure from reality and is an invalid reason for not accepting the challenge of improved financial management. If we analyze the functioning of an organization and apply a bit of knowledge about the human being, we will likely conclude that full delegation of authority is not necessary or probable. How can my superior actually divest himself of all his authority for my unit and give it to me? Does his delegation of accountability or authority to me actually lessen his accountability or authority? If I am given full authority, do I still remain subordinate to him? These are trying and discomforting questions because the answers do not justify what we would like: greater power for us to decide for our unit. Our personal desires, though, must give ground to the greater needs of the organization for continuity and unity of direction. The greater needs of the organization mean that some authority is always going to be retained by those managers above us in the hierarchy.

Delegation occurs in all units; it must, for the unit to function effectively. However, that delegation decreases in scope and content as we deserve it; and this occurs down the structure to the lowest level. We can recognize the logic of this reduction when we note that the scope of activity becomes more constricted as we descend the organization level by level. This is represented in the pyramidal form of most organizational charts in which authority is spread over more and more individuals as the level drops. Obviously, no one below the senior man is going to have authority equal to his, if for no other reason than that the top man's authority is shared; for example, first with two people, and then with four at the next level, and so on.

Responsibility for performance is another subject, however. It does not diminish so much in its delegation because it is not so shared. In other words, there is not a split responsibility for performing maintenance, and the maintenance officer and the commander are almost equal in that respect. So, while responsibility for results is essentially pure, we cannot say the same for authority to obtain those results.

Authority is reduced in lower levels of the organization because seniors just cannot give it all away. They, too, are constrained in the same manner by their bosses and higher authority. The actions of lower levels are always constrained by law, by ethics, and by regulations from above. No way really exists to avoid this. Senior managers retain some authority at all times to provide some control over resources and results. Control systems and policy books are reflections of this, and no subelement can ever really expect to be completely autonomous. But we will fret over the constraints we feel to be unreal or overdone. It is well we do, because from this fretting we can expect recommendations for change and improvement in structure and/or functioning of our organizations.

The important point is that real financial management is a joint affair that must be cooperatively accomplished by the manager and his boss. Neither can do the job alone, and this emphasizes the need for communication, coordination, and cooperation. The responsibility center concept must include the people of the unit, its immediate manager, and his immediate boss. They cannot be separated and expect to do the job well. They must all be cost-conscious and actively involved in the whole financial management operation.

This discussion of some basic considerations of financial management, without details of how it is done, can be supplemented by the manuals, pamphlets, and other directives that exist for detailed guidance and the specific forms and frequencies of reported data. The military manager should learn the systems for reporting and recording financial data and insure that he and his people fully and fairly comply.

As we have presented it, financial management is an inherent management responsibility in any unit anywhere. Efficient use of resources in the accomplishment of essential tasks is a part of the charge to each of us. It involves more than simply controlling funds and more than an accounting system. Adequate financial management includes continual consideration of tasks as to their essentiality and the least feasible expenditure of resources to accomplish those tasks that are essential. It includes budgetary considerations and preparations and requires the spending of as little as practical in mission efforts. It cannot be accomplished by one person alone. The people of the unit, the unit manager, and his boss must work together in coordinated cooperation, all aiming for the efficient operation that will result in our ability to do our part for national security.

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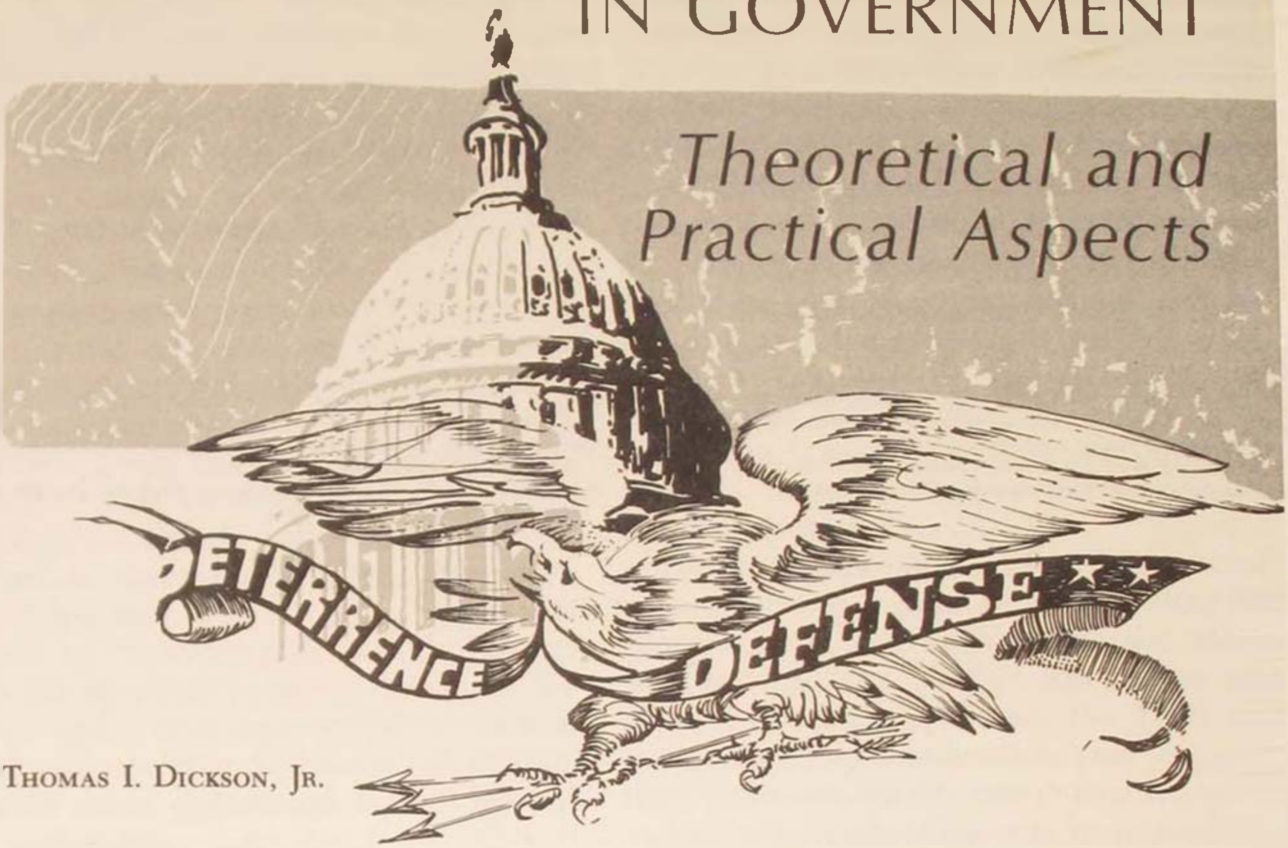
MILITARY INFLUENCE IN GOVERNMENT

Theoretical and Practical Aspects



DR. THOMAS I. DICKSON, JR.

THE EXTENT of military influence in the United States government has been a source of acerbic controversy for some time. The issue was heightened in recent years as a result of dissatisfaction with national security policies that developed during the unhappy Vietnam venture. Much of the voluminous criticism of the military-industrial complex has been based on assumptions about the nature and degree of an assumed military prominence in domestic and foreign affairs. The usual premise is that military influence has been increasing. "Increasing," however, could be taken to imply a straight-line progression. Even within the post-World War II period, when the role of the military is generally recognized to be an expanded one, it seems that the tendency has been for military sway to be cyclical, rather than constantly growing.[1]

While to many the term *military* is self-evident, commentary on the subject of military influence in government shows that the distinction between the uniformed services and civilian administrators often is lost in attempting to press home a point. So the meaning of the term needs to be specified. *Military* we shall assign to the man in uniform, including retired military professionals where they are in positions of importance relating directly to national security matters. More practically, for our purpose here, this means the upper ranks of the regular officer corps and retired ranking officers in defense industries. While others have a military-related role (reserve officers, for instance), their primary role is not military.

The term *influence* is difficult to define and, especially at the macroanalytical level, extremely difficult to identify and measure. Even so, *influence* (I) might be expressed in the following terms:

$$I = A \rightarrow T{:}D(GA)$$

to be read: *I*nfluence equals *A*ctor causes *T*arget to make a *D*ecision that is believed to contribute to a *G*oal desired by the *A*ctor.

Much of the problem with this representation, and where much influence analysis founders, lies in the area of causality. Without becoming embroiled in the complexities of this issue, let us say that the verb "causes" here does not involve explicit coercion but that it does require the Actor to exert an effort toward the Target and Goal. Some writers would have the Target acting somewhat against his will.[2] It seems more realistic, however, to accept as a guiding rule that, while the Target might have acted differently if not influenced by the Actor, his actions need not go against the grain. Thus, if a husband and wife want to go on a trip, and the husband has no preference about where to go while the wife wants Bermuda and persuades him to buy tickets for there, the husband still can be contented with the decision. (All married couples will spot instantly the "joker" in this scenario: What happens to his contentment if the trip goes badly? And the same type of relationship problem can occur in political influence.) Still, no matter how the relationship is phrased in abstract terms, in practice there remains a "chameleon" or "mirror-image" problem in that it is difficult to determine who influences whom. The military might request "x" of the Congress largely because military leaders think that "x" is what influential Congressmen want them to ask for. This is a familiar problem in government and one that illustrates the mutual symbiosis that often characterizes political relationships.

The foregoing equation obviously does not solve many difficult problems of influence analysis. Hopefully, however, it does provide some clarity on a crucial point that much of the writing on political-military relations glosses over: it avoids the *post hoc, ergo propter hoc* fallacy, in which it is assumed that those who benefit from a situation must have caused it. This aberration from logic is found in much of the critical commentary about military influence on civil government in the United States.

With this in mind, if we eschew the more extreme forms of analysis that claim to see a military conspiracy or resurrect the old (interestingly enough formerly "conservative") bugaboo of runaway bureaucracy,[3] we profitably can view the military, with its associated industrial and other elements (often lumped together under the rubric "military-industrial complex"), as a significant interest or pressure group of the within-government, without-government type.[4] By approaching the proposition from this perspective, we can consider the bases for military influence in more or less the same manner as might be done with other interest groups.

The most crucial asset of an interest group is its "position" in society.[5] This may, but need not, depend on variables such as leadership capability, wealth, size, and membership cohesion. Important to its "position" is the opinion that competitors, the public, and decision-makers have formed about the group, and the group itself must adjust to the distribution of effective political power within the political system. For purely private interest groups, factors such as wealth and size probably are more meaningful than for the military. While these factors are stressed in many analyses of military influence, and there is a great unresolved problem of when and to what degree politically acquired advantages tend to become self-perpetuating, wealth and size are fundamentally derived characteristics for the military. Thus, the more important factors for analyzing military political influence seem to be those that bear on political elites and popular opinion. At least this is likely to be so in an open, pluralistic, competitive, and democratic society like that of the United States.

Many items could be considered in the context of the military's "position" with the public and political elites, including the "selling of the Pentagon" and race relations in the barracks. However, two items seem to stand out for the post-World War II period: (1) the sense of a threat requiring military preparedness and possibly military response, joined with a belief in the utility and acceptability of the military instrumentality (organized force) to attain political purposes; and (2) the extent of competition for available resources that must be shared by the military with other public purposes.

Possibly also worth noting, although it may be linked in cause and effect patterns with (1) above, is the prestige of the military in American society and views held of the military institution. This aspect may be disposed of at least in part if we accept Professor Huntington's[6] assertion that the period of high popularity of individual ranking officers largely ended with the passing of popular World War II commanders and James Clotfelter's[7] finding that the occupational prestige of the military never has been very high, even during that post-World War II epoch when the military institution was expanding rapidly.

Laurence Radway,[8] among others, has noted how, in the late 1940s and early 1950s, Americans, with relatively little protest, abandoned their erstwhile isolationist views, reversed the trend of demobilization, and adopted and militarized a policy of containment. Many reasons might be given for this phenomenon, and Radway cites three: (1) the realization of a new U.S. strength; (2) the ethnic composition of the population, containing as it does many whose blood-countrymen were suffering Communist occupation; and (3), most important, hostility to totalitarian Communism and a resolve not again to permit a wave of totalitarian expansionism to engulf Europe and the world. Revisionist historians have argued that this apocalyptic vision of the world was unreal. We may choose to believe the revisionists or not. But the tenor of the times was such that a fundamentalist anti-Communism served as the core attitude for policies that, with tactical variations between "massive retaliation" and "flexible response," showed a high propensity, albeit still without unrestrained abandon, to favor at least readiness for military solutions to political problems or, in another interpretation, military responses to provocations of force, of which the Soviet Union usually was thought to be the author.

This was and to a degree still is a situation tailored to the pursuit of the military "interest." But even here we must tread with caution. We often encounter a simplistic syllogism that runs like this: Major premise: The military are the possessors of and proponents for the use of force in international relations. Minor premise: The United States gets into a lot of wars. Conclusion: Therefore, the military are formulating American foreign policy. Whatever military influence is in the making of United States foreign policy, it does not seem to be of that nature. The military have espoused preparedness but have been reserved in advising commitment of forces to armed action.[9] The reasons vary for specific cases, but the pattern seems to be one of greater caution by military leaders than by top civilian decision-makers.

Military reservations notwithstanding, there continued to be a fairly widespread faith in the efficacy of military force in solving critical international problems. We can seek the explanation in several facets of U.S. national character, such as a sense of technological superiority or of superiority of white Westerners over brown, black, or yellow people (it is in their lands that we fight most of our battles, but it should be observed that conflicts in which we might join militarily most often break out there). There have been periods of disillusionment, such as that growing out of the Vietnam experience. But it is difficult to say even that Vietnam permanently turned American opinion around on this score. There were strong parallels between the growing unpopularity of Korea and Vietnam,[10] and yet Korea did not keep us from trying Vietnam. Also, the interpretation of war unpopularity trends is a tricky matter,[11] a fact sometimes overlooked by the "limited war is politically passé" school of analysts. Even so, there does seem to be some downturn in confidence in the military answer, at least for the time being.

Having enjoyed such a favorable "position," the military, not surprisingly, has managed to obtain a significant slice of the resources pie during the past two decades. How big that portion has been and what effects can be attributed to defense spending are questions that have been much debated, often in terms that would have brought joy to the heart of Darrell Huff, author of *How to Lie with Statistics* (1954). Critics have depicted Congress as a pushover for the military-industrial complex, yet in the next breath have averred that the time was ripe for Congress to assert itself against the military. Various studies of defense budget requests before Congress (leaving aside that restraints likely had been applied before the requests left the executive branch) show that the Congress has been concerned not only with the "how much" but also with the "how" of the defense budget: Congress has not been merely passive.[12] There has also been a certain volatility in Congressional action on defense estimates not found for other areas of government in the aggregate.[13] So the brake has not simply worn out, but driving conditions did not seem to require much use of it. That circumstance may be changing. Disenchantment with the decision-making process, concern over the dominance of the defense establishment, and pressure for action on nonmilitary priorities have been cited as reasons for increased Congressional concern with defense spending.[14] Indeed, by several measures there already has been a retrenchment in the defense establishment, although this tends to be obscured by the continued high absolute size of defense budgets.[15]

Francis Castles suggests that pressure groups fall into two basic categories: (1) interest groups that serve to protect "shared sectional interests" and (2) attitude groups set up to seek a limited end, identified not by the common interest of the members but by shared attitudes.[16] Interest groups are likely to be fairly permanent, while attitude groups, based on the more subjective criterion of issue-oriented views, are inclined to be less lasting. The present seems to be a period of high visibility of attitude groups in the United States. While those whose cohesion was based on an antiwar, antimilitary persuasion seem to be on the wane, those whose ends involved competition for resources with the military—proponents of actions to reduce pollution, increase automobile safety, improve living standards of the poor and the aged, etc.—seem to be going strong. And, when we look at the present and projected major segment of the federal budget going to direct social welfare expenditures,[17] we again can raise the unresolved question of when and to what degree politically acquired advantages tend to become self-perpetuating.

THE FOREGOING has been largely without reference to the Actor in the equation, the military establishment. This was intended but not terminal. That the professional military has been able generally to set its course while it has benefited from favorable seas, that the impact of military activities is widespread, but also that the military has been buffeted by dissatisfaction and criticism—all have been documented and ranted about *ad nauseam*.[18] Assuming a lesser relative access to societal resources for the military in the near future, and taking into account that this is in the face of drastically increased personnel costs, we still must answer the question, How will the military maneuver from a still significant position? Following Professor Morris Janowitz, various authors (Palen, for example) [19] have pursued the growth of the bureaucratic-managerial type of military professional and the demise of the heroic leader role. Some (Sarkesian) [20] have followed another line of modern military sociology and pressed for increased political awareness and skills in the military. Others (Yarmolinsky) [21] have worried over whether the military would adjust to the Vietnam debacle or react against the military's reduced position with an avenging soul that would lead to greater conflict between the military and the country.

One might surmise that such changing aspects of military sociology and psychology would affect the way in which the military attempts to play its hand. But, without the benefit of a crystal ball or greater insight into the changing mores of the military than I care to claim, I will not try to ascribe a future new political style and role to the military. Possibly this will happen, but it seems unlikely in the short run that we are in for any such notable changes as those that took place through World War II and the subsequent period of confrontation with Communism. A more likely guess is that we will have basically a continuation of what we have been having, only with the military writ somewhat smaller. In any event, a summation of these remarks, to the extent that they aptly describe the situation, would be that military fortunes and setbacks are much more the result of the impact of the society on the military than the reverse.

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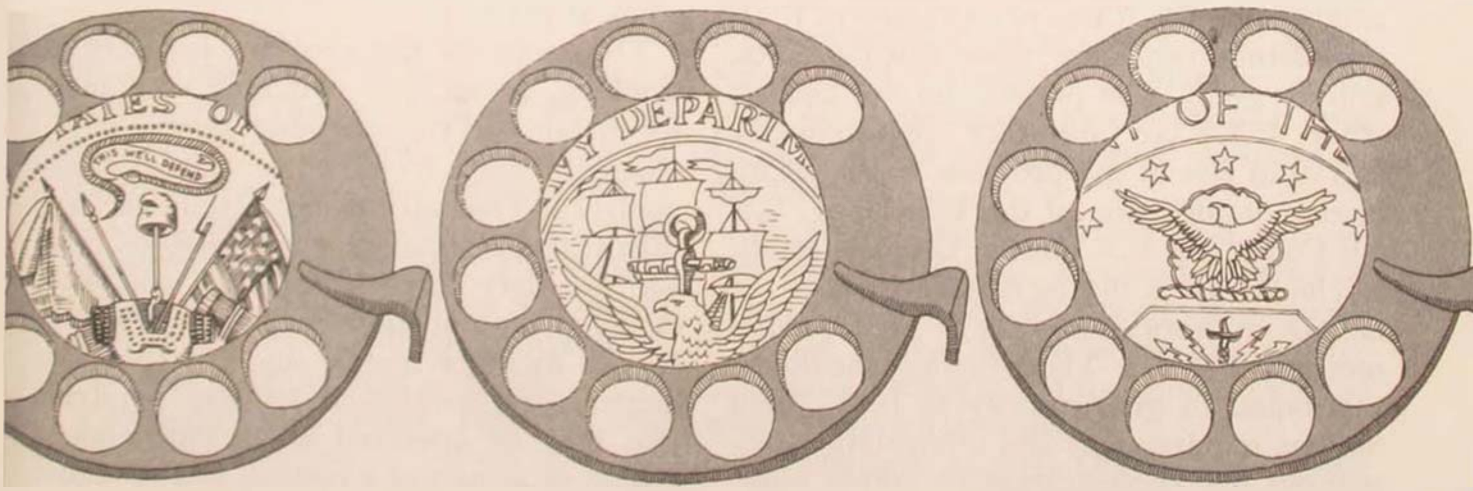
Air Force Review

WHAT IS TRI-TAC?

Brigadier General Charles E. Williams, Jr.

For the majority of readers, I suspect that the term TRI-TAC is unfamiliar. Hopefully, though, all who finish this article will gain a fuller understanding of an important Department of Defense effort that will have far-reaching effects on our future communications and indeed on the entire spectrum of our tactical operations.

All of us are familiar with the increased concern about communications effectiveness that has been generated in the past few years. Communications management within the Department of Defense was given special attention by the President's Blue Ribbon Defense Panel (Fitzhugh Panel), partly as a result of certain international incidents. Without discussing the effectiveness of, or indeed the part played by, communications in these incidents, I mention them only to emphasize that they served to increase the level of interest now focused on all DOD communications and specifically, for purposes of this discussion, on those used by our tactical forces. In our present atmosphere of intense competition for resources among proponents of our various national interests, both domestic and foreign, DOD investment



and expenditures for communications have quite properly come under close scrutiny. This interest was exemplified by a major recommendation of the President's Blue Ribbon Panel: that greater centralized management for telecommunications be established at the level of an Assistant Secretary of Defense. This position was established in May 1970 by DOD Directive 5148.6 as an Assistant to the Secretary of Defense for Telecommunications. It was elevated to full Assistant Secretary status in January 1972, and on 17 January 1974 was changed to add command and control responsibilities with a new title as Director, Telecommunications and Command and Control Systems (D,TACCS).

During the same time frame, the U.S. Army's Mallard Project, instituted in 1965, came under critical review by the Congress. This was an international developmental effort, conceived by the United States, United Kingdom, Canadian, and Australian armies (ABCA countries) as an effort to get an interoperable tactical communications system to assure compatible communications among our national armies in the event of mutual involvement in future conflicts. The system was revolutionary in that, using a turnkey approach, it was to employ digital technology to replace existing conventional analog switchboards, telephones, and transmission plants. With appropriate communications security, it was to be fielded in 1977, completely replacing then existing ABCA army systems. The project did not address other U.S.-NATO interface requirements, and until late in the program it did not include consideration of the U.S. Navy, U.S. Air Force, and U.S. Marine Corps interests.

The Congress, during deliberations on the defense appropriations bill in 1969, recommended that "(1) The program should be reoriented to give priority to [U.S.] Joint Service requirements and interrelationships without the complication of active international participation . . . ," and "(2) the need to interface with NATO Forces, [instead of only U.K., Canada and Australia] should be recognized and provided for, if practicable, by active coordination of effort, but not by joint development efforts which experience has shown to be more a hindrance than constructive." Thus ended the international developmental Mallard Project. The Congress had, however, put strong emphasis on the need for a program to address the tactical communications systems of the U.S. services *jointly*.

To carry out the intent of this Congressional guidance, the Secretary of Defense established the joint program on 27 May 1971 when he issued DOD Directive 5148.7, subject: Charter for the Joint Tactical Communications (TRI-TAC) Program. The charter lists the four major program objectives as follows:

(1) Achieve the necessary degree of interoperability among tactical communications systems and other DOD telecommunications systems.

(2) Place in the field in a timely manner new tactical communications equipment required by the armed forces to perform their mission and which reflect the most effective technology.

(3) Eliminate duplication, where feasible, in the development of service equipment.

(4) Perform the above in the most economical manner.

The scope of the program includes all trunking, access, and switching equipment for mobile and transportable tactical multichannel systems, including associated systems control and technical control facilities; local distribution equipment; voice, teletype, data, and ancillary terminal devices; and associated communications security equipment. It also includes mobile and transportable tactical single-channel switched systems that may be operated as an independent system or as part of a tactical multichannel system. Finally, it includes all interface devices for connecting TRI-TAC-developed items to existing service systems and the Defense Communications System (DCS). This last statement makes apparent the fact that equipment developed under the TRI-TAC Program must be able to extend the worldwide military command and control system (WWMCCS) into the tactical arena. The potential impact of the TRI-TAC Program on command and control of tactical weapon systems should thus be readily apparent even to those only casually familiar with the technicalities of communications equipment developments. Items of equipment developed under the TRI-TAC Program are also being designed for use within the Defense Communications System itself, thus extending impact in the strategic arena.

The charter also establishes the TRI-TAC Office to administer the TRI-TAC Program. The mission of the TRI-TAC Office is basically one of being a systems architect for development of future tactical communications equipment. To carry out this mission the TRI-TAC Director is given five major tasks:

(1) Provide advice and assistance to the Director, Telecommunications and Command and Control Systems, and other DOD components concerned with developing and implementing plans and programs for TRI-TAC.

(2) Be responsible for system definition and engineering of TRI-TAC systems and equipment.

(3) Be responsible directly to D,TACCS for coordinating the development and production of TRI-TAC systems and equipment in response to service/joint requirements.

(4) Communicate directly, for purposes of mission performance and information exchange, with all organizations and offices with which the TRI-TAC Program has interface or which support the program.

(5) Perform such other tasks as the D,TACCS assigns.

These five major tasks are enlarged in the charter by fifteen functional subtasks, which provide a detailed break-out of specific areas of interest and responsibilities where the TRI-TAC Office is involved.

The TRI-TAC organization is designed to carry out the mission and also to further our relations with the services, Defense Communications Agency, National Security Agency, and the Joint Chiefs of Staff.

The Secretary of Defense, recognizing one of the main Congressional criticisms of the Mallard Project (i.e., not really having full U.S. joint service participation), established the TRI-TAC Office as a truly joint organization with each military department about equally represented among the 62 military personnel. While the majority of our professional civilian personnel came from the Army's defunct Mallard Project, we have been successful in getting a number of highly qualified civil servants from the other services too. Regardless of where they come from, all civilian personnel are carried on Department of the Army records, since the TRI-TAC Office is located in New Shrewsbury, New Jersey, adjacent to the Army's Fort Monmouth.

The organization is responsible to the Secretary of Defense, with staff cognizance exercised by the Director, Telecommunications and Command and Control Systems.

We have the normal administrative support and certain liaison personnel, including representatives from DCA, NSA, U.S. Army, Navy, Air Force, and U.S. Marine Corps, plus representation from Australia and Canada. There are three staff assistants to the Director:

(1) The Scientific Advisor, who is a senior civilian scientist, ensures that TRI-TAC plans, policies, and specifications properly consider current scientific knowledge, the state of technology, and the threats to communications effectiveness.

(2) The NSA Liaison Officer also serves

on the staff as the principal communications security (COMSEC) advisor to the Director.

(3) The Assistant for Allied Affairs, a senior civilian electronics engineer, is the principal advisor on international communications matters, particularly actions to achieve international interoperability, standardization, and commonality.

The Operations and Management Directorate, headed by a Navy captain, provides the overall program and acquisition planning envelope, dealing directly with the Joint Staff and the services for operational requirements and the DOD planning, programming, and budgeting system. It ensures program status assessment and funding.

The Engineering Directorate, headed by a senior civilian electronics engineer, provides the systems architecture, design, and engineering disciplines. Its members, who are a mixture of military and civilian professional engineers, deal with systems definition, specifications, technical interoperability, and standards.

Responsibilities for configuration and data management, integrated logistics support, and computerized data support belong to the Logistic Management Directorate, also headed by a Navy captain.

The Operations Research, Test and Analysis Directorate, headed by an Air Force colonel, plans and prepares joint development test programs. It also provides analyses, modeling, life cycle costing, cost effectiveness, risk, and should-cost analyses.

The fifth directorate is our Washington Operations Office, headed by a Marine colonel. Being out of the services' mainstream of daily interaction in Washington, we maintain this office to act for us in the Pentagon on day-to-day items involving service tactical communications activity.

Our relationships with NSA and DCA are somewhat unusual. We have had a very close working relationship with both these agencies from the start. NSA engineers have worked on a daily basis with ours in preparing detailed performance specifications to insure a fully integrated communications security capability in all our developmental efforts. As with NSA, we have worked very closely with DCA from the start. We established nine DCA/TRI-TAC tasks, which covered our relations completely from plain administrative relationships, through technical design efforts, procedural standards, user requirements, to planning for the future. Under direction of the D,TACCS, the DCA, NSA, the services, and TRI-TAC are presently engaged in extensive efforts to achieve complete interoperability in future equipment design, procedures, COMSEC, etc., so as to provide as truly a transparent and end-to-end secure communications system as is possible to achieve within the constraints of budget and time.

Also, as a matter of interest, the Director of TRI-TAC sits as a full-time member of the Telecommunications Council, which meets monthly under the direction of the Director, Telecommunications and Command and Control Systems. At this level we interface directly with the senior communicators of all the services, with DCA, NSA, and the J-6 (Director of Communications-Electronics) of the Office of the Joint Chiefs of Staff, to address all facets of defense communications planning, programming, budgeting, and problem solving.

BRIEFLY, *the eventual goal of TRI-TAC is to produce a family of secure tactical communications equipment for use by all services which will interoperate with the DCS on a transparent and secure basis from end to end.* Our approach to this mission is twofold, that is, a long-term effort and a more immediate transitional effort. Our long-range planning effort is dedicated toward achieving this goal in the 1980s. The more immediate problem is to develop a family of transitional equipment that can interoperate with the communications equipment currently in inventory and in development, yet provide an evolutionary step forward toward achieving the longer-range objective of the 1980s. A subtask of this effort is to work with the services in solving existing interoperability and security problems caused by incompatibilities in inventory equipment.

Technological developments, information transfer requirements, long-range studies by the services, Defense agencies, industry, and academic institutions all tell us that digital methods of communications are necessary to meet our future needs. Our equipment today, with few exceptions, is not digital but is analog.

Although our record communications or message traffic is transmitted securely in most areas, much of our voice traffic is not secure. We need to achieve a completely interoperable capability to permit essentially transparent and secure communications end-to-end from the national command authorities to the tactical users at whatever level command and control requires.

Obviously, before we could begin an orderly attack on this requirement, our long-range objectives needed to be set in focus, and our immediate steps to start on the path to achieve these objectives needed to be made firm. This is the essence of what the TRI-TAC Office has been doing since it was established in mid-1971. For the long range we have an extensive planning effort in coordination with the services, DCA, NSA, and the JCS to prepare three levels of technical plans that will eventually lead to equipment developments. These are our systems, transitional, and subsystems plans. We have also drafted a master programming plan, which lays out developments, funding, and procurement calendars. For the near-term goals, we have initiated a series of transitional equipment developments to start us on the path to the secure digital communications world of the future.

Our systems plans establish a sense of direction for a particular segment of tactical switched communications by identifying a recommended system design. Our transitional plans will define the time-phased technical planning for implementing the recommended system design. Our subsystems plans will define a recommended technical solution and design for each of the functional subsystems identified in the transitional plans.

The Joint Tactical Communications Master Plan (TACOMASTER) is also being developed in coordination with the military services, DCA, NSA, and the JCS. It will provide for integrated program direction and overall management of TRI-TAC Office efforts to provide equipment that will satisfy service requirements by relating our planning and programming to service plans, inventories, and procurement programs.

Our Systems Plans, that is, the Land Based System Plan (Systems Objectives) and the Naval Switched Systems Plan (Systems Objectives), after full coordination with the services, DCA, NSA, and the JCS, were approved by the then Assistant to the Secretary of Defense for Telecommunications and have been promulgated to the services/agencies for technical objectives planning. Transitional plans for both objectives systems are now in draft coordination phase, and we are hard at work on several of the subsystems plans. We depend upon direct service and agency participation in the subsystems plans effort because these lead to equipment specifications of direct interest to the ultimate users.

Our near-term efforts are characterized by a series of fully coordinated steps designed to acquire new equipment that will help make the technological transition from analog to digital communications. In early 1971 we were directed by the Secretary of

Defense to develop an evolutionary concept for a land-based communications deployment for the purpose of determining what elements should be addressed as key to achieving a transitional posture aimed toward a secure tactical communications system for the future. Our analysis disclosed that digital technology, automatic telecom switches, communications facilities controls, and transmission systems, all with integrated COMSEC and peripheral devices, were key items to address. Our first development effort, undertaken at SECDEF direction, was to develop performance specifications for a new family of automatic switches that would satisfy the services' existing analog requirements and provide a secure digital interface to the future. Thus the hybrid AN/TTC-39 program with its associated COMSEC was born. The U.S. Army was tasked in January 1972 as the developing service, and NSA was tasked to develop the COMSEC. Both these procurements are under way, and the Joint Service/Agency evaluation for further contract awards began in October 1973.

As we develop the other elements needed to fulfill the systems requirements, a tasking assignment is prepared for the D,TACCS to send to a particular service to develop and procure the device envisioned. We capitalize on any ongoing service developments so that duplication of effort is avoided. Through this effort, a number of ongoing service developments have been brought under the TRI-TAC Program element, while some other programs have been phased down or terminated as being duplicative.

We have made the following taskings to date:

(1) AN/TTC-39 Circuit Switch (USA)
(2) COMSEC Subsystem (NSA)
(3) Tactical Communications Control Facilities (USAF)
(4) AN/GRC-197 Tropo Terminal (USAF)
(5) Composition and Editing Display Equipment (COED) (USAF)
(6) Digital Facsimile Equipment (USN)
(7) Unit Level Switchboards (USMC)
(8) Data Adapter (USAF)
(9) Short-Range, Wide-Band Radio (USAF)
(10) Digital Group Multiplexer (USA)
(11) Mobile Subscriber Access Equipment (USA).

The general time frame for developing and fielding transitional equipment is in the 1975–1981 period. What we are doing and planning to do constitute our effort to make that period pay off.

Obviously in a brief article the details of a program such as TRI-TAC cannot be adequately covered. If, however, I have been able to put in focus the nature of the organization, the extensive planning effort, and the impact of the individual taskings for developing new equipment for joint service use, I shall have accomplished my purpose.

Joint Tactical Communications Office

WHAT'S AHEAD FOR BASE-LEVEL MAINTENANCE MANAGEMENT?

Lieutenant Colonel Monroe T. Smith

On 1 December 1971, Major George McKee, then Director of Maintenance Engineering, Hq USAF, pushed a button starting a test program of enormous impact upon Air Force base-level maintenance management. This service test, known as Maintenance Management Information and Control System (MMICS), was conducted at K. I. Sawyer AFB, Michigan, from 1 December 1971 to 28 February 1973.[1] This article deals with that service test and the ramifications such a system will have on future base-level maintenance management. I say "will have" because that system is currently being implemented in small packages by the Air Force Data Design Center, Gunter AFS, Alabama.

Before describing the service test, let's focus on the subject of Air Force maintenance. Air Force maintenance is big business. Over one-third of the Air Force's people are involved in maintenance. They receive an annual salary of over $1.5 billion, spending or influencing the expenditure of one-third of the Air Force budget.[2] I could continue with the "gee whiz" figures, but the point is that the number of dollars and people involved in Air Force maintenance offers untold challenges in its proper management.

Maintenance management offers its greatest challenge at base level. This is where the "rubber meets the road." All the plans, programs, schemes, etc., up and down the chain of command come into focus at base level.

How do we do this job today—how do we manage our base-level maintenance organizations in this nuclear age of third-generation computers? Manually, that's how! We manage with pencil, paper, and grease boards. With all our sophisticated weapon systems and electronic marvels of the 20th century, we manage these fabulous systems with "little or no aid from mechanical or electronic devices." [3]

Typical of this manual operation is the requirement from the maintenance "bible," Air Force Manual 66-1, *Maintenance Management:* "Visual aids will be neat in appearance, covered with a transparent material to permit posting with grease pencil. . . ." [4]

MMICS was a test to see if a real-time, large-capacity, on-line computer could be used at base level to improve maintenance management.[5] For the sake of clarity, "real time" in this system means that the system obtains and presents data and produces outputs fast enough to affect the minute-by-minute performance of maintenance. Similarly, "on-line" means that the system receives input data when and where they originate through input and output devices.[6] That is as far as I will go into the computer terminology. Rather than talk about MMICS in computer terms, it is more meaningful to talk about the system as viewed from jobs within the system.

general viewpoint

Perhaps the single most onerous task on the flight line or in the shop is the "mountain of paperwork" required in the present system. To correct a defect requiring specialist help involves several people recording that defect on several different forms (AFTO

Forms 781, 349, 350, etc.) and grease boards at various times. Each form has its own set of technical orders and manuals detailing form accomplishment. No one who has spent time on any flight line would be surprised at what the RAND researchers had to say about the current management system:

> Operating under the current AFM 66-1, managers in the maintenance complex (planners, controllers, crew chiefs, shop chiefs) spend much of their time processing data—posting to status boards and filling out or checking a myriad of forms.[7]

Under MMICS, a discrepancy is recorded *once* by placing it in the computer. From that point on, anyone dealing with that item—whether he is a planner scheduling corrective action, a supervisor inquiring about the aircraft in question, or the mechanic involved in the actual fix—all will receive the same information from the output devices of the computer. As each individual within the management system adds his action to the repair process, he needs only to input his addition, without reworking or re-recording the entire problem. When questioned at any point in the repair process, the computer gives all the information recorded up to the point of inquiry. For example, during preflight inspection the crew chief discovers a brake leaking. Through a radio link-up to a remote computer input device, the crew chief inputs all he knows about the defect: such things as the status (red cross, red diagonal, etc.), when he discovered it, aircraft identification, work unit code of the brake, and a narrative of the defect.[8]

The computer then reproduces this information in job control. Job control should recognize the potential problem to the daily flying schedule. If for some reason job control does not react to schedule corrective action, the computer will respond because it too has the flying schedule. The computer "scans" not only the daily flying schedule but all operations, maintenance, and training events automatically at frequent intervals, recognizes conflicts, and prints notices to the appropriate agency.[9]

In our example, job control asks the computer if the hydraulic shop has people available for dispatch.[10] With a real-time computer capturing control data on a minute-by-minute basis, the computer will have the most current information about specialist availability.

Having a hydraulic specialist available, job control assigns the job a start and stop time. This action causes a work order to be produced on the remote output device in the field maintenance shop area. This work order is unique. It has all the information input by the crew chief and job control, plus some information the computer data bank supplied. Previous maintenance actions by the hydraulic shop on this particular brake system or special tools or equipment or special items of inspection might be included on the work order.[11]

In our example, however, the specialist proceeds to the job and calls in a job start. This action satisfies the computer. Had no job start been recorded within preset time parameters, the computer would have notified job control.[12] Among the many things the computer does with job start information is to decrease the dispatching shop's personnel availability and initiate actions to monitor job completion.[13]

The repairs are completed, and a job completion is radioed in for recording on the computer remote. By this single input the men are made available for further dispatch, the aircraft status is upgraded (if no other work is outstanding), maintenance man-hours are computed, aircraft history is updated, maintenance data collection information is extracted and stored, to name just a few actions accomplished automatically, efficiently, and correctly. Even

AFM 65-110 equipment status reporting required for many higher headquarters products, although not in MMICS, is automatically captured and can be automatically produced by this system.[14]

viewed from job control

In the current system, job control is the functional element charged with managing the ongoing minute-to-minute maintenance operation. That office controls maintenance by authorizing and assigning jobs, work priorities, and start and stop times. Job control is required to maintain visual aids depicting each aerospace vehicle, selected ground equipment, maintenance in progress, munitions installed, specialist availability, and a host of other things.[15] The information flowing throughout the current system, in attempting to comply with these requirements, is overwhelming.[16]

In MMICS, job control uses the computer as its communications link with the total ongoing maintenance effort. The computer serves as the storehouse of all information, handles all the routine work following, and functions to alert job control when things are not going as scheduled. The daily maintenance and flying schedules are loaded into the computer at some predetermined time. These preplanned maintenance actions require no action or monitoring from job control—so long as the actual jobs start, stop, and progress as planned. Job control does not get involved if preplanned jobs are not started on time (within preset parameters) because the computer notifies the shop or activity first. If, however, the shop or activity supervisor does not correct the situation within preset time limits, job control is notified by the computer.[17]

Since all maintenance actions involve computer inputs, job control has at its request detailed information about the entire fleet. The individual aircraft configuration, time compliance technical order (TCTO) compliance, delayed discrepancies, specialist availability, equipment location, and many, many more items of current information are instantly available. As the work day progresses, unscheduled maintenance is handled by job control's calling up various programs, assessing the situation with up-to-the-minute information, and assigning jobs and priorities based on complete knowledge. The time-consuming grease-board posting; information recording and re-recording; chasing, via telephone and radio, the person with the latest information; and completing the myriad forms and reports—all are a thing of the past in the computer-assisted system. Job control now spends its effort on the time-sensitive items that truly require human decision-making; the computer does the laborious, routine tasks. Job control can now look ahead, anticipate events, and, in general, control maintenance instead of following it.[18]

viewed from plans and scheduling

In any well-organized planning and scheduling activity are filing cabinets full of detailed information that must be consulted to preplan cyclic maintenance. Maintenance delayed for some reason fills delayed discrepancy files. Walls are covered with status boards of all types. Reports of all types consume valuable planning time.

In the computer-assisted system, the entire history of each vehicle, along with detailed cyclic maintenance requirements, is loaded in the data bank. Such things as technical order compliance are recorded during the normal ongoing control cycle, and the aircraft histories are updated automatically. Delayed maintenance may be reviewed in an instant by recalling that program. For reports, the planner needs only to ask for the information in the desired format. Internal computer programs generate tentative maintenance plans, taking cyclic requirements into consideration along with operational requirements. Once tentative maintenance plans and schedules are confirmed by the planner, the computer produces the plan and issues the work orders—both former time-consuming tasks. These work orders are produced containing much of the information previously researched by the mechanic. Freed from the laborious manual tasks, the plans and scheduling people now have the time and information to plan more effectively.[19]

viewed from supervisory levels

Base-level maintenance has suffered from a glut of information, yet, because of manual processing methods, timely decisions based on up-to-date knowledge were often lacking.[20]

In the computer-assisted system, questions that once required hours of research and yielded questionable products are answered by the computer on line and in real time. For example, the chief of maintenance asks the status of a certain modification. The inquiry is answered with electronic speed and computer accuracy. Since modification is an ongoing maintenance action scheduled and controlled through computer action, job completion automatically updates the modification status information within the computer. Intermediate supervisors might call up training requirements/schedules to plan work shifts. A simple inquiry returns the current, up-to-the-minute information. These, like hundreds more day-to-day questions now requiring manual research and reporting, are handled in microseconds. But more than that, the answers are the most current obtainable because all ongoing actions update system statuses and equipment histories. Through internal computer programs these ongoing control data are captured and massaged into whatever format is needed not only for base consumption but for off-base use as well. The entire data bank of the maintenance complex—from personnel to equipment to schedules to problems—is instantly available to supervisors at all levels.

problems

Lest I suggest that the computer-assisted system is a panacea for all base-level maintenance management ills, some formidable problems must be addressed. Maintenance has traditionally rejected formal job standards. For this computer system to work, fairly accurate job standards must be developed, implemented, and constantly updated. Without valid job standards, computer planning and scheduling become a farce. (The same problem exists in today's manual system, but we get around it by not following the schedule with any degree of accuracy.) Associated with this problem is the operational flying schedule. Again the number and type of sorties must be given to maintenance well ahead of the time needed for input to the computer.

Another problem that must be addressed is the control of ongoing tasks. As indicated in the RAND studies, job control has never really controlled the ongoing tasks—the job control people have followed the work, and only the most flagrant "conflicts" came to their attention. With the computer monitoring *all* tasks—maintenance jobs, training programs, etc.—any deviation will be noted and addressed by the computer. With literally hundreds of tasks being accomplished hour by hour, nonreporting of starts, stops, and deviations will inundate supervisors and job control with problem notices. The entire maintenance complex must become attuned to getting instructions from the computer and telling the computer what they are doing and when they are doing it. In other words, maintenance people MUST agree to extremely close control.

Moreover, using the computer to capture ongoing data and using the data for submission of off-base reports means that the actual work and training accomplished, inspection and analyses performed, and equipment kept in readiness go automatically to higher headquarters. Many management goals may have to be adjusted once such accurate and timely data become available.

Finally, as with any computer system, the data retrieved are only as good as the data input. MMICS is a dynamic system, highly dependent upon accurate and timely inputs. This may prove the most critical problem of all.

BASE-LEVEL maintenance management is in for a revolution. The Air Force Data Design Center is implementing MMICS in several "packages." As each package is implemented, it will require adjustment in the way we do business. Until the last package is implemented, there will be some duplication of effort. This short-time duplication will be more than offset by the increased capability brought about by each package. Moreover, the knowledge that full MMICS implementation will result in a fully integrated data system, furnishing information on-line and in real time not only for the control of ongoing maintenance but also for off-base reports, should lend enthusiasm for the system. MMICS is a big step in closing the gap between our modern weapon systems and our manual management system.

Air War College

Notes

1. Interview with Major James W. Frank, Project Officer for MMICS, AF Data Design Center, Gunter AFS, AL.
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3. Philip J. Kiviat, "Computer-Assisted Maintenance Planning," RAND Corporation, Santa Monica, California, July 1965, RM-4562PR, p. 8.
4. AFM 66-1, *Maintenance Management*, vol. 2, "Chief of Maintenance (Aircraft and Missile)," 1 August 1972, Department of the Air Force, para 2-11.
5. "Maintenance Management Information and Control System, Project Plan," Hq USAF, November 1970, p. 1.
6. S. M. Drezner and R. L. Van Horn, "Design Considerations for CAMCOS—A Computer-Assisted Maintenance Planning and Control System," RAND Corporation, Santa Monica, California, July 1967, RM-5255PR, p. v (hereafter referred to as CAMCOS).
7. *Ibid.*, p. 15.
8. AFM 66-176 (Test), *Maintenance Management Information and Control System (MMICS)*, vol. 3, 1 September 1971, Department of the Air Force, p. 44-1-5.
9. *Ibid.*, p. 30-1-14.
10. *Ibid.*, p. 64-1.
11. *Ibid.*, p. 17-1-11.
12. *Ibid.*, p. 30-1.
13. *Ibid.*, p. 40-1.
14. CAMCOS, p. 14.
15. AFM 66-1, p. 2-2.
16. CAMCOS, p. iii.
17. AFM 66-276, p. 30-1-14.
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19. *Ibid.*, p. 2-100-154.
20. CAMCOS, p. 15.

RECRUITMENT OF MINORITY STUDENTS AT THE U.S. AIR FORCE ACADEMY

Captain Rolf A. Trautsch

IN April 1972 General John D. Ryan, then Chief of Staff of the United States Air Force, set a new goal for minority officer representation in the Air Force. By 1980 he wanted 5.6 percent of the officers in the Air Force to be members of minority groups. This represents a 300 percent increase. In order to achieve this goal, the various Air Force recruiting sources have been asked to increase their proportion of minority members to much higher levels than ever before. For the U.S. Air Force Academy, this means that it should increase the number of minority graduates from 3.4 percent in 1973 to 11 percent in 1980.

Minority students entered the Academy for the first time in 1955 when one Asian American student was admitted. The first black students, three in number, entered in 1959. One American Indian student entered in 1964, and eight Spanish-surname students entered in 1966. Of the 844 cadets graduating from the Academy in the summer of 1973, 29 (3.4 percent) were members of minorities.

The recruiting methods of the Academy until 1972 had been through a number of programs that were aimed at the top one-third of high school male graduates. Some of the applicants were members of minorities, but no specific official efforts to recruit minority students were in existence.

There were, and there still are, a number of reasons why only a handful of minority high school graduates have come to the Academy. Entrance requirements are very rigid, and achievement on College Entrance Examination Board (CEEB) tests or on those of the American College Testing program (ACT) by those accepted is substantially above that required by the average civilian college or university. Because of this, many students refrain from even applying to the Academy for fear they might not meet the requirements. Additionally, the Academy is known for its rigid and relatively difficult curriculum. A further reason is that opportunities at the Air Force Academy have not been publicized adequately at most secondary schools with a predominantly minority student body. Everybody has heard of West Point and the Naval Academy at Annapolis, but many students and even educators simply are not aware that the Air Force Academy exists and that it is open to anyone who can meet entrance requirements. Counselors and teachers are often of little help in passing information to the students about the Academy. In fact, as has happened in many instances in the past, erroneous information is given to students. Another major factor was the generally unpopular attitude prevailing throughout the nation toward the military as a whole. The Academy was and often still is looked upon simply as another air base through which the military inducts civilians for military service. This, then, was the general situation in 1972.

new recruiting efforts

Officials at the Academy had already become aware of the problems, however, and had assigned one black officer to the Candidate Advisory Office under the Registrar to advise the Academy in its recruitment aims for minorities. Additionally, in February 1972 three senior black cadets collaborated on a letter to those agencies at the Academy that were concerned with the admission and recruitment of minority students. In the letter they expressed their concern about the low enrollment of black students at the Academy. With this complaint they also offered a solution: They recommended that as many as four black Academy graduate volunteers be deferred from assignment to their future Air Force job for a period of eight to ten months and instead be assigned to the Academy to assist in recruiting black students during that time. These cadets felt that they could be more effective as recruiters for blacks and other members of minorities because:

a. Minority graduates are the best source of information pertaining to their experiences at the Academy.

b. As newly graduating students, they are closest in age and philosophy to the prospective candidates.

c. A deep-rooted common bond exists between minority graduates and the minority candidates. For example, in the case of blacks, this bond is blackness. Furthermore, minority graduates are more sensitive to the needs, attitudes, and goals emerging from the minority consciousness. In other words, an easier identification by each side with the other is possible.

d. Minority graduates, being exposed during recruiting activities to the communities, will create a favorable image of the Air Force and particularly the Air Force Academy.

For these reasons the black graduates felt they could have great influence in gaining the trust, support, and assistance of students, parents, and counselors.

The idea was accepted and fully supported by the Superintendent of the Academy. In August 1972 a Minority Affairs Office was established. One black captain and the three black graduates, now lieutenants, were assigned to it. In the summer of 1973 a Hispano captain also joined the office staff, and the three lieutenants (who began their Air Force career in their regular Air Force specialties) were replaced by four 1973 Academy graduates—three black lieutenants and one Oriental lieutenant. All are volunteers and support the idea that they can assist at increasing minority representation in the Academy student body.

the minority affairs office

The primary purpose of this office is to recruit minority students, advise the Superintendent of minority affairs, and counsel and assist those applicants who have been admitted to the Academy. Their progress is monitored by the members of this office throughout their stay at the Academy. Some examples of the work of the lieutenants will best illustrate the task of this office.

Upon request, the Department of Health, Education and Welfare supplied a listing of those areas in the United States that have a population predominantly black and of other minorities. Having decided on the particular area in which he wants to work, a lieutenant establishes contact with the local Air Force Academy Liaison Office (LO), who is a reserve officer not on active duty. The lieutenant then arranges, with the assistance of the LO, a visit to that area for a number of days. Through the LO, contact is established with counselors and principals of local high schools, who in turn schedule a particular time period during which the lieutenant delivers his presentation. Additionally, newspapers, as well as radio and television stations, are given news releases, and interviews are scheduled.

The three lieutenants are military recruiters in a general sense; yet they prefer looking upon their job as that of a college admissions counselor. For this reason there are occasions when they do not wear their uniforms when on a recruiting trip. As they explain it, "We've found that when one talks with people from the inner city with a uniform on, everybody's impression, from the school counselors to the students, is that we are regular Air Force recruiters. . . . If we can reach them before they tune us out, then they can be more receptive to the idea of a uniform, the short haircuts, polished shoes, and all that. . . . A lot of times the stereotype image particularly carries to the counselors. They think you're a recruiter in the strictest sense, and they ask students to come for a briefing if they are interested in getting into the Air Force. In other words, a false picture is created. We are looking not for students who want to go into the Air Force. We are looking for students who are interested in going to college. We want those students to apply to the Academy, get admitted, receive an outstanding education, and then become Air Force officers. Therefore, we want to present more of an atmosphere of a college admissions counselor." They stressed that "the Air Force and the Academy are one hundred percent behind us."

The recruiting pitch depicts the Air Force Academy as a four-year college that offers one of the best general education programs in the country, with opportunities to obtain a portion of graduate credits. If qualified, some students are able to continue graduate school or professional school, such as medical and law school, upon graduation from the Academy. In addition, during the four-year term at the Academy the student gets paid, even though all his tuition, as well as room and board, are furnished by the government. Furthermore, upon graduation the student, unlike many of his civilian counterparts, steps into a relatively well-paying career with various opportunities for advancement, travel, education, and job challenges.

Although the lieutenants are specifically concentrating on the recruitment of minorities, they are prepared to talk to anyone interested in the Academy or the Air Force in general. Their greatest success seems to be in cities where they are able to identify one or two people "who seem to know everybody in town." These are usually leaders in such groups as the National Association for the Advancement of Colored People (NAACP), the Urban League, Hispanic societies, and other ethnic organizations.

Despite useful contacts, the lieutenants encounter a number of problems in their recruitment efforts. The standards for admission to the Academy are high. Additionally, the Academy is a four-year institution, meaning that a student must spend four years at the school; he cannot, by extra effort, graduate in less time. Furthermore, "we make no exceptions in our minimum admission criteria, because it would not be fair to applicants [with lower qualifications] to be placed in such extraordinarily high academic competition," the Associate Registrar at the Academy stated. In other words, the chances for success at the Academy of a student with lower entrance scores would be extremely small. Because of the high standards and competition, the lieutenants encounter their greatest difficulty in finding qualified candidates: "Where the blacks fall short primarily," an officer in the Minority Office stated, "is in the fact that these students are not able to pass the English and/or math requirements."

Another problem encountered by the lieutenants is the antimilitary sentiment that has been prevalent in the past few years: "For the blacks, the sentiment of antimilitarism has a different twist, however. It is not wrapped up in political issues like 'Get out of Vietnam or Southeast Asia' but rather in social issues. It seems to be much more important to these people what opportunities are available for blacks, and how much does a black have to compromise as far as his manhood is concerned." Of course, this is the area where the black recruiters find that they are of much more assistance than a white recruiter, primarily because they speak from personal experience: "We can dispel these fears they have about being called an 'Uncle Tom' and becoming subservient because of the military structure."

Once a student is accepted, personnel of the Minority Affairs Office see to it that he receives proper information about study habits and budgeting of time and that he knows, in the case of blacks, who his "brothers" are and where they can be found. All this information is extremely helpful in adjusting to Academy routines.

Of special help in the endeavor to retain students at the Academy are the minority faculty officers. Each of some 32 black faculty or staff officers at the Academy monitors the progress of a certain number of minority cadets. As one black faculty member stated, "The main reason for this is to insure that everybody graduates, to increase the number of minority officers in the Air Force, and to show minority cadets that they can do the work." These officers counsel the students, invite them to their homes, and assist them wherever possible and whenever needed.

The Minority Affairs Office is presently engaged in organizing Spanish-speaking and other minority officers on the staff and faculty for similar purposes. "We have to overcome such basic problems as deciding on a name for all Spanish-speaking people," one officer stated. "At present we are called Chicanos, Spanish-descent, Spanish-speaking, Mexican Americans, etc. We want a common name so that it will be easier to identify us." The need for association and identification for Spanish-speaking students, as well as American Indian students, is of particular importance. Both groups have been traditionally accustomed to life styles that promote close family ties. Being placed in the Academy environment, completely away from their families, these students find that they have no one to identify with. Often the student so ostracizes himself as to develop doubts about his abilities, his confidence in himself wanes, his achievements suffer, and he eventually resigns. "To assist these students, we are attempting to provide a home away from home for them. But the only way we can do this is with the cooperation and understanding on the part of assigned minority officers. . . . There are a lot of things that need to be done, and we will do them!"

What about the results of the recruiting efforts? "It will take more than one year before we can really see the results of our work," one minority recruiting officer said. "One thing is clear, though," he continued; "we have covered the country pretty well, and we've got a lot of exposure for the Academy—I hope favorable exposure, and we are going to continue doing this job." The Minority Affairs Office and the recruiting lieutenants are convinced that only good can grow out of their efforts—good for the minority student, the Academy, the Air Force, and eventually society as a whole.

the Grassroots Program

The Grassroots Program, established in 1969, was designed for cadets to spread information about the Academy during their vacation. On a voluntary basis, cadets would give presentations to high schools in their hometowns, provide materials to newspapers, and arrange for interviews with TV and radio stations. No funds were expended by the Academy. This effort is still in progress, and special emphasis has been given to minority students who volunteered for such tasks. Funds were authorized to send these volunteers to their hometowns and other areas to provide information to communities about the Academy. Often they provide names of interested high school students to the Minority Affairs Office, which then contacts the student and assists him in application procedures. The philosophy behind this program is similar to that of the recruitment program of the lieutenants of the Minority Affairs Office. The minority student at the Academy can depict life much better than a regular recruiter or any kind of brochure or poster. Additionally, he represents to the high school student a living example that success at the Academy for a minority student is possible.

liaison officers

Liaison officers are civilians who are in the Air Force Reserve, not on active duty. As a partial fulfillment of their Reserve obligation, some 1300 LO's throughout the country have actively attempted to recruit male high school graduates for the Academy. Because of the emphasis on recruitment of minority students in the recent past, an attempt has also been made to identify more minority Reserve officers who are willing to work as LO's. As one of the primary contacts for the recruiters from the Academy Minority Affairs Office, including the Grassroots recruiters, the LO's have been responsible for establishing contact with local black leaders and leaders of other minority groups, high school counselors, and other school officials. They have arranged meetings and interviews with local news media and have assisted prospective applicants with information as to application procedures. In order to maintain proficiency about the information pertaining to the Academy and its admission policies, the LO's visit the Academy periodically for briefings and tours. While some problems still exist in this program, the special efforts put forth by the LO's have enabled Academy recruiters to make important contacts with local minority leaders.

educator-counselor orientation visits

Another method of spreading information regarding Academy life has been the Air Force-sponsored airlift program. High school principals, counselors, and educators are flown via military aircraft to the Academy for two-day briefings and tours including cadet contact. These airlifts are coordinated with the LO's, who accompany the educators for their own update briefings. Recently efforts have been made to include more minority educators and counselors. In fact, several of the airlifts have been for members of minorities only. These airlifts occur approximately twice every week during the regular school year.

How effective are these airlifts? I interviewed several counselors and educators on such an airlift, a predominantly black group from the Baltimore area. There was no doubt that they were impressed with the Academy. One woman counselor from a 100-percent-black high school was particularly interested. When asked for her opinion, she said that she had heard of the Academy but had never suggested that any of her students apply for admission because she had thought it was primarily military-oriented. She was so convinced of opportunities for black students at the Academy that she told me she would make an all-out effort to help recruit eligible students. Obviously, she was not concerned about assisting the Academy in its recruiting efforts; her concern was to assist in providing an opportunity for her pupils to obtain an excellent education, totally free. If she is successful, the Academy and ultimately the Air Force will have gained, and so will the student.

Although to some it may seem that spending five years in the Air Force as an officer upon completion of the Academy program is too high a price to pay, the Minority Affairs Office has a quick answer: "I look at it this way," one lieutenant said, "the Air Force is like a huge business corporation. They put you through school, and you give them some of your time in return. That is not unreasonable. But what corporation in the world would do that for you? I can't think of any!" He had answered his own question. Furthermore, the majority of Air Force Academy graduates find they like the Air Force and stay for a career.

a major obstacle: standardized tests

The typical minority candidate applying to the Academy is a well-rounded individual with excellent high school qualifications. He would have no trouble being accepted at any major college or university. Minority students entering the Academy in 1972, for example, had the following qualifications: 56 percent were in the top 10 percent of their high school class, over 80 percent were in the top quarter, and nearly 90 percent were in the top third. More than 60 percent participated in some form of student government, with 25 percent serving as class presidents, vice presidents, secretaries, or treasurers. Over 26 percent were given outstanding achievement awards, and 15 percent were given citizenship awards. Practically every one participated in at least one type of sport in high school, track and football being the most popular, followed by basketball, baseball, and swimming. Two-thirds of those participating earned letters. About 40 percent were Boy Scouts, and about one-fourth participated in musical programs. By comparison with the average entering cadet, these achievements are not unusual, however.

Based on this background, plus the types of courses required at the Academy, the total academic load, the quality and academic background of the faculty, cadet motivation, and other factors, the academic standards at the Academy are high. The entry standards generally control the quality of entering cadets. These standards include average CEEB scores of 580 in English and 660 in math in addition to rank in the upper 40 percent of their school class.

Cadets at the Academy are required to complete a minimum of 187 semester hours of study, of which 145½ hours are in academic courses, 14½ hours in physical education and athletics, and 27 semester hours in leadership and military training.

In studies conducted at the Academy, a high degree of correlation has been noted between the admissions test scores and academic performance by cadets. Results of this nature have caused the Academy to place continuing emphasis on minimum requirements for admission. One consequence has been a rather small pool of graduating high school seniors eligible for entry to the Academy. It is estimated that approximately ten to twelve percent of all senior male high school graduates achieved CEEB scores and high school grades suitable for admission to the Academy. Among minority groups the figure is closer to two to three percent, creating an even smaller pool. The pool is further reduced by the active recruitment programs of other academic institutions. This has been particularly true in recent years when colleges and universities, because of social and political pressures, have placed special interest in recruiting qualified minority students. Additionally, many minority students who are actually qualified simply do not apply because they have not heard about the Academy, have a misconception of what the Academy stands for, or have heard of the relatively tough curriculum. Rather than risk failure and possible loss of face, many students are more willing to enroll at a civilian college where pressures are less intensive and chances of success greater.

One reason that minorities, particularly blacks, score low on entrance examinations is, in my opinion, that such tests are culturally oriented. The tests are relevant for the student who has had the normal American high school experience of the white majority, middle-class population. The subject matter covered in the achievement tests is taken from the kind of material that white middle-class or upper-middle-class high school graduates can be expected to have learned, given the achievement motivation that is normal within the white majority culture. Many minority high school students will not have had opportunities to be exposed to the same instructional materials; they will not have had the same opportunity for home study; and they will not have had the same internal motivation to achieve as white students. Parental pressures and values will have been channelled toward other than a high level of academic achievement.

The problem of language further complicates the issue. Chicanos, for example, are generally accustomed to speaking Spanish in their home environment. Blacks who come from predominantly black population areas of the country have a similar problem; many have been exposed at home, and in some cases even in elementary and high school, primarily to "black English," that form of the language consisting of idioms and expressions peculiar to black culture. In both instances minority students look upon the English spoken by the majority white culture as a "foreign" language. Thus, when these students are exposed to tests or courses that are appropriate to the white majority culture, they often find themselves confronted with forms of expression quite alien to their accustomed language. Indeed, studies indicate that minority students, when compared with whites of equal ability, are most deficient in culturally oriented items.

These, then, are some of the major reasons for the low minority student enrollment at the Air Force Academy. Too few can qualify to pass admission tests. Standards are not lowered, however, because it is believed that if a student is admitted with lower qualifications he will not be able to adjust in the competitive and rigid academic environment of the Academy. Also, it would not be fair to those students who can pass the requirements to lower the standards. If this were done, it is hard to see how an institution such as the Academy could continue to provide academic programs of excellence. It is true that in the past few years more minority students have entered the Academy, primarily as a result of the increased recruiting efforts. But these students have generally been members of the middle or upper-middle minority classes who had adapted most to white society. There are many blacks and other minority students outside that group, however, who need and indeed deserve to come to the Academy. They may be potentially excellent officer material, but their culture, background, and life styles are different from what is presently measured by predictors and criteria. The Academy is attempting to assist these potential candidates in becoming qualified; that is, if they are qualifiable, help them to become qualified. If this can be done, the pool of possible candidates will be increased, giving the Academy and the Air Force an opportunity to increase their minority membership.

two promising prospects

If a student fails the entrance requirements but has a sufficiently high score to indicate a potential to pass the test, he may go to the Air Force Academy Preparatory School.

The purpose of this school is simply to prepare young men for the Air Force Academy. The curriculum was designed to prepare deficient Academy applicants to compete eventually in Academy entrance examinations and, hopefully, to succeed as cadets at the Academy in all phases of training.

In 1972, a more concentrated effort toward recruitment of minority students to the Prep School was attempted. Students were allowed to enter with CEEB scores slightly lower than the previous requirements. On the basis of an analysis of this group, it was found, however, that students who were at the lower end of the group could generally not be upgraded sufficiently to achieve the minimum requirements for entrance to the Academy. In other words, there seems to be a decisive cutoff point in an individual's ability eventually to become qualified within a certain time period. This experience supports the point of establishing a minimum requirement for the Prep School, as is the case with the Academy. If set standards for admission cannot be met by the student, his survivability chances at the institution, in competition with those who had higher scores, can be considered very small.

While this program has opened the door for some additional minority students, the pool still remains extremely small. In view of this, the aim to attain an 11 percent minority representation at the Academy seems at this time somewhat unrealistic. Given the nationwide college population of 5,730,557 (1971), 90 percent of these are white students, approximately 6.6 percent or 379,438 are black, and 204,661 (3.4 percent) are members of other minorities. The minority college population comprises approximately 10 percent of the total, and approximately half of these are women. On the basis of these figures, a 5 percent minority representation at the Academy would be a more realistic goal that could be achieved in reasonable time frames. Even so, the Academy needs to continue to employ aggressive and imaginative recruiting methods and increase the number of Prep School graduates in order to achieve such goals from the presently available pool.

In order to enlarge the pool of minority applicants who can qualify for entrance to the Academy, one other possibility exists. In 1971 Mr. Frank McFadden, Neighborhood Youth Corps Coordinator for the San Diego School District, visited the Academy. Realizing the relatively low representation of minority students at the Academy, Mr. McFadden challenged the Superintendent of the Academy to increase the number of minorities at the Academy. Responding to this challenge, Lieutenant General A. P. Clark, Superintendent, has given his preliminary approval for a pilot program that combines the efforts of the San Diego School District and the Academy to qualify more minority students for entrance to the Academy or any other college in the nation. Plans are being developed that call for students who have the potential to go to college to be identified while in the seventh grade. In volunteering to participate in the program, students will be administered the regular high school program but will be required to take special English, math, and basic science sequences. This program would last for the remaining four years of high school work. It is hoped that, if the students are exposed early to these various courses, they will be better prepared upon graduation to score sufficiently high on college admission tests and enter the Academy or any other college or university of their choice. Men and women will have equal opportunity to participate in this program. Selected teachers and staffs of participating high schools will visit the Academy for motivational purposes. Such motivational materials as films, tapes, slides, and brochures will also be provided. The Academy will assist the San Diego School District in developing course materials to acquaint students and teachers with modern study techniques, time-budgeting philosophies, and test-taking methods as used at the Academy. While the Academy hopes to benefit by assisting in enlarging the pool of minority college-bound students, it should be remembered that it is the student who will ultimately choose the institution he wants to attend. Initial concentration of the program was directed at approximately 90 students at O'Farrell Junior High School in San Diego in the fall of 1973.

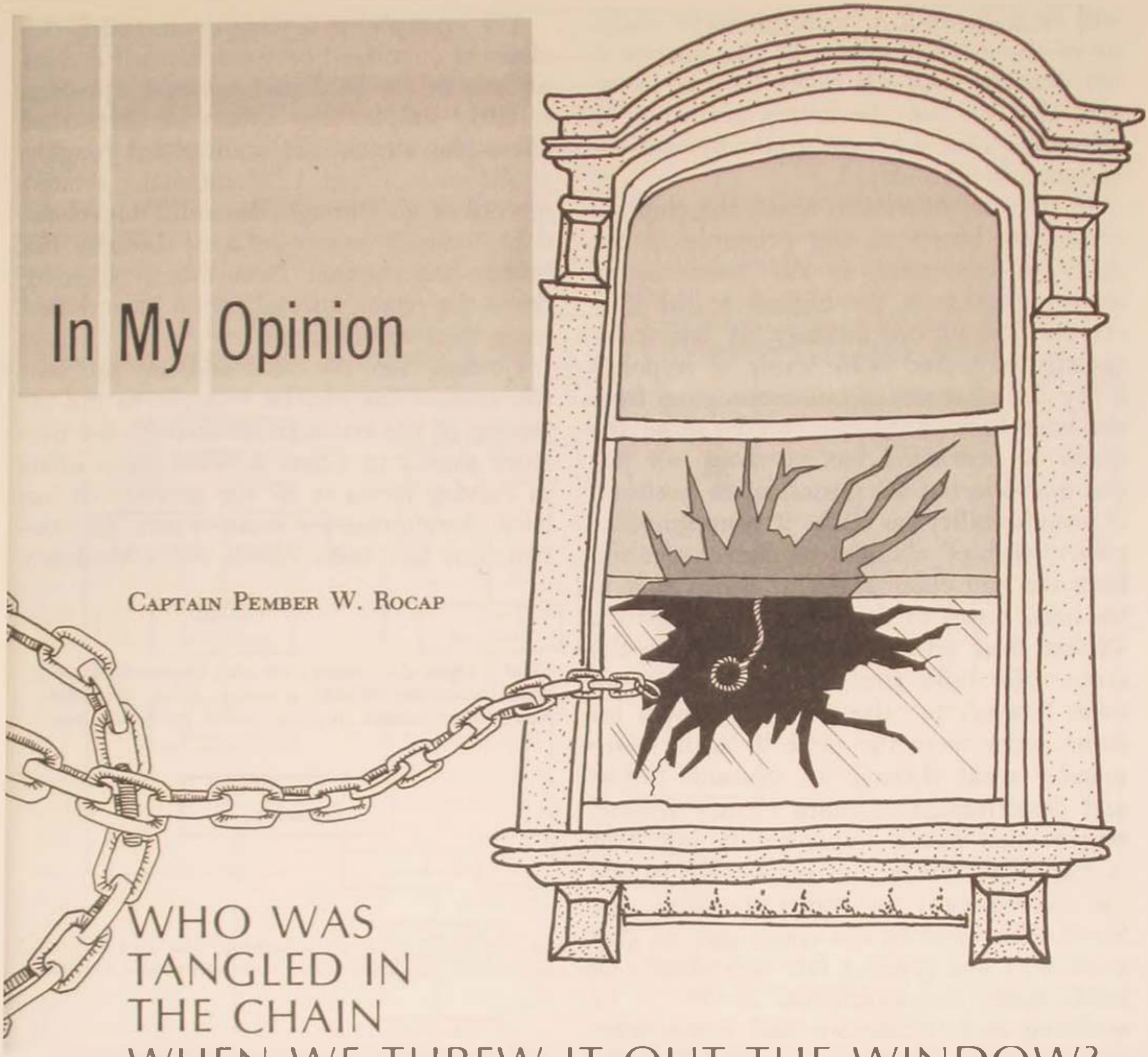
Although this program is still in the development stage, it is clear that it has the potential, if successful, to become an effective method for many minority students to become qualified to pass present college entrance tests. If successful, this program, or a similar one, could have prospects for national application.

Faced with the problem of insufficient minority representation in its student body, the Academy has responded by developing vigorous recruiting programs. While the Minority Affairs Office, the Grassroots Program, the educator-counselor orientations, and the liaison officer program all help to assist in overcoming basic problems, the most basic problem of all—namely, to increase the pool of college-bound minorities —has not been resolved. But here again, the Academy has responded. The attempts at the Prep School and at a joint Academy–San Diego School District pilot program in qualifying those students who can be qualified could add considerably to the size of the pool. While it is too early to predict accurately the outcome or impact of these programs, it is clear that the Academy has committed itself to helping solve a national problem. In the event that the Academy reaches its goals of minority representation, actions will have spoken louder than words.

United States Air Force Academy

In My Opinion

Captain Pember W. Rocap



WHO WAS TANGLED IN THE CHAIN WHEN WE THREW IT OUT THE WINDOW?

TO the professional military man, the chain of command is as inviolable a management concept as it is an absolute necessity in combat. Most leaders feel that no matter what else changes as the military adjusts to the times, the chain of command must be preserved. The feeling is so strong that we have not yet recognized, or at least not yet admitted, that the chain of command as the military once knew it exists no longer. The primary purpose of this article is to point out that the chain *has* been replaced and to describe the "situation" that has replaced it. In the process, areas requiring a re-evaluation of current practices and thinking will be indicated. A comprehensive analysis of the overall effects of the change is not possible until Air Force leaders recognize that we may be acting according to principles that we have gradually and unconsciously invalidated.

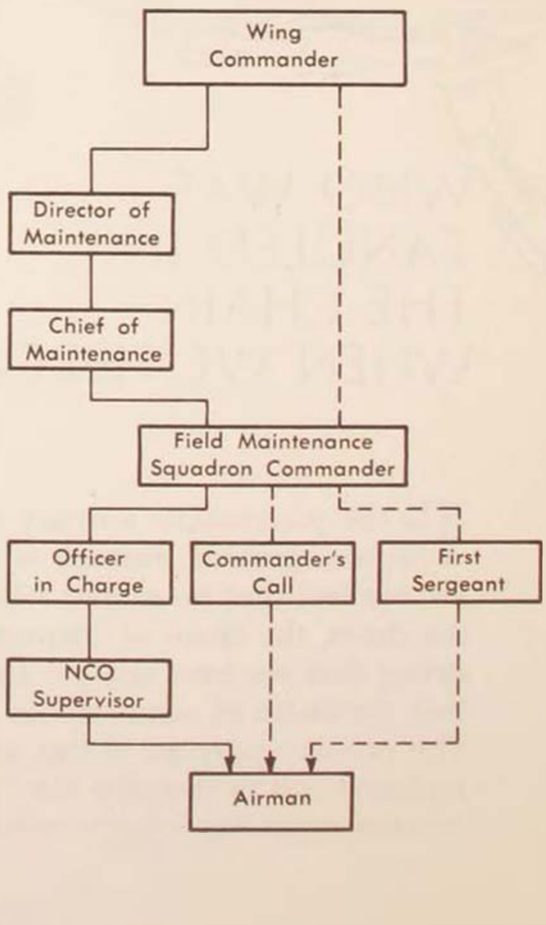
In the very narrowest sense, the chain of command, based on the principle of the unity of command, is the hierarchy of commanders from the highest to the lowest echelon in the military. It has traditionally indicated both levels of responsibility and channels of communication from one level to the next. In a broader sense, the chain of command has involved not just commanders but all personnel in positions of responsibility; as such, it represented a clearly defined channel of communication between any commander and any man in his unit, down to the man at the bottom. Viewed from either end, the chain was the same. The links the man at the bottom went through to raise a problem with his commander were the same links the commander went through to transmit orders and directives. The chain clearly defined where each man's responsibility lay: that is, the supervisor he was responsible to and the subordinates he was responsible for. Strict adherence to the chain insured that each man was given a fair opportunity to fulfill those responsibilities. It did so by enabling each supervisor and commander to know and influence everything that occurred in his area of responsibility. The chain insured that all communication coming down and going up or out went through the supervisor.

Right now, from the commander's viewpoint, the chain may appear to be intact. He transmits his orders through a clearly defined channel to the lowest working level in his unit. That channel is clearly defined one way only. In the Air Force, looking from the bottom, an airman is faced with a maze of channels to his commander.

For example, to a wing commander, the chain of command between himself and an airman in his field maintenance squadron is fairly simple. Any orders he gives that affect the airman are transmitted roughly as shown in Chart 1. Maintenance-related directives go through the solid-line channel, nonmaintenance-related through the broken-line channel. Note that even going down the chain, specialization has created more than one channel.

Coming from the other end, any problem the airman has can be brought to the attention of the commander through the network shown in Chart 2. This maze exists in varying forms in all the services. It has been developing for many years. Its construction has been driven by a tendency

Chart 1. Chain of command from wing commander to airman: maintenance-related directives follow the solid line; nonmaintenance directives follow the broken line.



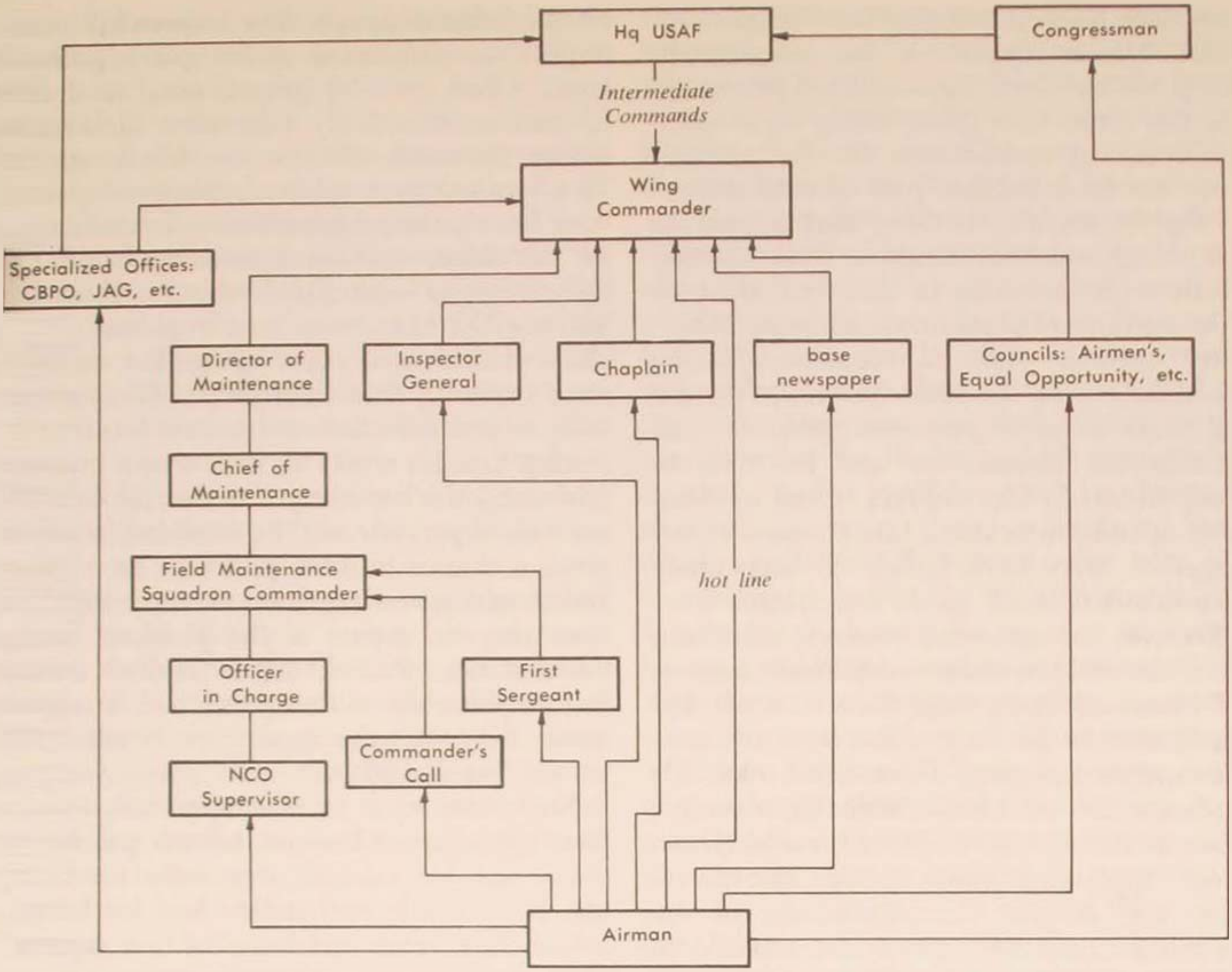


Chart 2. An airman's approach to the wing commander may seem to be a complex of possible alternatives, but each channel has had its own specific raison d'être.

and need for specialization and by the constant search for effective methods to handle personnel problems in the modern military. There was and is a legitimate reason for each channel to exist.

In this age of specialization, the first sergeant was long ago consigned to administrative and housekeeping details while the noncommissioned officer (NCO) in the shop took care of those problems dealing with the primary mission of his unit. For years now, any airman who could correlate his problem with the specialized function established to handle it could go directly to that function (CBPO, the legal office, etc.). In addition, the chaplain and the congressman have been long-standing receivers of the problems of disgruntled airmen, especially when a "satisfactory" answer is not forthcoming from elsewhere in the system. Each base now has an Airmen's Council that also transmits communication from the man at the bottom to the man at the top. The more recently established Equal Opportunity Councils function similarly. Within the past few years most major air commanders have established the position of Chief Master Sergeant of the command to keep in touch with their enlisted personnel. In the sense that those filling these positions act as ombudsman for the airman, they too have become part of the maze.

On the surface, nothing may appear to be wrong with this situation. Each channel deals with problems in different areas. A few are open to problems in all areas. Whatever overlap exists is considered to be necessary, even desirable. In total, they are all ways to solve personnel problems and enable the commander and his men to keep in touch. The sad fact is that as channels of communication, taken separately or together, they have failed. At least many commanders think so. If this system were effective, commanders would not have seen the need to create additional channels of communication with their men as they have done in the form of hot lines and base newspaper columns. These latest channels indicate the need for a thorough, objective look at the system we have created. However applauded these latest innovations are, and despite the significance of the problems they have been instrumental in solving or preventing, their effectiveness will be short-lived. In the end, they will become another, unesteemed part of the maze. Ultimately, this proliferation of channels and functions could be creating more serious problems than it has solved.

The greatest miscalculation to be made at this point is to think that the half of the chain of command that remains, the order-transmitting half devoted to mission accomplishment, will be unaffected by the transformation in the other half. It will be affected; and the person who may already be feeling that effect is neither the commander nor the airman but the NCO supervisor.

There is a valid reason for a commander to establish hot lines and to keep his ear to all the other channels. His responsibilities require an awareness of his men's problems, views, morale, gripes, etc., so that he can constructively take care of them before the unit's effectiveness deteriorates. To a lesser degree, each subordinate supervisor has similar responsibilities toward and for his men; and each requires similar knowledge to accomplish those responsibilities. Yet the maze that replaced the chain of command works against the supervisor's gaining that knowledge. The more sincere and effective a commander is in stating that he wants to hear every man's grievance, the less likely it is that the intermediate supervisor will be confided in and given a chance to solve problems he could and should solve. In a few cases, the supervisor may be a part of the problem, and the existence of all the other channels may be justified solely on that possibility. In most cases, however, the supervisor is not involved. He should be.

No matter what level a supervisor occupies, when one of his men takes a problem above him for solution, especially a problem he could have handled had he been aware of it, then confidence in that supervisor may be weakened on three counts:

First, the airman's confidence in the supervisor's ability may be weakened by atrophy because he has little need to test it. At a time when direct, working relations should be placed on a "human," personal basis, the system says to the airman: "Take your orders from your supervisor but take your problems elsewhere, anywhere but to him." The rapport necessary for an effective working relation between an airman and his boss is given little chance to develop. The system, by encouraging only an orders-giving-and-receiving relationship between the airman and his supervisor, dehumanizes that relationship.

Second, the commander's confidence in the supervisor may be weakened each time he is presented with a problem that in the past the supervisor should have solved or at least been the first to bring to the commander's attention. This will assuredly occur if the commander does not realize that the system, and his contribution to it, facilitates bypassing the supervisor.

Third, the supervisor's confidence in himself may eventually be weakened. The best, rather than the worst, will be most affected. They are more likely to have been able to handle a problem and to have been most sincerely interested in doing so. The weak supervisor, on the other hand, is probably relieved that he did not have to be bothered; or, worse, he couldn't care less.

This is not as much pure conjecture as it may seem. During a recent tour of Army units in Europe, a retired Army lieutenant general found that NCO's did, in fact, feel that they were being bypassed in the chain of command. He correctly labeled this an unsatisfactory condition but concluded by swearing fidelity to a chain of command that no longer exists.[1]

At the very least, the NCO's of the Air Force, our first-line supervisors, should be sounded out on their feelings and feel for the new "chain of command." If there is frustration and lower morale, it should quickly become apparent.

These observations might still not be worth pursuing if it were not that one of the toughest positions of leadership in the Air Force is occupied by the career NCO who supervises first-term airmen. Leadership, in the sense of influencing human behavior to accomplish a mission in the manner desired by the leader, is much easier when the men the leader works through are committed *a priori* to accomplishing that mission and to the professionalism a military career entails. The supervisor of airmen at the lowest level must carry out his responsibilities through personnel who are *not* necessarily mission-oriented. The true test of leadership comes when a job must be accomplished with men who are not personally dedicated to the mission of the service. The NCO supervisor must daily exercise this type of leadership.

This is not the place to discourse on the characteristics of an effective leader. However, it is generally agreed that, among other essentials, the effective leader must know his men and be directly concerned with their welfare. Such knowledge, to be applicable, requires complete communication between the leader and his men; such concern, to be credible, must be demonstrated. The maze that has replaced the chain of command obstructs the NCO in exercising his leadership on both counts. It is increasingly harder for the NCO to know his men and have complete communication with them when the system offers the men numerous ways to avoid communicating with him. He can hardly demonstrate concern or assist them when the system encourages them to seek assistance elsewhere.[2] Calling the current situation a generation gap or a credibility gap between lifers and nonlifers is an oversimplification. Wherever there is a generation gap between an NCO and his airmen, the communications maze we have constructed insures that it will remain and probably widen.

This article is little more than one opinion that the chain of command no longer exists. Whether it is gone completely or simply buried under a maze of communications channels is debatable, as is the tentative conclusion that the first-line leadership of the Air Force is in danger of being weakened as a result. There may be other problems, or there may be no problem at all. The assertions made in presenting this situation should be closely examined. Any debate on their validity will help focus attention on a communications Topsy that should not be ignored.[3]

Perhaps the greatest weakness in this proliferation of channels is only the unrealistic expectation that an 18-year-old airman with all of three months' military experience can judge which channel will be most effective in solving his particular problem. In many instances the airman may haphazardly try several or all of them—a shotgun approach. But in that event we have provided the shotgun and carefully aimed it back at the Air Force. The airman has only to load his problem into the chamber and pull the trigger. In other instances the the airman may simply riot and see who comes running.

This maze will remain. It is too much a part of the Air Force's organizational structure. It *is* the structure. But it requires the Air Force in every way possible—through training and education programs and through the words and actions of every commander—to give the NCO supervisor a chance to do his job. We tell the NCO that he must be a leader. Let's be sure that he is given the opportunity to function as one by indicating that he is the first man for the airman with a problem to see. *Then* let's provide all the support necessary to solve that problem while at the same time keeping the NCO supervisor directly involved. The effect on discipline, morale, retention, unit effectiveness, and aspirin consumption by harried commanders might be surprising.

Hq United States Air Force

Notes

1. Interview with Lieutenant General Bruce C. Clarke, USA (Ret), in *The Pentagram News*, 18 November 1971.

2. Interestingly enough, one of the more recent discussions of leadership in the *Air University Review* ("Leadership—Seen from the Ranks," March–April 1971, pp. 76–83) emphasized the paramount importance of the development of *team spirit*. Obviously, here too the maze operates to thwart much of the NCO's efforts.

3. For example, the observation that the commander's hot lines and newspaper columns will eventually lose their effectiveness can be considered further. This will occur, and not simply because their novelty has worn off.

A commander has overall responsibility for his unit and its mission. Regardless of the rhetoric that proclaims the smallest problem of the most junior airman in a unit to be also the commander's problem, the commander cannot afford to become involved in all the details of doing all the jobs and solving all the problems. The hot line provides a way for most if not all to be brought before him. Yet if a commander personally attends to every minor irritant and problem in the unit, he risks personal exhaustion and the deterioration of his unit's overall effectiveness because of neglect of major problems that are his, and his alone as commander, to solve. As an alternative, he can, as many commanders are probably doing, delegate the task of answering and solving hot-line problems to a subordinate or staff function. At that point, the very aspect of the hot line that made it effective—the promise and influence of the commander's personal attention—has been removed, and the hot line is well on the way to becoming one more bureaucratic gimmick in the system.

There is another alternative. In some units, the hot line will be used for vital problems infrequently enough for the commander to afford the time and effort to attend to them personally. But this situation will occur only in those units where the much more numerous minor problems of most airmen will have already been solved by the man who should solve them: the airman's NCO supervisor. Unless we act soon, such units will exist only in the memories of a few old-timers.

SOMEONE HAS GOT TO LISTEN

MASTER SERGEANT DICK LARSEN

A MAJOR problem looms on the horizon unless someone begins to listen to what military and civilian leaders of the North Atlantic Treaty Organization are saying.

For the past year responsible NATO officials, from Secretary General Joseph Luns and Supreme Commander General Andrew J. Goodpaster on down, have issued repeated warnings against any unilateral troop reductions by Alliance members without a definite reciprocal reduction by the Soviet Union and its Warsaw Pact satellites.

They have warned and warned and warned. Before Congressional committees, to visiting political figures, in the press—to anybody who would listen.

In case you haven't been listening, here is a brief sample of what is being said:

• "If NATO's already stretched military position were to be reduced while the Warsaw Pact's military capability continued to grow in quality and quantity, there would be a de facto unilateral reduction by NATO without any compensation by the other side, with the result that the Alliance would be weakened and the security balance that safeguards the peace would be upset."—Dr. Joseph Luns[1]

• "It is necessary not only to maintain the level of our forces but also to modernize and improve them. Soviet Russia . . . allocates large and increasing resources to research and development and to modernizing military equipment. Thus, if we in the West should stand still, we would actually soon fall behind. The net result would be the same as a reduction in strength. This we must avoid."—General Andrew J. Goodpaster[2]

• "The military commander is not allowed to base his assessment and his advice on the political climate or on speculation. He is expected to assess the facts, and in this field no détente can be seen. On the contrary. The gun which is directed point blank at the heart of the Western Alliance, that is the Central European region, has a greater calibre than ever in the past."—General Juergen Bennecke[3]

• "It is simply not realistic today, given this strategic balance between East and West, to consider that nuclear weapons would be a credible deterrent to the varieties of aggression with which we [NATO] could be faced. Active or passive aggression, in war, or in the blackmail and coercion that could be imposed without war. We simply must have a better conventional capability in Allied Command Europe."—General Russell E. Dougherty[4]

These are the types of warnings against any reduction in the North Atlantic Alliance that are coming at a time in history when all indicators seem to point toward the dismantling of military commitments.

Moves are being made on many fronts to bring some sort of détente between East and West. Diplomatic contacts between the United States and the Soviet Union are flourishing, as is the economic exchange between the two superpowers. A nuclear war between East and West is now considered highly unlikely. Discussions on mutual and balanced force reductions are taking place in Vienna. The 35-nation conference on security and cooperation in Europe is now under way in Geneva.

Despite all these indicators, officials within the NATO Alliance have continued to call for a strengthening and modernization of NATO forces and equipment, as well as a halt to any further unilateral force reductions.

Why?

Why would responsible leaders with a genuine desire for peace promote such a course of action if today's political trend is toward meaningful reductions in the chances of military confrontation? Why this insistence on maintaining a strong military posture when nations are striving for reductions in military spending?

Why? Because military and Alliance leaders judge situations according to their evaluation of military estimates. In this regard there are some rather curious statistics that should be examined.

While NATO strength figures have remained relatively constant, Soviet and Warsaw Pact totals have increased. Force cutbacks and dual-basing programs, according to one NATO commander, cut the number of on-the-spot NATO forces by 25 percent since 1967, but capabilities remain the same.[5]

NATO-committed forces are now outnumbered nearly four to one in battle tanks, two to one in manpower, and approximately three to one in combat aircraft.[6] The proficiency of Warsaw Pact forces is constantly being improved, as is the standard of their equipment. The Soviet navy is now second only to that of the United States and growing stronger at a rapid rate, particularly in the area of nuclear submarines.[7]

Why, NATO leaders ask, should the Soviet Union and the Warsaw Pact find it necessary to continue to improve and expand their military might if they are sincerely interested in joining in a new atmosphere of peace and cooperation? Why, to paraphrase General Goodpaster, should the stick get bigger all the time while the talk keeps getting softer?

That "why" is something that worries members of the Alliance because they judge the answer on the basis of military capabilities, not political speculation. On one hand they see the potential danger posed by the military strength of the East, while on the other hand they are aware of elements within their borders that are not as interested as they should be in maintaining NATO capabilities at their present level.

Look at it for a moment from the Soviets' point of view. Thus far they have reached two important goals. They have gained numerical superiority and approximate nuclear parity in Europe over the United States and its NATO Allies. Secondly, they have gained recognition by the West of the postwar boundaries of Soviet expansion in eastern Europe.

If you were a Soviet leader, wouldn't your next logical goal be the removal of U.S. forces from Europe, with its resultant impact on NATO solidarity? Why worry about fighting a war when you can sit back and wait for the other side to defeat itself?

The dangerous slide has already begun. Several of the 15 NATO nations have announced troop reductions or cuts in conscriptee length-of-service rules.[8] Belgium, for one, plans to remove two of its four brigades stationed in West Germany and cut back its total force level.[9] The two brigades will be transferred to the Belgian strategic reserves and will remain available to NATO. Denmark has announced an 8 percent reduction in its defense spending and a cut of 50 percent in its armed forces. Canadian soldiers in Europe are scheduled to trade battle tanks for armored reconnaissance vehicles by 1974, while the total Canadian strength in Europe is 50 percent lower than in 1970.[10] West Germany plans to cut back the number of its Army brigades and has already reduced the length of service for conscripts from 18 to 15 months.[11]

The United States commitment to Europe is also under growing pressure. Some members of Congress seek to ease the balance of payments and dollar devaluation problem by a cutback in American troop strength in Europe. Figures ranging from 7 to 50 percent are being discussed.[12] Yet proposals for such reductions have been strongly opposed by the President, and there is strong Congressional support for NATO.

There has been no armed conflict in Europe for more than 28 years. A mantle of peace and prosperity has settled over the 200 million Europeans protected by NATO. Living standards and personal incomes have risen sharply as European economies become more and more invigorated. Defense spending has increasingly had to take second place to social demands.

WHAT EVERYONE seems to have forgotten is that it is the strength of the NATO Alliance that has made it all possible. NATO was formed at a time when Russian armies appeared poised to plunge into the heart of Europe. NATO alone stood between the powerful Soviet Union and the war-weakened nations of Western Europe. Now those nations are powerful, and the need for a continuation of the very thing that made it all possible is being questioned.

What is happening can be compared to two giant companies that have been bitter rivals in the past but are now trying to move into a phase of cooperation; however, they must remain aware that renewed rivalry in the future is by no means impossible.

The NATO "company" has favored the payment of high dividends in the form of a higher standard of living, but it could have done more, in this writer's opinion, in the way of capital investments—armaments in this context. The Warsaw Pact firm, on the other hand, has put most of its earnings into capital investments at the expense of dividends.[13] Consequently, NATO's ability to compete, should rivalry renew, is declining.

NATO leaders know that all too well. They have been trying to tell the people who control the purse strings exactly what is happening and what is at stake.

If the stakes were not so high, it could humorously be compared to the old story about the little boy who cried "Wolf" until no one listened. Only this time the danger is from a wolf with steel-tipped claws.

Someone has got to listen before it is too late.

Hq Allied Forces Central Europe

Notes

1. Address by Dr. Joseph Luns, Secretary General of NATO, to the Annual Assembly of the Atlantic Treaty Association, Istanbul, Turkey, 11 September 1972.

2. Address by General Andrew J. Goodpaster, U.S. Army, Supreme Allied Commander Europe, to the Assembly of Western European Union, Paris, 21 June 1973.

3. Address by General Juergen Bennecke, Commander-in-Chief, Allied Forces Central Europe, to the Royal United Services Institute, London, 5 December 1972.

4. Address by General Russell E. Dougherty, USAF, Chief of Staff, SHAPE, to conferees at the Allied Command Europe Public Information Officers' Conference, SHAPE, Belgium, 16 May 1973.

5. This figure is arrived at by the following method: French military withdrawal—a loss of three full divisions and a tactical air force; Belgium—transfer of two brigades (of six) to the strategic reserve; Canada—reduction of nearly two-thirds, from a full brigade to a battle group and from an air division to a wing; United States—return to the continental United States under the dual-basing concept of three full brigades plus five fighter squadrons.

6. This figure varies slightly, depending on the source. I have taken figures quoted by General Bennecke, CinC AFCENT, to a visiting group of German journalists at Hq AFCENT, Brunssum, The Netherlands, on 16 May 1973. This does not consider total assets of NATO countries.

7. *Jane's Fighting Ships, 1971-72*, p. 78. Included is the somber warning, "The only category of warship in which the U.S. Navy now *and for the future* maintains a decisive advantage is the aircraft carrier . . . yet even this margin over the Soviet Navy is narrowing." Also see "Sea Power in the Mediterranean—The New Balance," *NATO's Fifteen Nations*, October/November 1972.

8. *NATO's Fifteen Nations*, October/November 1972, p. 14.

9. This action was announced as one part of a larger military reorganization by the Belgian government in late 1972. The two brigades are now in the process of being repositioned within Belgium. Included in the plan was an overall reduction of the Belgian armed forces from 101,000 to 87,000 men and the lowering of conscriptee service time from 15 to 12 months.

10. *International Defense Digest*, vol. 5, no. 5 (October 1972), p. 450; *The Military Balance 1972–73*, International Institute for Strategic Studies, p. 18.

11. "The Force Structure in the Federal Republic of Germany, Analysis and Options," report of the Force Structure Commission of the Government of the Federal Republic of Germany, published 1972/73. Under this plan the Bundeswehr would field an army of 24 full-strength brigades plus 12 reserve brigades.

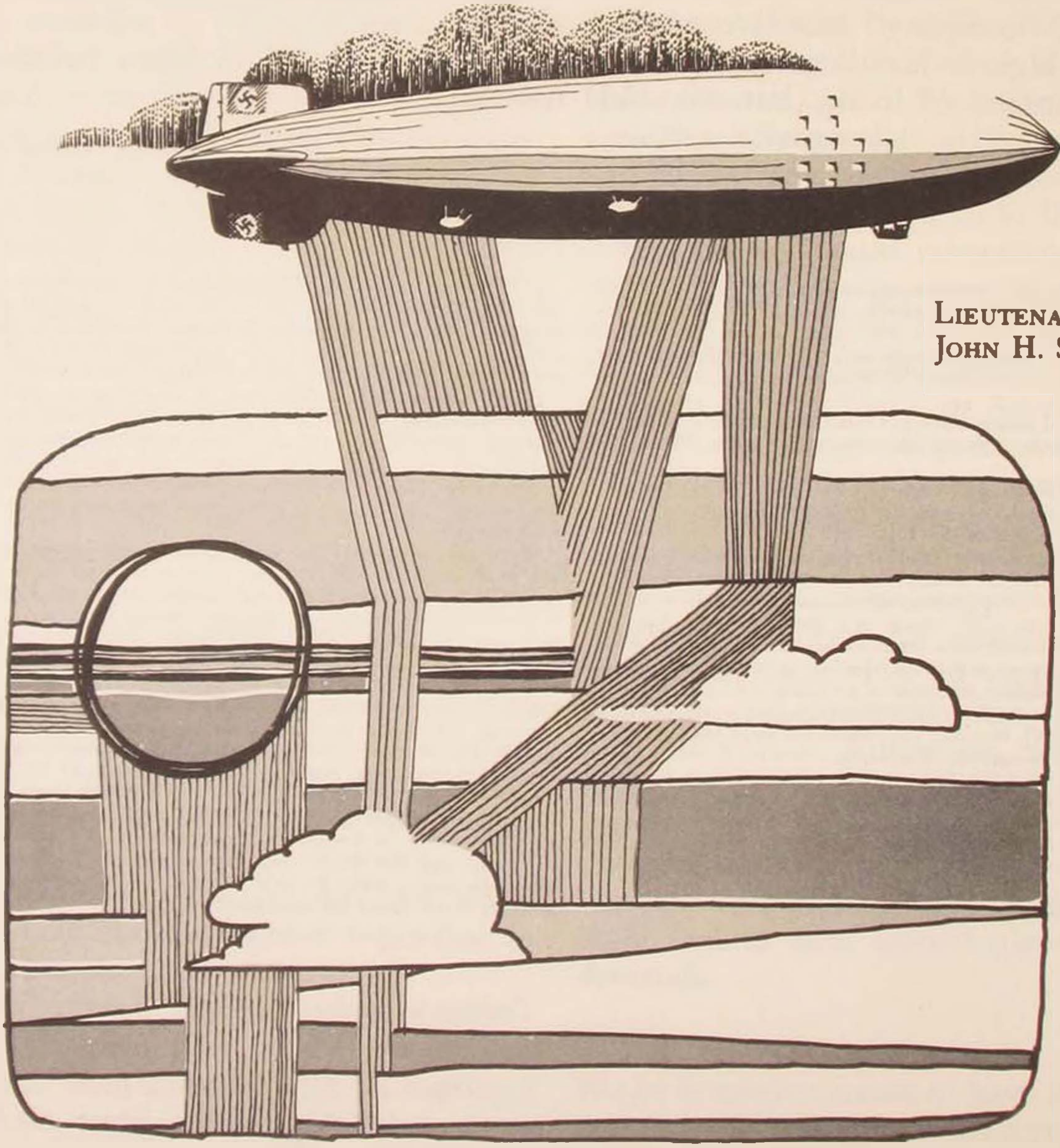
12. Senator Mike Mansfield has annually introduced amendments to legislation calling for cuts not only in European-based forces but most recently in the worldwide U.S. military commitment. An excellent argument in favor of reducing troop levels is detailed in Section VI of "America's Move" by Benjamin S. Rosenthal, published in *Foreign Affairs*, vol. 51, no. 2 (January 1973).

13. Speaking to the Council of the British Atlantic Community, British Foreign Minister Sir Alexander Douglas-Home drew one comparison when he explained that roughly two-thirds of British expenditures on the forces is for pay and one-third is for equipment, while the Soviet ratio is just the reverse. This trend is not unique to our British allies. In FY 1964 the United States spent $12.9 billion on military personnel and $7.04 billion on research and development. By FY 72 this had changed to $20.16 billion for personnel and $7.888 billion on research and development. It is a trend that grows ever greater now that the U.S. is into the all-volunteer force concept. (The figures are from a report by then Secretary of Defense Melvin R. Laird before the House Armed Services Committee.)

Books and Ideas

"UP SHIP"

Once More with Nostalgia



Lieutenant Colonel
John H. Scrivner, Jr.

IS IT RIGHT to consign lighter-than-air travel to the grave when it was not given a full or fair trial? This has been the recurring argument of historians and writers since an explosion and fire caused the destruction of the German Zeppelin *Hindenburg* in 1937 at Lakehurst, New Jersey. To counter that argument, heavier-than-air proponents point out the vulnerability of the huge airships, their high cost, and the almost consistent run of bad luck suffered by lighter-than-air craft during their development.

Neither side convinces the other; the argument for lighter-than-air for other than combat use still rages, and some go so far as to say the time of the dirigible has returned.[1] Three recent books† on the subject indicate that interest in lighter-than-air continues despite its detractors. None of the books will convince a heavier-than-air purist, but each contributes to the knowledge of the development of lighter-than-air flight.

Michael Mooney's book, *The Hindenburg,* details a well-kept secret about one of the most shocking tales of sabotage against the German Third Reich ever uncovered: theoretically, the deliberate destruction of the dirigible *Hindenburg,* apparently to discredit Hitler's Germany in the eyes of the world. Instead, the disastrous crash effectively ended lighter-than-air development. After 1937, except for coastal patrol by "blimps" of the U.S. Navy and the familiar Goodyear advertisement airships, lighter-than-air vehicles (especially dirigibles) disappeared. By 1962 only the advertisement blimps remained.

The second volume, Robert Jackson's *Airships,* is a detailed recounting of the historical development of lighter-than-air from the original concepts presented by Roger Bacon to Pope Clement IV in 1268 to the present. He traverses the well-worn stories of the Montgolfier brothers and their successors and the development and destruction of the leviathans of the sky, such as the British *R-38* and the American *Roma,* USS *Shenandoah,* USS *Akron,* and USS *Macon,* ending with the *Hindenburg* and a plea for lighter-than-air.

Had Jackson stopped there, his book would have little to recommend it over other airship histories now on library shelves. He has much more to say, however, and as a result his book makes a worthy addition to the history of lighter-than-air.

Jackson limits his narrative history to dirigibles, those blimps with rigid metal framework. Doing so allows him to cover a most significant, but often-slighted, period in the development of lighter-than-air—the dirigible in World War I. With few exceptions, the dirigibles of that period were Zeppelins constructed in Germany. Remarkable for their advanced design and impressive durability, Zeppelins were formidable only because the state of the art in fighter aircraft had not yet reached a point where a plane could climb fast enough to intercept a dirigible or maintain, for more than a few minutes, a Zeppelin's combat altitude once it was reached. Beginning on the night of January 19–20, 1915, the Germans raided English towns and cities using dirigibles in what could well be termed early strategic bombardment. The Kaiser, in an Imperial Directive a month later, specifically instructed his

† Michael Macdonald Mooney, *The Hindenburg* (New York: Dodd, Mead and Co., 1972, $8.95), 278 pages.

Robert Jackson, *Airships* (Garden City: Doubleday & Company, Inc., 1973, $6.95), 277 pages.

Douglas H. Robinson, *Giants in the Sky: A History of the Rigid Airship* (Seattle: University of Washington Press, 1973, $15.00), 362 pages.

dirigible pilots that ". . . the air war against England will be carried out with the greatest energy." Nevertheless, he explicitly exempted residential areas of London, the royal palaces, and his royal cousins, the King and Queen, from what was thought at the time would be a rain of bombs.

It is in the author's detailed handling of dirigibles and blimps in World War I combat that his book is lifted out of the ordinary. He records the tracking of German submarines by British blimps and the first successful sinking of a submarine in this manner. He shows the growing effectiveness of antiaircraft defenses against the huge Zeppelins and, with the invention of the incendiary bullet, the terrible vulnerability of the hydrogen-filled airships.

Also chronicled is the obvious advantage of lighter-than-air craft: their amazing endurance in flight. During their early use in 1914 and 1915, dirigibles made reconnaissance and naval fleet-hunting flights. This was followed quickly by aerial bombardment as the dirigible's possibilities were recognized. Initially, the duration of the flights was short, but as the state of the art progressed so did the Zeppelin's capability to link the distant areas of the Central Powers and the German Empire.

Operating out of Bulgaria and Rumania, the German airships began recording raids of 37 to 52 hours in duration. Extended range was not remarkable at this stage; Yambol, Bulgaria, to Naples, Italy, or Port Said, Egypt, established records until, on November 21, 1917, the Zeppelin L-59 was called upon to deliver supplies and ammunition to besieged German forces in East Africa. Departing from Yambol, the airship reached Khartoum, where the crew learned that the German garrison had fallen. The airship was turned about and, without stopping, returned to Yambol after 95 hours and 35 minutes in the air, covering a distance of 4200 miles.

Nor does Jackson, a Britisher, stop there in his research of early dirigibles. He carefully details the construction and use of each of the British, French, German, and American dirigibles during World War I and in succeeding years. He includes the details of the construction and crash of Britain's last dirigible, the *R-101*, while en route from England to India. That fiery crash into a hillside in France in October of 1930 snuffed out the lives of many of the finest lighter-than-air designers in Britain and ended British participation in dirigibles.

The famous German passenger dirigible, the *Graf Zeppelin*, receives full attention and deservedly so. In the annals of dirigibles, the most successful was the *Graf Zeppelin*. Its maiden trans-Atlantic flight from Friedrichshafen, Germany, to Lakehurst, New Jersey, in 1928 set an airship record of 111 hours and 43 minutes for crossing the Atlantic. More important, it proved that dirigibles could weather storms, make repairs while in flight, or take alternate routes when weather was too bad, and still arrive at their destination. The *Graf Zeppelin*, successful as she was, lacked speed, and the Zeppelin Corporation had insufficient funds to build another huge airship with that requisite capability. Dr. Hugo Eckener, chief pilot and head of the Zeppelin Corporation, devised an ambitious plan to publicize dirigible flight by proving the reliability of the huge airships in passenger service around the world.

A round-the-world flight had been made by American planes, ending in March of 1924, with numerous stops en route and covering a period of 175 days. Eckener planned the dirigible global flight with only three stops while carrying a normal load of passengers and mail. On August 8, 1929, the *Graf Zeppelin* departed Lakehurst for Friedrichshafen, Germany, on the first leg of the history-making flight. Jackson's account even details the freight aboard, as well as the passengers and crew. Worthy of note is the fact that Commander (now Vice Admiral, USN, Ret) Charles E. Rosendahl was aboard the *Graf Zeppelin* on this flight. Rosendahl later piloted every U.S.-owned dirigible and was in charge of the U.S. Navy's blimp program during World War II. Since the retirement of the last blimp, he has remained an outspoken proponent of lighter-than-air.

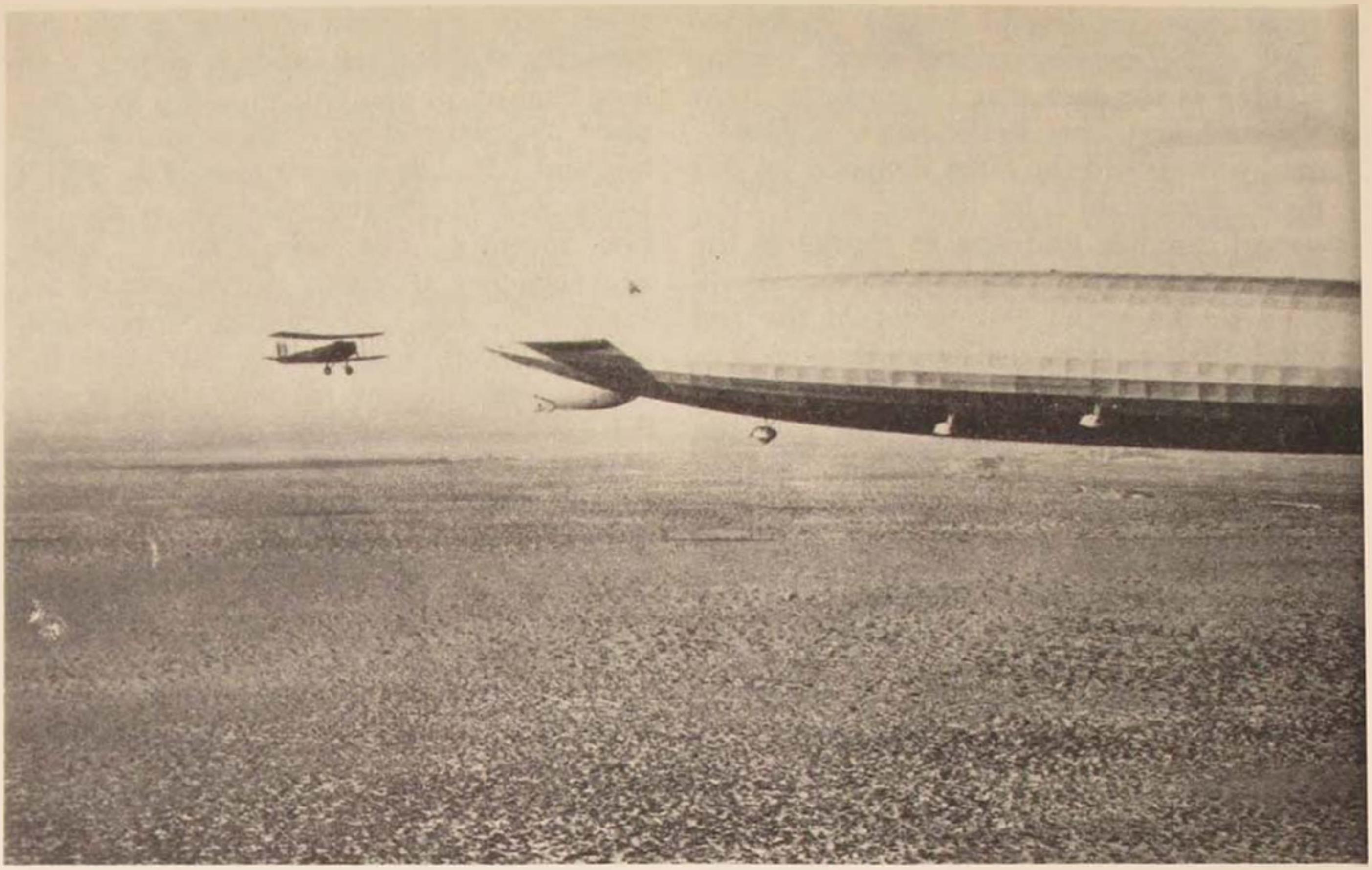
Circumnavigation of the globe took the *Graf Zeppelin* 21 days, 7 hours, and 34 minutes, with stops at Friedrichshafen and Tokyo before returning to Lakehurst. Total elapsed flying time was 14 days, one hour. The scheme to publicize dirigibles worked. By 1930 regular passenger service between Germany, Brazil, and the United States had begun, with each year proving more profitable than the previous one. Success permitted the laying of the keel of a new and better airship.

In 1936 the *Graf Zeppelin* was joined in service by the *Hindenburg*, and the following year the *Graf* was retired from service. By 1937 all U.S. dirigibles except the German-built USS *Los Angeles* had crashed. England had given up her dirigible program while other countries had never seriously begun one. The *Hindenburg* held the world's monopoly on airships and began immediately to continue the achievements of her sister ship, the *Graf Zeppelin*.

Jackson's narrative repeats the well-known story from this point on. However, he has assembled an extensive chronology of airship events that make the book a valuable reference document for anyone studying lighter-than-air—a subject which, if Jackson could have his way, would come under increasing study as a means of transportation, if not for passengers, then for cargo. The bigger a cargo airplane becomes, the more difficult it is to fly, land, and handle. The bigger a dirigible is, so Jackson's thesis goes, the more efficient in lift and capacity it becomes, and it requires no long runway; it can deliver cargo to a pinpoint location and hover there during loading and offloading operations. The Soviet Union has conducted research along this line recently. The late Captain Eddie Rickenbacker, testifying in 1945 before the President's Air Coordinating Committee, stated that if "the airship had had the experimental money in proportion to that the airplane has had, it would be with us today."[2]

The dirigible *Hindenburg* played a unique role in aerial history. Large,—it held 7 million cubic feet of hydrogen—sleek, and gracefully beautiful, the leviathan was bigger (800 feet long) than any other flying machine ever built except for the short-lived *Graf Zeppelin II*, which first flew in 1938 and subsequently was broken up in 1940 for scrap aluminum. The outstanding record of the first *Graf Zeppelin* paved the way for a triumphant beginning for the *Hindenburg*. So dramatic and attention-getting was the dirigible in flight, or when merely moored on the ground, that Hitler's propaganda minister, Dr. Joseph Goebbels, ordered the Nazi swastika painted on each tail fin for "advertisement."

The *Hindenburg*'s keel was laid in 1934, and the airship entered service during the summer of 1936. By then Eckener was Chairman of the Board of the Zeppelin company, a figurehead position in the Zeppelin organization controlled by the state. The new dirigible made seventeen round trips across the Atlantic either to Lakehurst, New Jersey, or Brazil during the summer of 1936. During that winter twenty new passenger cabins were installed, which gave the ship a capacity of nearly one hundred passengers. This modification was completed in late April 1937, and the *Hindenburg* prepared to enter the summer trans-Atlantic travel season.



Rumors were abroad that sabotage of the *Hindenburg* might be expected in an attempt to embarrass the Third Reich. The 97 passengers manifested for the first flight were carefully screened and their luggage searched. Nothing unusual was discovered, and the *Hindenburg* took off on May 4, 1937, on her maiden flight for the year and on what was to be her final Atlantic crossing.

This historic and pivotal flight has been meticulously recreated by Mooney in his book, *The Hindenburg*. Amazingly, the detailed conversations of the passengers and crew have been reconstructed as well as daily routines and menus. Mooney's investigation of the ill-fated flight led him to contact surviving members of the passengers and crew. He found that they had

Airships in Their Heyday

The Graf Zeppelin, *a German rigid airship, was the most successful of all dirigibles. From 1928 until retirement in 1936, it flew passengers between Germany and Brazil and the U.S. and circumnavigated the globe in 21 days 7 hours 34 minutes, flying time 14 days 1 hour. . . . The airship* Bodensee *seated 24 in the passenger compartment, one more in the navigating car at double price. . . . The* USS Akron, *a 785-foot rigid airship built at Goodyear-Zeppelin factory, had the control cabin at lower forward of hull, engines along its length, and catwalks inside the hull for inspection and repair. The* Akron *crashed off the New Jersey coast on April 4, 1933, killing Rear Admiral William A. Moffett, Chief of the Navy's Bureau of Aeronautics, and 72 others.*

astounding memories for detail, which he in turn has faithfully recorded and placed in minute-by-minute order. He also used to excellent advantage the extensive file in the National Archives on the investigation of the crash of the dirigible. A member of that investigation commission was Commander Rosendahl, appointed to the job by the commission chairman, Joseph P. Kennedy, father of the late President of the United States.

From these records and the exhaustive interviews, Mooney declares that the destruction of the *Hindenburg* was due to sabotage.[3] Officially, the investigating commission ruled that the dirigible exploded due to a spark of static electricity which ignited leaking hydrogen as the airship prepared to land, a fact that Jackson repeats in his account of the *Hindenburg* career.

Mooney finds, however, that, even during the investigation of the crash, members of the commission felt that sabotage was the cause of the fire. The reason this fact was not brought out was that "a finding of sabotage might be cause for an international incident, especially on these shores." Accordingly, the author states, the Board of Inquiry did its best *not* to discover any sabotage during the public hearings. It was during the evening off-the-record sessions that the initial rumors of sabotage turned into "inescapable evidence." Part of that "evidence" was the discovery of the remains of the flimsy bomb that blew up the huge airship as it prepared to dock.

Mooney, like Jackson, begins his book with a long chapter on the early history and growth of dirigibles. However, he quickly proceeds to the backgrounds of the crew and the political overtones surrounding the construction and launching of the dirigible that became the pride of Germany and the symbol of her post-World War I expansiveness. One American newspaper said that the *Hindenburg*'s flight indicated that the Germans had become the "fearless conquerors of space."

The *Hindenburg* was the immediate object of an international dispute when Germany asked for American helium to fill the gas cells of the airship. Approval was almost granted when Hitler himself spoiled all chances of obtaining the nonflammable gas by marching into Austria. The U.S. Congress suspended approval of the gas sale, and the *Hindenburg*'s gas cells were filled with the dangerous hydrogen that sealed her fate.

Mooney has been able, by extensive research, to name a *Hindenburg* crewman, Eric Spehl, as having planted a flashlight-battery-energized phosphorous bomb which he detonated by a photographer's timing device. It was timed to explode after the ship had been moored at Lakehurst, the passengers had disembarked, and the airship was being prepared for the return voyage. Instead, due to a weather delay prior to landing, the bomb went off between two huge hydrogen gas cells near the stern of the airship as it hovered preparatory to landing. The spectacular radio broadcast of Herb Morrison, who witnessed the crash, and the photographs of the disaster are familiar to all students of history.

As Mooney reconstructed arsonist Spehl's motives for destroying the airship, it becomes clear that the confused crewman saw his deed as his "act of genius." Spehl, in destroying the symbol of German might, created his own masterful stroke of rebellion against the brutality and power of the German Reich, which had done him no favors. Ironically, he did not survive the explosion and fire he caused.

The best of the three books, and the most authoritative, on lighter-than-air is Robinson's *Giants in the Sky*. The author writes to remind the older generation of the glory and pageantry of the great airships and to answer the question posed by those much younger, "What was a rigid airship?" Robinson answers that by stating:

> The rigid airship . . . was one of the most extraordinary and romantic creations of men, enthralling millions during its reign from 1900 to 1940. It offered the promise of great range and load carrying capacity long before the aeroplane was really developed. . . . all work stopped, traffic ceased to move, and thousands crowded into the streets to watch their majestic passage, announcing the attainment of man's dreams of exploring the farthest reaches of the earth, and of connecting the actions of the world in peaceful commerce through the air. (p. xv)

Robinson's extensive and enlightening story of these airships details the history, building, use, and eventual destruction of 161 of the regal giants. Beginning with the innumerable problems of Count Ferdinand von Zeppelin, the inventor who gave the ships his name, he chronicles their growth and use during their forty years of existence. Of the total number of them built, the firm that Zeppelin founded built 119.

Troubled initially by finances and technical problems, Count Zeppelin eventually produced the giant airship concerning which Jackson and Mooney write with such admiration. Robinson joins these authors in admiration, and he excels them by telling not only the story of the rigids but also what they meant to the world politically, economically, and militarily.

Robinson sees in the use of the rigid airship what the leaders of Germany, England, France, Italy, and the United States saw: a national symbol. He terms Britain's entrance into that field after World War I as an "imitation," a verdict with which Jackson would quite probably not agree. At any rate the British Royal Navy insisted on duplicating the German airship during World War I, to permit aerial scouting of the North Sea in support of the Grand Fleet. While the Germans succeeded in their early airship program, the British did not. Robinson blames the failure on a lack of British public interest and support and the fact that British designers and engineers so slavishly copied the Germans that they failed to advance the state of the art.

In the United States it was the Navy that looked both long and hard at the dirigible. With the vast Pacific to be covered, an increasing awareness of the value of air power, and the growing possibility of war with Japan, our Navy saw in the huge dirigibles a means of reconnoitering the ocean. In 1919 the U.S. embarked upon its own program of dirigible building, the first one being the ZR-1 (USS *Shenandoah*). The *Shenandoah*'s first flight on September 4, 1923, was a first for a dirigible inflated with the safe but expensive helium.

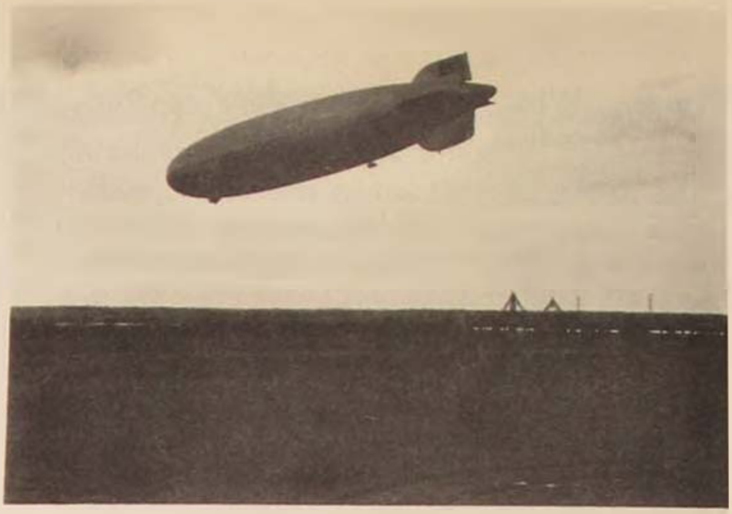
With the *Shenandoah* began a series of American innovations in lighter-than-air. The British-invented mooring mast was improved upon and put to practical use, including one mounted on the stern of a Navy tanker. The American public began to see the possibilities in lighter-than-air when the *Shenandoah* was flown from Lakehurst to the West Coast and back. This flight, coupled with the advent of the *Graf Zeppelin*'s passenger service, seemed to forecast a new and incredibly luxurious method of transcontinental and transoceanic travel. The German-built USS *Los Angeles* took the place of the ill-fated *Shenandoah*, after the latter's crash in 1925. The USS *Akron* and *Macon* also met tragic fates, yet both represented enough inventive and creative features to earn for the United States Robinson's accolade as "innovators." Included among the innovations were aerial hookups of small U.S. Navy combat biplanes to the *Akron* and *Macon*, the mooring masts, an all-metal-skinned airship (ZMC-2) known as "the tin balloon" and first flown by the U.S. Army's Captain William E. Kepner,[4] water re-

Continued on page 94

The *Hindenburg*

The day was May 6, 1937. The German passenger dirigible Hindenburg *was completing the first trip of her second trans-Atlantic summer season. Suddenly, observers recoiled in horror at the holocaust that consumed the great airship as it approached its mooring at Lakehurst, New Jersey. The horror was accentuated by the fact that, but for Nazi Germany's invasion of Austria, the* Hindenburg *probably would have been filled with helium instead of flammable hydrogen. Of the 97 people on board, 61 miraculously escaped death.*

Now, more than 35 years later, painstaking research illuminates the mysterious circumstances surrounding the tragic event.



covery while in the air, "orange-peel" doors for the sheds to house the huge airships, new ground-handling procedures, and much-improved engines and design. The crashes of the *Akron* and *Macon*, plus the none-too-friendly attitude Robinson attributes to some of the shipbound Navy brass, spelled the end of U.S. innovations with the dirigibles. The field, from the time of the *Macon*'s crash in 1935 until the *Hindenburg*'s burning in 1937, belonged entirely to the Germans. Thereafter, the *Graf Zeppelin II* was built and flown, but as World War II approached it was retired and scrapped.

To these three authors the rigid airship is not simply a product of a dramatic but short past. To each of them it has a future despite the huge airship's shortcomings. Robinson sees the major problem of the future airship not as one of innovative design but rather one of sufficiently interested financial circles to back the leviathan after such an ill-starred past record. After World War II the Goodyear Aircraft Corporation tried to interest the U.S. government in a ten-million-cubic-foot Zeppelin for an overnight passenger/cargo run from the mainland to Hawaii, but no subsidy was obtained. Atomic power was discussed seriously, plans for an atomic-powered airship were drawn, but no company was formed and no action ever taken.[5] Robinson sees airships as the cheapest, if not the fastest, way to move cargo by air. He also points to the luxurious means of passenger travel that the airship of today's technology could provide. In short, the obstacle to seeing another rigid airship in the sky is not technical; it is psychological, resulting from the crashes, and financial. Perhaps a really severe energy crisis could revive the rigid airship.

For devotees of lighter-than-air, for those who still cling to the hope of its phoenix-like renaissance, for those who want to recreate an important era in the history of man's flight, these books are a welcome addition. For many, they anticipate fulfillments yet to come.

Kent, Ohio

Notes

1. Michael F. Conlan, "Dirigible Revival: 'Airships Practical for Consumer Use,'" *Akron Beacon-Journal*, August 1, 1973, p. D-4.
2. Edwin J. Kirschner, *The Zeppelin in the Atomic Age* (Urbana: University of Illinois Press, 1957), p. 52.
3. Others have made similar findings. See A. A. Hoehling, *Who Destroyed the Hindenburg?* (Boston: Little, Brown & Co., 1962).
4. Kepner went on to fame as one of the three balloonists in the National Geographic balloon *Explorer* in 1933 and as an Air Force lieutenant general before his retirement in 1953.
5. Kirschner, p. 39.

SOVIET AIR POWER AND VICTORY IN WORLD WAR II

Dr. George W. Collins

Bourgeois falsifiers of World War II history attempt by any means at their disposal to minimize the role of the Soviet Air Force in the defeat of the Luftwaffe. They affirm that the power of the Luftwaffe was undermined by the Anglo-American bombing raids on German aircraft factories. However, historical documents and facts overthrow these unfounded assertions. (p. 382) †

DESPITE the ideological bias evident in the above statement, those interested in the Second World War will not want to dismiss lightly this Soviet history. While there are many good books available about the war, a perusal of Janet Ziegler's bibliography *World War II: Books in English 1945–1965* reveals the disproportionate lack of publications about the Russo-German part of the war. Miss Ziegler lists more books on the North African campaign than on the entire war in Russia. Although that disparity might be excused because of the Anglo-American military operations in Africa, it can lead to a distorted conception of the war that mistakenly minimizes the Soviet effort. Furthermore, the bulk of the literature about the war on that eastern front usually concentrates on the ground war; for example, neither Alan Clark's *Barbarossa* nor Albert Seaton's *The Russo-German War* gives any significant attention to air operations. On the other hand, Asher Lee's *The Soviet Air Force* and Robert A. Kilmarx's *A History of Soviet Air Power* give some attention to the air war but do so within a broader context of Soviet air power. And, unfortunately, most of the monographic literature on the Russo-German air war reflects Germany's point of view.

Official histories often are suspect, and while for us Soviet histories probably are more so than others, they cannot be discounted offhand, for at the very least they are indicative of the party line at the time of publication. This history, for example, demonstrates how a "de-Stalinization" policy may operate: it makes no accusations against Stalin; instead his role in the war is generally ignored (there are only six references to him), and the command decisions are attributed to the General Headquarters of the High Command (*Stavka*).

In this account, the war on the Russo-German front is divided into three periods. During the first, which ran from the invasion of 22 June 1941 to November 1942, the principal feature was that of defense. Then the period to December 1943 included the battles for Stalingrad and Kursk and the reoccupation of Soviet territory to the Dnieper River. And the last, 1944–1945, was a period of Soviet successes on all fronts. For each of these periods there is a discussion of the general military situation and

† *The Soviet Air Force in World War II: The Official History, Originally Published by the Ministry of Defense of the USSR*, translated by Leland Fetzer, edited by Ray Wagner (Garden City, N.Y.: Doubleday & Company, 1973, $12.95), 440 pages.

Soviet objectives, data are provided on aircraft types and production, and an account is given of the preparations for and conduct of various campaigns. The discussion of each period closes with a summary of the accomplishments and an assessment of Soviet air strengths and weaknesses.

The narration, like the air war itself, emphasizes the tactical ground support role of Soviet aviation; but strategic operations, reconnaissance, and air support of partisan forces also receive attention. However, no attempt has been made to draw a large canvas of the war, and matters of grand strategy and diplomacy are ignored. There are numerous vignettes of individual Soviet heroism, which at first seem more suitable for the Soviet propaganda pamphlets published during the war;[1] but, on reflection, these differ little from similar accounts of American heroism narrated in books like Samuel Eliot Morison's *The Two-Ocean War.*

The book is especially enhanced by the annotations of the editor, Ray Wagner, author of *American Combat Planes* and *The North American Sabre.* He has provided additional data on Soviet aircraft, has noted discrepancies in the narrative from other evidence, and has added clarifying comments that considerably assist the reader. Included are about forty good photographs of World War II aircraft. The Soviet planes pictured range from the then obsolete I-153 biplane fighter and the TB-3 four-engine bomber to the later Yak-3 and La-7 fighters that were a match for the Luftwaffe Me-109 and Fw-190. Mr. Wagner also has added three appendices: on Soviet aircraft, Lend-Lease, and U.S.S.R. and German aircraft production.

This reader found the discussion of the first two periods the most interesting. In them it is argued that during the most critical years of the war the Soviets fought virtually unassisted by the Allies and that prior to 1944 the outcome of the war had been determined—by Soviet action alone.

Avoiding the issue of Stalin's failure to initiate a state of readiness in June 1941, the book claims that the initial Luftwaffe onslaught succeeded because the Soviet Air Force was caught in the midst of a modernization program and forward airfield construction. It further claims that, despite the loss of over one thousand aircraft on the first day of the war, throughout the general retreat of 1941 Soviet air power played a vital role in the ultimate containment of the German attack. In accordance with prewar strategy that had assigned to long-range bombardment air power the responsibility for annihilation of important targets and destruction of enemy air forces, during the first days of the war Soviet aircraft struck at cities and industrial targets ranging from Königsberg in the north to Bucharest and Ploesti in the south, and Berlin was bombed in August and September 1941. Such operations were soon abandoned, however, and all air resources were applied to the tactical situation.

In defending Moscow during the winter of 1941–42, the Russians learned lessons concerning the essential priorities for the employment of air power. These lessons stressed the importance of thorough air reconnaissance and the attacking of enemy communications, troops concentrating for battle, and aircraft on the ground. The Soviets also recognized the advantage of mass air offensive and, most important, the fact that control of the air was a prerequisite for successful ground offensive. By December 1941 they established air supremacy around Moscow and were able to launch a counteroffensive.

Following the Moscow counteroffensive, major organizational changes were made within the Red Army Air Force. The incorporation of air forces within the armies and of different types of aircraft within the air divisions had proved to be impracticable; therefore, separate air armies and divisions were created as well as an Air Force for Long-Range Operations. It should be noted, however, that only some two hundred outmoded bomber aircraft were available, and the strategic strike concept had little significance. Aircraft production increases during 1942 provided the opportunity not only for air superiority at the front but for the creation of substantial reserves as well.

The climax of the second phase of the war came in the summer of 1943 at the battle for Kursk, where, this history states, "the struggle against the Luftwaffe . . . concluded in the destruction of its basic forces." Strategic control of the air was gained as "the German command could no longer replace its great losses, especially in flying personnel." (p. 186) Thereafter, say the Soviets, the Luftwaffe no longer had the ability to influence significantly the outcome of the war. (p. 201) In this period the Soviet Air Force was able to launch massive attacks upon the enemy with great success both in support of Soviet ground offensives and in destruction of the Luftwaffe on the ground and in the air. About 796,000 sorties were flown, and more than 20,000 aircraft were destroyed. A great increase in the use of radio communications, improved bombing accuracy and navigation procedures, and more aggressive air tactics all contributed to the Soviet superiority. Following the Kursk campaign, the Soviet offensive continued until the end of 1943, by which time the enemy had been driven across the Dnieper River. After that, declares the Soviet history, although the last two years of the war were dramatic and difficult, they were anticlimactic because by the beginning of 1944 the U.S.S.R. showed that it could defeat Germany singlehanded.

Within this book there is much that students of tactical air power will want to read. It honestly acknowledges initial Soviet deficiencies in the quality of aircraft, organization, and combat procedures, but any stereotype of Soviet inflexibility and awkwardness is dispelled by the evidence of the continued evolution of tactical effectiveness. Although the repeated insistence on the aggressiveness of Soviet flyers from the very beginning of the war may be somewhat exaggerated, in the light of what we know about the offensive nature of Soviet soldiers, the characterization appears more correct than the hesitant qualities attributed to them by German analysts. Moreover, the combat accomplishments of the Red Army Air Force alone would merit that judgment.

In the present Soviet era of internal detention but of external détente with the West, one notes that, nevertheless, this history is most critical of Allied wartime policy and operations. The Anglo-American strategic bombing offensive is declared ineffective, the invasion of Europe in 1944 is regarded merely as a response to the Soviet success in the east and not as significant to the defeat of Germany. Throughout the war, it is argued, the Germans maintained the bulk of their forces, including their most experienced air units, on the Russian front, and Allied air superiority was gained in 1943 not through Anglo-American air raids "but by the defeat of its [the Luftwaffe's] best squadrons on the Soviet-German front." (p. 383) In general, Anglo-American military operations and assistance are dismissed as being too little, too late.

Despite tales of heroism and other citations of individual Soviet airmen included in the book, this is an impersonal narrative of aircraft and operations without any discussion of the interplay that must have gone on between air and other leaders and planners as to the direction of Soviet strategy and operations. Neither N. G. Kolesnikov nor N. V. Voronov, the Soviet Air Force representatives on the General Staff, is cited, which is unfortunate as they are generally ignored in S. M. Shtemenko's *The Soviet General Staff at War: 1941–1945*, also. In all, no Arnold, George, or Spaatz emerges. Air Marshal Alexander A. Novikov, who became chief of the Soviet Air Force in April 1942 and held that position throughout the remainder of the war, is mentioned more than any other person except Hitler, but one acquires little appreciation of him either as an individual or as a commander. There is no comment about his removal in 1946 and disappearance from public attention until 1953. Nor is the organizational relationship between the Soviet Army, Navy, and Air Force made clear. Although there are many references to the *Stavka*, its subordinate relationship to the State Defense Committee (GOKO) is not mentioned.

The casual dismissal of Anglo-American assistance as insignificant requires further comment. Admittedly most combat aircraft provided the Soviets through Lend-Lease were not the latest models available, but it was a considerable effort in view of the facts that the United States was engaged in expansion of its own forces and those of the British and that deliveries to the Soviet Union involved difficulties in long-distance transportation. Robert Huhn Jones, in his study of Lend-Lease, tabulates 1663 Allied aircraft delivered to the Soviets by 1 November 1942—which he notes exceeded the number of modern Soviet-built aircraft used at Stalingrad.[2] One of the greatest difficulties in assessing the Lend-Lease contributions to Russia is the lack of information about the Soviet employment of these aircraft. However, German sources have stated that after the spring of 1942 American and British aircraft were particularly noticeable on the Leningrad and Kuban fronts and that, on the latter, Allied aircraft sometimes outnumbered those built by the Soviets.[3] It should also be remembered that as early as 1942, when the war was still undecided, Stalin was offered an Anglo-American bomber force that would operate from the Caucasus beginning in 1943, but for political reasons he rejected the proposal, desiring only the aircraft.[4] The $11 billion of Lend-Lease also provided raw materials, foodstuffs, and technical assistance vital to Soviet sustenance and production.

Neither can the contribution of Anglo-American strategic bombardment be so brusquely condemned. The Soviet analysis emphasizes the tactical nature of the Russian operations, which they claim had won air superiority in 1943 and thus ultimate victory before extensive Western air raids had begun. No one questions that Allied strategic air power was applied belatedly or that targeting mistakes were made.[5] However, the Soviet argument may hinge upon their own lack of a strategic capability and upon their desire to underplay the Allied invasion and subsequent ground operations in Europe by claiming that the outcome had been determined prior to that time. As Asher Lee has stated, the Soviet long-range bomber force was "without a really accurate destructive punch throughout the Second World War. It was typically realistic on the part of the Kremlin defense authorities to use their Soviet air arm primarily as a weapon of tactical air support and air transport."[6] And, too, the Germans had a different outlook. Albert Speer has written of the importance of 12 May 1944 as the day on which "the technological war was decided. Until then we had managed to produce approximately as many weapons as the armed forces needed, . . . But with the attack of nine hundred and thirty-five daylight bombers of the American Eighth Air Force upon several fuel plants in central and eastern

Germany, a new era in the air war began. It meant the end of German armaments production."[7] This would indicate that the critical period of the war came much later than the Soviet history claims. As for the death blow to the Luftwaffe, according to Galland it was struck not in 1943 but in the winter of 1944–45, when Germany exhausted its fighter capability in the Ardennes campaign.[8] Moreover, the Germans, who were subjected to and could assess both Soviet and Western applications of air power, not only regretted their inability to cope with the Anglo-American strategic bombardment but saw their lack of such a capability as a decisive factor in their defeat in Russia.[9]

Frank Futrell, whose knowledge of air power history is second to none, once commented at an Air Force Academy military symposium that despite the spate of surveys of World War II strategic operations an absolute evaluation was not available. He attributed that to the researchers' lack of essential standards and techniques. He further noted that the "evaluators and historians tended to fall back upon the slippery facts of experiential history and to base many of their judgments upon the intensely personal experiences and views of the participants in the conflict. These varied views and experiences have permitted different interpretations."[10] The same is true for other aspects of the air war, as this Soviet history attests. It is unfortunate that not until twenty-eight years after the war has this official Soviet record of the Red Air Force appeared in an English-language edition. Professional military men and other students of air power will want to read it.

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Notes

1. There is a romanticized story about Victor Talakikhin's ramming of a German aircraft, which ends happily, in Alexis Tolstoy *et al.*, *Ram Them! Tales about Daring Soviet Airmen* (Moscow: Foreign Languages Publishing House, 1943), pp. 17–24. In the official Soviet history, which credits him as one of the first to use that tactic, it is recorded that after four more victories the lieutenant was killed in an air battle (p. 59).

2. Robert Huhn Jones, *The Roads to Russia: United States Lend-Lease to the Soviet Union* (Norman: University of Oklahoma Press, 1969), p. 233.

3. Generalleutnant a.D. Walter Schwabedissen, *The Russian Air Force in the Eyes of German Commanders*, USAF Historical Studies No. 175 (Maxwell AFB, AL: USAF Historical Division, RSI, June 1960), pp. 163 and 260.

4. "Notes on Velvet: General Adler's Mission to Moscow, 1942," edited and with introduction by Dr. Maurer Maurer, *Airpower Historian*, IX, 3 (July 1962), 141–50.

5. See Haywood S. Hansell, Jr., *The Air Plan That Defeated Hitler* (Atlanta: Major General Haywood S. Hansell, Jr., 1972) for the best account of what the Combined Bomber Offensive could have been had not diversion and target revision catastrophically altered its impact. Unfortunately this book has been privately published and probably will not receive its merited attention.

6. Asher Lee, *The Soviet Air Force*, revised and enlarged edition (London: Gerald Duckworth & Co., 1961), p. 129.

7. Albert Speer, *Inside the Third Reich* (New York: Avon Books, 1971), p. 445.

8. Adolf Galland, *The First and the Last*, translated by Mervyn Savill (New York: Ballantine Books, 1957), p. 242.

9. Richard Suchenwirth, *Historical Turning Points in the German Air Force War Effort*, pp. 76–90, and Generalleutnant Hermann Plocher, *The German Air Force Versus Russia, 1941*, p. 252. These are respectively USAF Historical Studies no. 189, June 1959, and no. 153, July 1965 (Maxwell AFB, AL: USAF Historical Division, RSI).

10. Robert F. Futrell, "Commentary," pp. 284–85, in *Command and Commanders in Modern Warfare*, the Proceedings of the Second Military History Symposium, USAF Academy, 1968, edited by William Geffen, Lt. Col., USAF, 2d edition, enlarged (Washington: Office of Air Force History, Hq USAF, 1971).

NATIONAL SECURITY AND AMERICAN SOCIETY

Colonel George Holt, Jr.

IN THE "good old days," civilians involved in national defense were limited primarily to the feeding, clothing, and arming of the troops. The heady stuff like grand strategy and the actual employment of troops in the field was left to the generals. Today the situation is different. Never before have so many nonmilitary people involved themselves in matters affecting national security.

The geometric increase in the destructive power of modern weapons seems to have created and sustained an atmosphere of anxiety within the United States. Quiescent for the most part but surfacing occasionally, as it did during the Cuban missile crisis, this atmosphere appears to be the driving force compelling people to action. Thus the instinct for self-preservation, once limited to the soldier in battle, now pervades the fibre of American society, and we see concern being expressed by scientists, scholars, statesmen, and Sunday school teachers alike.

From the mid-1950s on, we have seen pour forth a multitude of suggestions that attempt to resolve the dilemma of how to use force to further national security objectives without wiping out mankind in the process. Many eminent writers and perhaps a greater number of pseudostrategists have attempted to simplify and quantify the profound and unquantifiable. We have witnessed slogans such as "massive retaliation," "minimal deterrence," "credible deterrence," "mega-deaths," and "crisis instability" being coined, growing popular, being worn out, and then being discarded like so many empty cans along the roadside. More recently computer analysts, fascinated by the revelations emanating from their machines, have become self-proclaimed prophets on how to save the world. They back up their neatly packaged strategies with reams and reams of computer printouts that, if anyone takes the trouble to read, prove beyond a doubt that two times two does in fact equal four. They revel in the discovery of the most efficient methods for maximizing deaths in the sterilized war games played on their computers.

Classical strategists like Clausewitz offer theorems and absolutes that are still valid regardless of technological advances in weaponry. One may be convinced that, barring an irrational leader, another general war is highly unlikely. However, if general war does occur, the firebreak may depend no longer on the use or nonuse of nuclear weapons but on the attack or nonattack of civilian population centers. Extremely low-yield nuclear weapons can now fill the gap in the continuum of destructive force from conventional to maximum nuclear. Mutual restraint against type of targets, rather than restraint on the intensity of the conflict, may be the governing criterion in the future.

There is a new trend under way in the United States to extend and improve academic education and scholarly research in the national security field. College and university faculty members are taking an active interest in the teaching of national security, defense policy, civil-military relations, defense economics, and related areas. Prominent among the projects devoted toward this end is the National Security Studies Series under the general editorship of Professor Frank N. Trager of

New York University. The first publication in the series attempts a broad overview of the major components of the national security system.† Over 300 books and articles were reviewed, and 45 were selected to appear in this work. From Clausewitz to James R. Schlesinger, from grand strategy to broad social issues, the work offers a valuable insight to the intellectual controversies and central issues surrounding national security.

The first few essays in the book attempt to provide a means for approaching the study of national security. They provide models, frameworks, and definitions for the field. For example, the nature and use of military power may be studied by examining the factors that influence military potential, the decisions to mobilize and use military strength, and the causes of international conflict. A conception of national security is proposed by Trager and Frank L. Simonie in their "Introduction to the Study of National Security": "National security is that part of government policy-making having as its objective the creation of national and international political conditions favorable to the protection or extension of vital national values against existing and potential adversaries." They go on to observe: "The United States government's failure to retain popular support for the Vietnam War is traceable, in part at least, to its inability to demonstrate to many people a direct relationship between the war and vital national values."

Trager and Simonie continue:

> Many of the best scholarly works in the national security field have been concerned with the nature and purposes of military power. Unfortunately, this phase of the national security process is still surrounded by emotional controversies that tend to obscure the fundamental realities of national security in the twentieth century. . . . National security is concerned first and foremost with values and with the political conditions in which those values can flourish. Because of its potentially destructive consequences, military power is used only when failure to do so would result in an intolerable sacrifice of some vital national value. The obvious criterion is the relative weight of endangered values and risks involved in deciding for war. This is the most critical decision any policy-maker in the national security system of any country will ever have to make.

The authors also note that peace can always be attained by a country's refusing to defend its vital national values but that the political consequences could be more adverse than the averted condition would have been. "That there would be political differences is indisputable. In short, military power is a tool, a tool most countries would prefer not to use. But in the world of practical affairs, the tool will be used whenever the projected losses are judged to be greater than the risks of the war itself." The emphasis in the past has been on the means of national security rather than the ends. Issues have been centered on weapon systems and their employment instead of the end purposes of national security.

In the selection entitled, "Power, Glory and Idea," Raymond Aron discusses values, interests, and objectives in national security and highlights the most important of all objectives that any country seeks. Referring to Hobbes, he says that ". . . each political unit aspires to survive. Leaders and led are interested in and eager to maintain the collectivity they constitute together by virtue of history, race, or fortune." He also notes that, historically, "societies have

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† Frank N. Trager and Philip S. Kronenberg, editors, *National Security and American Society: Theory, Process, and Policy* (Lawrence: University Press of Kansas, 1973, $8.95 paperback), 612 pages.

fought amongst themselves for three primary reasons: space, men, and souls. Why should societies fight if not to extend the territory they cultivate and whose wealth they exploit, to conquer men who are alien today, slaves or fellow citizens tomorrow, or to insure the triumph of a certain idea, whether religious or social, whose universal truth the collectivity proclaims simultaneously with its mission?"

The potential to wage war is a necessary instrument in a state's struggle for power, and technological advances only serve to increase the utility of this instrument. According to Quincy Wright, in the selection "Causes of War," this struggle for power is the driving force behind most wars, and the people are encouraged to support the state through ideological and symbolic interpretation of the war.

In his article Gerhard Ritter writes: "A law of national policy of radical pacifism could be maintained only at the risk of self-destruction; and survival is the basic instinct of all living things and of states as well." But he does note that there are limits which should not be transgressed, else we risk the dehumanizing of the combatant.

This is only a small sampling of the many articles appearing in this 612-page work. The majority of the articles were written by professors, primarily in the political science field, but there are also some military authors; French, German, and Russian authors; and articles from the RAND Corporation and the *New York Times*, just to cite a few of the authors and sources.

Readability of the book varies from excellent to poor, depending on particular author and translations. As an example of good readability and low abstraction: ". . . a returned prisoner of war, Major James Rowe, declared that American POW's largely ignored Hanoi's propaganda until late 1967, when Hanoi began citing U.S. Senators by name. 'The peace demonstrators and the disheartening words of these senators made our life more difficult,' said Major Rowe."—(Morton A. Kaplan, "Loyalty and Dissent") Now try wading through this: "Programming likely attains the maximum degree of parabureaucratic characteristics that is possible, given the nature of the interorganization. Routinized decisions, instrumental rationality oriented very explicitly toward stated goals, and a mechanistic structural pattern are to be expected. This routinization of decision-making and the mechanistic structural characteristics also imply high congruency between organizational domain and the supradomain of the interorganization."—(Philip S. Kronenberg, "Interorganizational Politics and National Security")

From the foregoing the work could be criticized in some respects as an attempt by some professors to impress other professors. However, it has high research value, and I recommend it to those who have an interest in national security strategy and policy-making and in the social and economic processes affecting decisions in these areas. The work has a slight liberal bias, which is to be expected, considering its origin. On the whole, it is a refreshing compilation and well worth reading.

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AWARD

The Air University Review Awards Committee has selected "Simulation—The New Approach" by Major General Oliver W. Lewis, USAF, as the outstanding article in the March–April 1974 issue of the *Review*.

ATTENTION

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