



AIR UNIVERSITY **review**

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the cover

The need to bring U.S. military strategy into accord with the new domestic and international environment of essential equivalence between the force postures of the U.S. and the U.S.S.R. has led to numerous studies, including this present report by Colonel Robert H. Reed and members of the USAF Six Man Group. It highlights this issue of the *Review*, and the cover suggests the degrees of intensity in the spectrum of possible conventional or nuclear confrontation—possibilities that recede with détente but that must nevertheless drive U.S. deterrence policy.

ON DETERRENCE

a broadened perspective

COLONEL ROBERT H. REED





... the maintenance of deterrence has become a far more subtle and complex task than in the past and will require continuing in-depth study, thought, and analysis by the military.

THOSE today who are responsible for military planning and strategy must deal with an increasingly complex world, one in which political, economic, and military power is far more diffused than in the Cold War period. In retrospect, the relative simplicity of the black-white world of the Cold War era stands in sharp contrast to that of today. Not only was it a simpler world for the planner and strategist but it was a time when strategy captured the imagination of much of the civilian academic world, resulting in a great outpouring of strategic thought and literature. More recently, however, strategic thought seems to have stagnated, the older strategists moving on to other interests and the younger generation apparently preoccupied with totally different problems. Within the military, concern with strategy and new strategic concepts has also languished, first out of preoccupation with the Vietnam war and more recently with the need to adjust military force levels and programs to fit the realities of budget constraints. In addition, there is the natural tendency to cling to past solutions and concepts.

The fashioning of military strategy today is a far more difficult and challenging task, given the impact of changes that have occurred in the domestic and international environments. The most significant of these is the change in U.S. force posture, relative to the Soviet Union, from one of superiority to one that is essentially equivalent. Strategy needs to be brought abreast of these changes. It is the principal purpose of this study to focus on this need, to

highlight the spectrum of significant threats and postulate major features of a deterrent strategy for countering them. Finally, certain broad principles of deterrence are postulated as a background so that future planning can develop the kinds of essential capabilities needed for an effective deterrent posture across the spectrum of potential conflicts.

Spectrum Deterrence and Supporting Strategies

For the foreseeable future in the international arena, U.S. national policy will continue to be pursued effectively, largely to the extent it can be supported by military power.

Basic national security policy for rendering that support will continue to be the deterrence of armed conflict. The focus of this policy will be on the Soviet Union and its allies as the primary threat to the security of the United States and its allies. At the minimum, then, the military power of the United States and its allies must balance that of the Soviet Union and its allies and have sufficient reserve and flexibility to deal with Nth country threats. Deterrence will remain as the fundamental objective and basic strategy of U.S. military forces. Given the increased domestic demands on tax resources, priority in defense spending must be on those military forces and programs designed for deterrence of the primary threat. Furthermore, to insure maintenance of a military balance, U.S. efforts must increasingly be aimed at sharing responsibility for deterrence below the nuclear threshold through pro-

grams that recognize, complement, and reinforce capabilities of U.S. allies. In short, with respect to its military force posture, the United States has entered an era of bipolar military balance, a balance that includes allied capabilities. Whether this U.S./Allied balance can be translated into an effective combined instrument of deterrence against armed conflict or coercion by the Soviet Union and its allies rests in large measure upon devising military strategies relevant to deterrence across the spectrum of significant threats ranging from general nuclear war to localized conflict.

In an era of nuclear parity, deterrence cannot be founded solely upon a mutual assured-destruction capability. While this capability is an absolute prerequisite to a deterrent posture, alone it offers only two untenable options: nuclear holocaust or capitulation. To the extent that all-out nuclear war is made incredible, the threat of conflict tends to move down the spectrum, giving rise to the need for countervailing deterrent capabilities and strategies at lower levels of conflict. Moreover, the unpredictability in an uncertain world where nuclear weapons do exist makes a spectrum of deterrent capabilities and options an essential prerequisite to the pursuit of U.S. policy.

It is a relatively simple task for the strategist to define and describe the inherent military capabilities available to the United States and its allies. Similarly, given the quality of today's intelligence information, he can make reasonably accurate assessments of a potential enemy's inherent capabilities. The actual capabilities that can be derived from the inherent capabilities of these forces depend upon a combination of factors, one of the most important being the strategy and concepts governing their use.

Just as nuclear parity and the bipolar

military balance made a broadened concept of deterrence imperative, it is likewise imperative that supporting military strategies and concepts be developed if inherent military capabilities are to provide the actual capabilities necessary for a spectrum of deterrence. Additionally, under the conditions of parity and balance, it is essential that military strategy be brought into a much closer relationship with policies and strategies for use of all other elements of national power. For the foreseeable future, there will not be a surplus of military power, and diplomacy and economics will play an increasingly important role in the deterrence process. Definitive development of the necessary strategies and concepts to support spectrum deterrence will require much study, thought, and analysis. A look at the range of significant threats, however, suggests major features of military strategy for coping with this spectrum.

strategic nuclear deterrence and supporting strategy

The basic national security objective is to preserve the United States as a free nation. Because the threat of an all-out nuclear attack places the survival of the United States at risk, it is the highest priority for deterrence. An effective force to deter strategic nuclear attack is not only absolutely essential to the preservation of the United States, it is also a prerequisite capability in deterring conflicts at lower levels. An assured second-strike capability is at the heart of such a posture. It will remain the most clearly defined and easily understood requirement of deterrence. Alone, however, it is inadequate in meeting future nuclear deterrent needs of the United States.

The existence of U.S. and U.S.S.R.

assured second-strike capabilities has made an all-out strike the least likely form of nuclear conflict. Such capabilities also provide strong incentives for both sides to avoid the use or threat of use of nuclear weapons. Even so, the U.S. strategic nuclear deterrent posture and strategy cannot be oriented solely on the assured destruction role. Strategic nuclear warfare could result from miscalculation, deliberate escalation, or evolution from some lower category of conflict and be limited in scope and intensity. In light of this, there is a need for options, concepts, and supporting strategies that do not lead to either extreme of high-intensity general nuclear war or capitulation. In short, given the extent of the threat posed by current Soviet nuclear capabilities and improvement efforts and Nth country proliferation, a more objective-oriented nuclear deterrent strategy is called for. Some of the more important features of this strategy may be described as follows:

- First of all, the all-out attack option is, of course, central to deterrence. Under an objective-oriented strategy, however, this option would be designed to place at risk those elements of an enemy's political, economic, and military structure essential to his ability to function as a postwar power. With respect to the Soviet Union, placing its power base at risk would very likely have greater deterrent value than placing some given level of population and industry at risk. That is, shifting the focus of general nuclear war strategy to affect the Soviet postwar power status could help mitigate any apparent advantages the Soviet Union might have or perceive itself to have in terms of its population densities, civil defense measures, and geography.

- Second, strategy for executing the general nuclear war option should

not be so rigid as to rule out opportunities for negotiation and bargaining at the general nuclear war level. Hence, the flexibility to destroy critical economic, military, or political structures selectively is fundamental to a more objective-oriented strategy. Should the enemy take a gradual or piecemeal approach to general nuclear war, our responding selectively could provide a means to deny him any advantage he might seek below the all-out level and concurrently create conditions for negotiation and bargaining for conflict termination. At the same time, this approach would be contributing to the objectives of the all-out attack option should it subsequently be deemed necessary to invoke it. Admittedly, ambiguity and uncertainty as to enemy intentions would abound in such an approach to general nuclear war. The important point is, however, that strategic thought, planning, and strategy be sufficiently flexible in the face of these ambiguities and uncertainties to exploit any opportunity to seek the best possible outcome for the United States.

- A third feature of an objective-oriented nuclear deterrent strategy would be to deal with the situation wherein the Soviet Union possesses forces, in addition to those adequate to sustain an assured destruction capability, that are also sufficient to mount nuclear attacks concurrently against other objectives. In this situation, the prospects for limited nuclear provocations, coercion, and strategic confrontation give rise to the need for countervailing U.S. force options and supporting strategies. Strategy, here, would be formed around highly discrete, limited nuclear options designed to deny the enemy limited objectives, to counter coercion, and to deter further escalation and intensification of nuclear conflict. To better sup-

port achievement of specific political objectives in this scenario, strategies must be especially sensitive to the need to minimize collateral damage and control escalation. To realize maximum deterrent value from this subset of the overall objective-oriented deterrent strategy, the capability to reach out and put at risk any target, any place in the world, at any specific time is needed. Moreover, the flexibility to employ the option of non-nuclear precision weapons in the face of a severe provocation or attempted coercion through threats to use nuclear weapons should be maintained. This kind of option could provide a means to demonstrate the political will, skill, and military capability that would be brought to bear at the nuclear level should the enemy attempt to follow through on a specific threat or provocation. In short, in a competition of wills, it could be the *time qua non* for avoiding nuclear war.

• A fourth aspect of strategic nuclear deterrence that will be of increasing concern is Nth country nuclear threats, the most significant being the People's Republic of China. As these threats proliferate, the U.S. nuclear deterrent posture will need to have sufficient capability and flexibility to deal with them while remaining predominantly oriented to the primary threat. In the event of nuclear war, a residual capability during the initial, trans-attack, and post-attack phases will be an important requirement in relation not only to the engaged enemy but also to Nth country forces. Thus, strategic reserves, withholds, and the ability to recover and reconstitute forces will become increasingly important in maintaining a future strategic nuclear deterrent posture.

THE QUEST for viable arms control measures inherent in contempo-

rary foreign policy will likely be an enduring feature of future U.S. relations with the Soviet Union. Arms control efforts will continue to impact on strategic policy and planning, particularly in terms of research, development, and weapon system procurement initiatives. These initiatives will increasingly be judged in relation not only to their qualitative merits but also to their bargaining value in securing meaningful arms control agreements. There is, however, a broader, more fundamental issue inherent in the attempts to stabilize the nuclear deterrent posture of the United States and the Soviet Union.

The central issue concerns whether or not a U.S. nuclear force posture sufficient for the tasks outlined in the foregoing discussion on strategy but numerically inferior to the Soviet Union is adequate to serve the international needs and responsibilities of the United States. It could be argued that forces excess to these tasks represent unneeded "surplus security." This argument obscures the very real possibility that the Soviet Union could perceive political advantage accruing from its superior nuclear posture and attempt to exploit it in diplomatic dealings with nations other than the United States. Moreover, these nations might believe that such a nuclear posture does give the Soviet Union an advantage and thus be more amenable to Soviet political influence. Over the long term, this could prove to be very destabilizing. For the foreseeable future, then, the United States must prudently maintain two hedges against false détente: (1) strategic nuclear forces with the breadth and depth of capabilities that clearly foreclose any apparent political advantage in the Soviet nuclear posture; and (2) a stable of research and development (R&D) strategic options.

theater, regional, and local deterrence and supporting strategy

In the foregoing overview of strategic nuclear deterrence and supporting strategy, the basic thrust was to emphasize the need for a range of strategic nuclear capabilities that might better deter the use or threat of use of strategic nuclear weapons against the United States, its forward deployed forces, and its allies. While these capabilities are absolutely essential for the security of the United States, they are also the ultimate source of U.S. ability to pursue a range of national security objectives at the theater, regional, and local levels. That is, there is an implicit linkage between the U.S. strategic nuclear deterrent and those capabilities for deterring and defending against theater and subtheater threats. It serves more as a "shield" against the use or threatened use of strategic nuclear weapons than as an operative deterrent at the local level. At theater and regional levels, the advent of mutual nuclear vulnerabilities has given rise to the need for much greater reliance on conventional military capabilities as the operative deterrent against threats. These capabilities are necessary in order to maintain the nuclear threshold at the highest possible level while at the same time protecting those security interests where it is neither desirable nor credible to resort to a nuclear conflict. Furthermore, the capability to conduct military operations across the spectrum of possible conflict, particularly where nuclear-capable powers are involved, is fundamental to the concept of escalation control. Hence, the successful pursuit of U.S. national security objectives at the theater, regional, and local levels will depend more and more upon building and maintaining, in concert with allies, a spectrum

of conventional deterrent capabilities. From these, appropriate response options can be fashioned that do not necessarily rely on early resort to the use or threatened use of nuclear weapons.

Failure to provide for high-confidence theater and subtheater conventional capabilities could invite nuclear blackmail, coercion, and piecemeal aggression out of fear of the consequences of a nuclear response. On the other hand, the maintenance of a strong initial conventional defense posture against theater, regional, and local threats is a key index of the will and confidence of the United States and its allies to protect their vital interests in these areas.

In comparison with the U.S. strategic nuclear deterrent, the form and scope of a U.S. deterrent posture below the strategic nuclear level is less well understood and defined in the public's mind. This lack of understanding suggests the need for better articulation of the role of credible conventional forces as an essential element in the strategy of deterrence. That is, if U.S. national security interests and those of its allies are to be protected without resort to nuclear conflict, a spectrum of credible conventional capabilities for theater and subtheater use will be required.

Theater defense. Deterrence of conflict at the theater level is perhaps the most complicated and demanding of the various deterrent tasks facing the United States. For the foreseeable future, Western Europe will remain the theater of most direct and important concern to the United States. The threat confronting the North Atlantic Alliance is real and formidable, both conventionally and in nuclear terms; but the threat is by no means beyond the capability of the Alliance to continue to deter or defend against successfully if necessary. Also for

the foreseeable future, the strength of the NATO Alliance is the only rational basis on which the nations of Western Europe can continue to provide for their individual security and sovereignty. To persevere in this collective task in the face of growing economic constraints will necessitate increased military interdependency, cooperation, and national will among all member countries. Strong leadership will continue to be required, to balance and harmonize the interests of the Alliance as a whole. This leadership is fundamental to NATO effectiveness and must of necessity continue to be provided in large part by the United States.

Deterrence of conflict against Western Europe has been successful as a NATO objective due in the main to the credibility of NATO-committed and appropriately linked forces and the willingness of member nations to persist in this common defense effort. It is this shared perception of the need for a common defense effort that has given NATO its sound core. This core is reflected in the form of a credible integrated military command structure and in the in-being, coordinated, combat-ready forces of the various member nations. Fundamental to the continued soundness of this core are the respective commitments of member nations to a high-confidence conventional deterrent posture. As noted earlier, the advent of nuclear parity makes a conventional deterrent and defense in Europe much more important. This is not to suggest that the nuclear deterrent has lost utility. Rather, a capability to mount and sustain a strong initial conventional defense in NATO is an indispensable approach to controlling and limiting escalation. Not only is a conventional defense a more desirable precursor to any subsequent use of nuclear weapons; it also places the Alliance in a far more

tenable and confident position to consult, negotiate, and bargain at the lowest possible level of conflict.

NATO's deterrent strategy is well developed and not at issue. The basic security issue affecting the Alliance concerns primarily the means of deterrence. Specifically, can NATO achieve a high-confidence conventional deterrent without incurring additional costs? This question has already been much studied and debated. The purpose here is not to recapitulate the data except to note the clear indication that a highly credible conventional deterrent posture is within NATO's grasp at little additional cost. Achieving this will involve some very hard choices aimed at optimizing the defense capabilities of individual member nations to better fit Alliance strategy. For example, rather than most of the member nations maintaining an array of limited capabilities, the objective would be to have individual members optimize whatever they could do best. Admittedly, individual national interests and political separateness will tend to constrain this approach, and persistent, dedicated leadership will be required to harmonize these interests with the higher security interests of the Alliance as a whole. In this regard, the Alliance core—the Council, Military Committee, and NATO commanders and staffs—must continue to play a crucial leadership role in advancing toward this goal. Through their efforts, there can emerge practical proposals to use available resources better for conventional defense, to correct command and control deficiencies, and to show the additional steps necessary to achieve a high-confidence conventional deterrent posture.

To generate and sustain momentum toward the goal of a credible conventional defense, NATO needs a more realistic assessment of Warsaw Pact capabilities

and deficiencies. Such an assessment could help dispel certain ingrained perceptions of inevitable Warsaw Pact superiority in mounting and sustaining a conventional attack against NATO. If unchecked, these perceptions can, over the long term, undermine NATO's vitality.

For the foreseeable future, a strong U.S. presence in NATO will be required in the form of forward deployed forces. Future U.S. decisions may, however, reduce the size of its in-theater forces. Should these decisions be made, a close linkage and interface between CONUS-based forces and the NATO command structure would be a vital requirement. Establishing command arrangements that would link U.S.-based rapid reaction and central readiness forces to NATO would be advantageous in mitigating any adverse implications of a decision to redeploy certain U.S. forces from Europe. Moreover, should mutual and balanced force reduction (MBFR) bear fruit, NATO linkage to quick-reacting and sustaining follow-on forces in the United States would help offset Warsaw Pact reinforcement advantages. In this regard, the rapid responsiveness and mobility inherent in air power are key assets that can be exploited to help insure preservation of a high-confidence NATO conventional deterrent posture.

In the matter of theater deterrence and strategy relative to the Pacific, some important distinctions between that theater and Europe deserve comment. The Pacific is not a coherent theater in the same sense as Western Europe. Overt threats to U.S. security interests in the Pacific have been primarily along the Asian rimland, most notably Korea and Southeast Asia. Given the geography of the Pacific, our level of national interest in the area, the Sino-Soviet split, and the capability of Asian allies to deal with local

threats, the need for U.S. general purpose deterrent forces in Pacific forward deployments is considerably more limited than for Western Europe. Provided that South Vietnam and South Korea can maintain a domestically viable governmental framework, a reduced U.S. military presence in the Far East should be an acceptable risk, at least in the short run. The potential danger to be guarded against is that a reduced U.S. military presence might be interpreted as a reduced U.S. commitment to the security of non-Communist Asian countries. To offset this possibility, U.S. aid—specifically, tailored military support—will continue to be required, to allow U.S. allies to realize their full military potential. Not only will such action increase their own military capabilities; it will also enhance deterrence through increasing interdependence with the U.S. In sum, placing greater reliance upon allied military capabilities can compensate for a smaller U.S. force posture, provided there are appropriate security assistance and credible U.S. reinforcing and counterintervention capabilities. In the future outlook, these tasks will probably fall most heavily upon air support forces that can provide the degree of responsiveness and technological advantages not normally within the ability of most indigenous forces.

Regional defense. It is essential that sufficient and appropriate military capability be provided for regional stability and deterrence where U.S. interests are at stake. In the absence of such a capability, the United States would be subject to coercion. The proper objective for the U.S. in a strategy of regional deterrence is to encourage and assist its allies to provide for their own national security. If credibility of means is to be established, concerned nations will have to invest adequately in their own defense

and generally rely on U.S. support only in the event a major power threatens intervention that places vital U.S. interests in jeopardy. U.S. military support in peacetime can be provided most appropriately through active security assistance programs with emphasis on foreign military sales. These efforts should be designed wherever possible to provide the affected country with relatively inexpensive and unsophisticated military capabilities suited for the most likely defensive problem. Not only would increased military capability gained by the host country through such efforts enhance deterrence but their increasing interdependency with the U.S. through military supply and support channels could also increase the deterrent effect.

The credibility of U.S. national and political will and the ability to display intent could be crucial in the deterrence or containment of regional conflict. These active security assistance programs are a positive although indirect indication of commitment. When a more direct manifestation of U.S. intent to protect its security interest is required, forward deployed conventional forces are appropriate. Such an open display of military capabilities could reduce the initiation of regional conflict by conveying certainty of U.S. intent to honor its commitments, and the same forces could play a key role in countering aggression and deterring escalation should conflict erupt. For such forward deployed or "presence" forces to deter aggression effectively, they must possess a sufficiently credible military capability.

Another ingredient in the establishment of credible military means for regional deterrence is the maintenance of combat-ready, rapidly deployable, centralized reserve forces in the U.S. to fulfill the "high" portion of the force

mix. Responsive strategic mobility is essential for the expeditious deployment of these forces to potential problem areas and for the establishment of credibility of U.S. means and will to honor its regional commitments and security interests.

Insurgency. Insurgency is the lowest level of conflict in the spectrum of war, but, even so, deterrence of insurgencies can be vitally important to U.S. interests. If insurgency is not deterred or contained, it may lead to regional conflict and direct U.S. involvement. The early phase of the Vietnam war is a prime example of this. In addition, insurgency can lead to an eventual takeover of business interests, which can destabilize the economic picture in a particular region and have adverse impacts on the U.S. internal economy. Insurgency can also threaten the overall U.S. defense strategy if it occurs in an area involved in our first line of defense.

As a first step, insurgency operations are usually designed to achieve political goals through psychological means. Failing this, military forces are employed in unconventional ways. For these reasons, deterrence of insurgency is a most difficult task for conventional military forces. A more appropriate counter is the effective use of political and economic measures by the host government to satisfy grievances upon which the insurgency is often based.

When and where U.S. national security interests are threatened, diplomatic, political, psychological, economic, and military aid assistance should be offered to reduce the effectiveness of the insurgent movement. Economic and military interdependence through strong security assistance programs can have a positive deterrent effect through the improvement of allied economic and military

strength. These programs not only provide a credible means for allies to suppress insurgency but, by increasing U.S. involvement through resupply and training commitments to the host country, can have a corollary deterrent effect.

In summary, the maintenance of international stability will be a key concept in guiding U.S. strategy at the regional and local level. Military aid and sales, closely linked to a responsive U.S. logistic support base, will be the principal means for supporting this strategy. The primary U.S. military role will be less active and aimed at deterring major-power intervention where such intervention adversely impacts on important U.S. national security interests. All of which suggests that future strategy will come to be governed by a broad set of principles of deterrence.

Principles of Deterrence

The maturation of deterrence has established a foundation from which it should be possible to seek out and identify certain fundamental tenets underlying a strategy of deterrence. For example, experience in Korea, Berlin, Lebanon, Hungary, Czechoslovakia, Southeast Asia, Middle East, and Cuba has greatly increased understanding of the dynamics of national power as an instrument of deterrence. In light of this experience and the avoidance of nuclear war, there is a sound basis for articulating a general set of principles to guide a successful strategy of deterrence. To explore a possible set of principles applicable to deterrence is the purpose here.

An appropriate departure in the development of a set of governing principles is a statement of the hierarchy of objectives underlying a strategy of deterrence. The uppermost objective is to

deter conflict altogether while pursuing a range of national interests; or failing that, to deter escalation while denying the enemy the objective he seeks; or, if necessary, to control and limit escalation at the lowest possible level of conflict. It is toward these objectives that principles of deterrence should be directed.

In a discussion of specific principles of deterrence, the relationship between traditional principles of war and the concept of deterrence deserves comment. Principles of war are still valid in a tactical sense at any level of conflict to the degree that, as a result of their application, the objectives of deterrence are not compromised. In short, the unconstrained application of the principles of war at a given level of conflict involving nuclear-capable powers could undermine deterrence of higher levels of conflict. Hence, the pursuit of deterrence requires identification of and adherence to a higher set of broad principles uniquely suited to a strategy that is aimed, in the first instance, at promoting the security of the United States and its allies by deterring war across the spectrum of conflict, and in the second instance at deterring, controlling, or limiting escalation should conflict occur.

In proposing a given list of principles applicable to deterrence, we recognize that this effort will be tentative at best. Valid principles must be derived from a wide range of collective knowledge representing the experiences, perceptions, studies, analyses, and evaluations of a number of individuals. Moreover, principles of deterrence will change over time and continue to evolve in response to changing military environments, concepts, and technology. This evolution must be a continuing process so that valid basic principles of deterrence can continue to be identified and brought to

bear in the process. In light of this, it would appear to be an appropriate and worthwhile endeavor for the Air Force to develop and promulgate principles of deterrence for incorporation in future statements of its basic doctrine (i.e., Air Force Manual 1-1, *United States Air Force Basic Doctrine*). Should that effort be undertaken, the principles discussed here may be of use.

credibility of means

The foremost principle of deterrence is that the various elements of national power dedicated to the deterrent task be credible. Of these various elements, the credibility of military means is of paramount importance because the objectives of a strategy of deterrence are achievable only to the extent that they are supported by military power. Moreover, other instruments of national power that are brought to bear in the deterrence process are effective largely to the degree that they are supported and reinforced by military means. Military means must be broadly capable and encompass a range of deterrent options appropriate to the spectrum of possible conflict. A capability to deter general nuclear war is a fundamental requirement. But nuclear means alone may lack utility as an operative deterrent to certain other forms of warfare adversely impacting on U.S. objectives. To be credible, then, there must be a variety of means, particularly military means, appropriate to the spectrum of U.S. national security interest and objectives. Otherwise the United States could be faced with the hard choice of sacrificing certain interests and objectives or escalating the crisis to a level where it has credible means. When viewed in this light, credibility of means across the spectrum of conflict is an important prereq-

uisite for promoting stability in the deterrent equation. The maintenance of a stable deterrence is a complex and dynamic task in a nuclear world. It requires that credibility of means be continually assessed against technological advances of potential adversaries so that timely stabilizing adjustments can be made.

credibility of will

National power is the product of force and will. In a strategy of deterrence the willingness to use national power must be perceived as credible by an adversary. Credibility of will is established in the main through persistent use of appropriate instruments of national power to further national security. In this regard, the will of the United States has been clearly demonstrated over a considerable period of time by its actions in support and defense of its security interests and its allies.

A key aspect of national will is the strength of political will to make the critical decisions when important national interests are at stake. In a crisis affecting national security, political will is the operative subset of national will, and much depends upon the assessments and perceptions of national command authorities as to what needs to be done. To persevere, however, political will requires the backing of a strong national will. It is essential to a strategy of deterrence in the nuclear age that credibility of will continue to be sustained over time. It is important that the variety of opinions, fissures, and cleavages inherent in and essential to the vitality of an open democratic society not be misconstrued by a potential adversary as the operative index for judging credibility of will. The more important index of credibility of will is the degree of support a nation provides to its military means.

clarity of intent

Under conditions of nuclear parity, clarity of intent is a key aspect of a successful deterrent strategy. The most important facet of intent is perception. For deterrence to be successful, opponents must perceive the level of each other's national interest in a given situation and accurately assess their credibility of means and will. In a situation adversely impacting on U.S. national security, the message transmitting U.S. national resolve should be unmistakably clear; and actions reinforcing stated resolve should be obvious and clearly support stated intent. Only in this manner can a nation be assured that an adversary will correctly perceive its level of interest and interpret its probable actions. It is important for the U.S. to understand the Soviet psychological and ideological framework of interpretation, as the penalty for misreading a major political, economic, or military action could be severe.

Certainty of intent plays a key role across the spectrum of war. Its importance increases as the actual or threatened level of conflict rises. It is paramount that intent be clearly evident as the nuclear threshold is crossed. The reason for and actions pursuant to a given escalatory step should provide evidence of an intent not to let a situation expand uncontrollably. The options open to protagonists at any level of conflict should be visible to all concerned. Deception normally is an operative concept only in a tactical sense in the conduct of war.

controllability

All elements of national power contributing to deterrence must be controllable by

appropriate national command authority across the full spectrum of conflict. A successful deterrence strategy depends upon the orchestrated use of the proper weight and mix of various elements of national power to achieve national security interests.

Military forces require the highest degree of controllability because of their destructive potential and the attendant risk of rapid escalation. During crisis situations, controllable military forces may be the only adequate means of signaling true national interest and intent to allies and adversaries alike. Should deterrence fail at a given level, the ability to deter unwanted escalation or to influence the outcome would depend heavily upon the controlled use of military force. At the same time, should it be in the national interest to escalate a conflict to achieve an important security objective, precise control of military forces would be essential. In the consideration of nuclear parity and nuclear proliferation, escalation control becomes a key principle in a strategy of deterrence.

Whereas controllability of military forces is fundamental to deterrence of conflict at all levels, it is vital during operations involving limited employment of nuclear weapons. To be usable during crisis situations requiring limited nuclear options, forces need to be completely controllable from conception of the idea and the making of the decision until weapon impact on the designated target and receipt of damage assessment.

flexibility

The capability of the various elements of national power to contribute to the achievement of vital security interests depends largely on their flexibility. In particular, flexible military forces can

provide a degree of insurance against the risks and uncertainty associated with accelerating technology that could adversely affect the nuclear balance. For a strategy of deterrence to be successful in such an environment, it must be served by a host of flexible capabilities and options involving all instruments of national power.

The probability of a declining defense purchasing power in the foreseeable future and the increasing cost of technology portend fewer military forces. Therefore, the need for broad applicability of a given force posture is increasing. Moreover, a modern strategy of deterrence demands that military forces possess sufficient inherent flexibility to counter unforeseen capabilities or technological breakthroughs by an adversary. Finally, military forces must possess the adaptability to be employed passively in a static deterrent role, actively either in crisis-management or war-prevention situations involving allies, and finally in a war-fighting role as the ultimate instrument of national power.

negotiation

The importance of negotiation as a means of preventing or settling armed conflict has been well established, and under conditions of nuclear parity, negotiation increases in significance. Historically, the results of armed conflict have often been moderated by negotiations between adversaries, either during armed confrontation or immediately thereafter. Vital national security interests can no longer be achieved with assurance through armed conflict, either among superpowers or through their surrogates, without the risk of escalation across the spectrum leading to nuclear war. Should bargaining fail in a given

instance and armed conflict result, negotiation becomes even more critical, to offset the possibility of escalation to all-out nuclear proportions.

For a deterrence strategy to succeed, bargaining efforts and the application of the various elements of national power, especially the threat or use of military forces, must be finely orchestrated in a unified effort to achieve a given national security goal. Armed conflict at a given level should be planned and conducted to support negotiating efforts toward a solution while further escalation is being deterred. In the absence of a coordinated effort in support of negotiations by all appropriate elements of national power, substantial diseconomies in financial and human terms are probable; and, more important, vital national security interests may be needlessly placed at risk.

unity of effort

Coordinated planning and application of the various elements of national power toward achievement of a common security objective are essential in a strategy of deterrence. Failing such an objective-oriented approach, inefficiencies are probable, and the possibility of failure increases. In a like manner, U.S. and Allied combined efforts toward common security objectives should be closely coordinated to insure maximum effectiveness. It is essential that sufficient military strength be available to undergird the use of other instruments of national power. However, the military element should be subjugated to and closely coordinated with other elements so that objectives can be achieved at the lowest possible social, political, and economic costs.

From a military perspective, two of the most important purposes to be served

through unity of effort relate to economy and intent. First, military capabilities of the various services must be planned and acquired to achieve the necessary deterrent posture without regard to current service roles and mission assignments. If this leads to one service's dominating the overall force posture because it provides the best capability to deter and if necessary conduct war, then so be it. Second, unified politico-military actions can provide a positive means of conveying true intent in a given crisis situation. As an example, the successful outcome of the Cuban missile crisis was made possible through the unity of effort displayed by the various subelements of the military instrument in harmony with accompanying diplomatic actions.

economy of effort

The provision for national security should be at the lowest practical cost. To this end, the most cost-effective elements or combination of elements of national power should be developed and employed to achieve a given security objective. Active U.S. deterrent efforts at the lowest end of the conflict spectrum can often be effectively and efficiently pursued through the orchestrated use of diplomatic, psychological, and economic elements of power. As the threat or level of conflict rises, the military element increases in utility and expense to the point that strategic nuclear forces are essential, regardless of their cost.

Economy of effort is particularly important in the development and employment of military forces in that defense costs comprise 70 percent of "controllable" federal expenditures and are a logical target for reductions in the face of severe economic constraints. There is a need, then, to insure that force planning

is sound and reflects a thorough examination of all relevant alternatives, including active/reserve and U.S./Allied force mixes for the essential mission areas. This planning should not be needlessly constrained by current roles and mission assignments. Failing such an approach, unwarranted redundancy and diseconomy will likely result.

interdependency

As the industrialized countries of the Western world become increasingly interdependent, national interests tend to converge and reinforce the need to pursue common security goals. The continuation of this process makes it logical and prudent for the U.S. to broaden and extend the strategy of deterrence to protect mutual national security interests. Successful alliances depend on mutual interests, objectives, and security arrangements, which, in turn, can be fostered through interdependent relationships. The very facet of this mutuality strengthens deterrence. Moreover, the deterrent effect tends to increase with rising interdependence.

NATO is the foremost example of the value of interdependency to deterrence. Interdependency there is essential; no West European nation alone could successfully provide for its own defense. As the member countries have grown increasingly interdependent, the credibility of their combined means and will to deter war needs to increase also. It is to the advantage of the United States to capitalize on this phenomenon by encouraging increased economic, political, social, and military cooperation among NATO nations in order to enhance the defensive posture of Western Europe.

Finally, interdependency among the various instruments of national power,

including the separate services, is a key factor in a strategy of deterrence. Within this context, interdependency can provide important synergisms in the application of all the principles of deterrence in achieving our national security interests.

Strategic Thought in a Period of Change

In concluding this examination of deterrence, we appropriately note the marked change in the environment out of which U.S. foreign and national security policies are fashioned today. In the two and one-half decades following World War II there was a broadly based domestic consensus supporting unquestioned U.S. military superiority for the roles of containment and deterrence. Now, however, that domestic political and economic foundation has eroded, based in the first instance on a more realistic perception of the nature of the Communist threat and in the second on a recognition that non-Communist nations should share more in the responsibility for deterrence. In the process, containment and deterrence have given way to the concept of stability and deterrence centered on a high order of interdependence of U.S. and Allied polit-

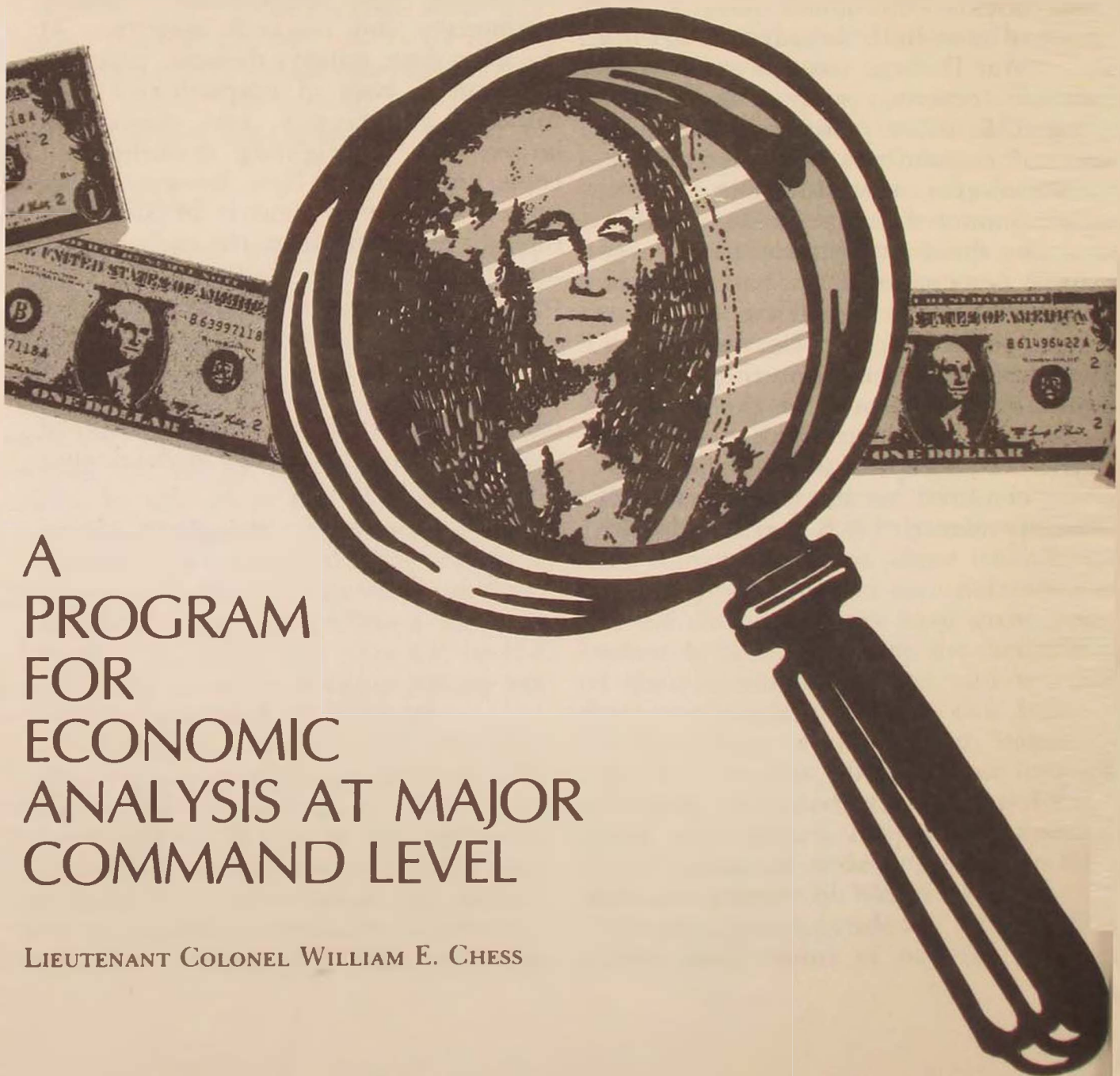
ical, economic, and military capabilities. This interdependence, occasioned by the decline in the relative power position of the United States, is perhaps the pre-eminent feature of the current environment impacting on military policy and strategy. As a result, the maintenance of deterrence has become a far more subtle and complex task than in the past and will require continuing in-depth study, thought, and analysis by the military.

In the past, doctrine, concepts, and strategy for deterrence were heavily influenced and shaped by strategic thought emanating from the civilian academic community and research institutes. At the same time, military thought, proceeding from a basis of unquestioned U.S. military superiority, was concerned largely with "war fighting" doctrine, concepts, and strategy. Now, however, there appears to be a dearth of strategic thought emerging from the civilian community. Within the military, the twin requirements of stability and deterrence have generated the need for a much broader perspective on the nature of deterrence as it relates to the total spectrum of conflict. It was in recognition of that need that this study on deterrence was undertaken.

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THE private sector is not the only place where money is "tight." In the federal government, the Congress is faced with determining how to allocate funds among a multitude of agencies and departments, each of which represents some form of public need. Our Congressmen more and more resemble a board of directors forced by corporate shareholders to demand an efficient operation and increased return on investment from management. This demand, in the federal system, is passed on principally to the executive branch, where most of the public need is transformed into expenditures. During the past decade, a special target has been the Department of Defense.

The public—and therefore Congress—seems to accept massive expenditures for defense when the need is obvious, that is, when the nation is threatened and the threat is recognized. When the need is no



A
PROGRAM
FOR
ECONOMIC
ANALYSIS AT MAJOR
COMMAND LEVEL

LIEUTENANT COLONEL WILLIAM E. CHESSE

onger urgent in the eyes of the billayer, however, there is an understandable clamor for reductions. The need may still exist, but other requirements appear, at least, to have greater priority. It is this reordering of priorities that has put DOD in the defensive and generated the climate in which we now find ourselves. Briefly put, military managers must find more efficient ways to reallocate and use that resources they are provided.

Military preparedness programs are being viewed now more than ever before as an integral part of the broader concept of national security. As a result, the expected benefits from specific military programs are being compared directly with the expected benefits from non-military programs for purposes of making resource allocations.¹

The practical advantages are clear. Finding the least costly or most beneficial alternative, when viable alternatives are available, can assure the purseholders that management is truly attempting to get the most from each dollar. Even when the choice is not the least costly, simply having considered all the costs and benefits of each choice is comforting to both the decision-maker and those who provide the wherewithal. One practical advantage, then, is an increased capability to justify a selected proposal or at least maintain the current position (which may very well be one alternative). All other advantages are derived from this kind of capability. The decision-maker is reasonably assured that he has been given a chance to review all the feasible ways to get the job done, that all the relevant costs of each route have been evaluated, and that the pluses and minuses involved in each case have been considered.

The essential thing is the comparison of all the relevant alternatives from the point

of view of the objectives each can accomplish and the cost which it involves; and the selection of the best (or a "good") alternative through the use of appropriate economic criteria.²

Economic analysis is simply the process of formulating a basic structure or methodology for a systematic evaluation of problems of choice. Given an objective, an economic analyst identifies alternative ways to reach the objective and then determines the costs and benefits of each alternative. The analysis product should provide management with an orderly and comprehensive presentation of the essential elements of each alternative and thereby assist the decision-maker. In reaching that point, economic analysis structures informal thinking and hopefully avoids unfounded "gut" decisions, surfaces hidden assumptions and their implications, and provides a convenient and effective means of communicating the considerations behind a recommendation.³

Program evaluation is essentially the same process except that it addresses an existing program to determine whether a change is appropriate. In this article, whenever "economic analysis" is used, the reader should assume that program evaluation is included, as an extension of the basic technique.

This kind of capability surely is worth having at any level in military management or in the private sector. DOD is committed to it, and the Air Force is pushing for service-wide application. In the field, at major command level and below, however, use of economic analysis so far is spotty. This writer believes the opportunities abound and that an effective economic analysis program truly is essential at major command level. Once established there, applications at lower levels will surface or increase in propor-

tion to the number of managers who have seen economic analysis work, realize that it is not complicated nor simply a statistician's tool, and *demand* its use.

Implementation

It cannot be stated too frequently or emphasized enough that economic choice is *a way of looking at problems* and does not necessarily depend upon the use of any analytic aids or computational devices.⁴

Surprisingly, in view of the aura of sophistication surrounding the term, economic analysis does not need to be complicated to be effective. A viable capability requires only a few basics: a problem (a clearly defined need), a source of standard or generally acceptable cost factors, maybe a calculator, and a format or procedure to follow.

It is true that economic analysis involves a variety of statistical techniques. They contribute to the basic capability and include the tools that generate the cost and planning factors used in quantifying each alternative, provide a uniform basis for comparison, or test the validity of the analysis. But these are the technician's tools and no more essential to understanding and using economic analysis than being able to build a computer is necessary to making effective use of its capability.

Who is needed?

The uninitiated might reasonably assume a viable economic analysis program would demand an economist, a mathematician or statistician, maybe an operations analyst. Their disciplines would contribute much to the technical end of economic analysis. Of course, such expertise may be necessary at an advanced

stage. What is really needed, however, is someone with initiative and imagination. His or her facility with statistics need be no more than what is required to handle college algebra. An economist, mathematician, or statistician without a healthy imagination is generally much less desirable than an English major who can apply relatively simple algebraic equations, provided he or she can approach a problem of choice in an orderly, logical manner.

Along with initiative and imagination, the ideal economic analyst must be able to work effectively with people. In generating inputs to an economic analysis, as in any problem-solving situation, the analyst must rely on the cooperation and contributions of others.

As for the technical aspect, eventually a graduate mathematician or statistician will be useful as improved and unique cost and planning factors and more detailed or complicated analyses become necessary. Personnel well versed in the command mission and its technology are also essential. Since some continuity will always be valuable, civilian employees are possibly the best source of both kinds of expertise.

A well-rounded capability, however, requires occasional disruption: new ideas and the flexibility to go with them. This by no means implies that experienced civilian analysts are unlikely to generate new approaches and new applications, but it does reflect this writer's conviction that a change in faces provides fresh ideas. That alone is worth any temporary loss in momentum. It is occasionally even worth reinventing the wheel. The obvious way to bring in new personnel now and then is to have some military authorizations. And there is another way: perhaps idealistic but not necessarily counterproductive is a program for career progression wherein a productive and

aggressive civilian employee makes his or her contribution and moves on to a promotion elsewhere.

Recognition of accomplishments is another key factor—not simply acknowledgment of a job well done but the kind of recognition that motivates doing the very best within one. It means putting the individual's reputation on the line, putting his or her name on the analysis, trusting him or her to carry the results of an effort up through the chain of command. Let the analyst brief the results, defend the findings, answer the questions, and reap the benefits of exposure. At the same time, his or her supervisor must be prepared to support the analyst and accept criticism of what is purely more than an individual effort.

What is needed?

The importance of an effective and imaginative staff in a program for economic analysis and program evaluation is understandable. No less important is the environment in which these people work. This is true, of course, whether we are discussing the analyst or those who participate in other ways.

Environment. To be most productive and imaginative, people must operate in an atmosphere that is conducive to originality. Essential to creating this atmosphere is the encouragement of open discussion with all concerned. This is an atmosphere wherein the boss truly wants to know when he or she is wrong and the staff feels free to say so. It also is an atmosphere in which mistakes are made and accepted as a natural part of the analytical process. It is most certainly a productive and dynamic environment, a place where past successes are not enough and the status quo is almost always questioned.

The prerequisite for this kind of climate is a healthy share of self-confidence on the part of the person in charge of the program as well as others' confidence in the capability and professionalism of the analyst. The end result can be a genuinely effective group of analysts who in turn impart their enthusiasm to the "customers" with whom they work.

Training. Assuming the embryonic economic analysis function eventually will need additional statistical capability, training requirements must be identified. Even if the staff is well qualified academically, the short courses available at the Air Force Institute of Technology or in the Air Training Command will aid immeasurably in orienting individuals toward Air Force problems. Next best, in order of preference, are courses offered for the same reasons by our sister services, by the Civil Service Commission, and by civilian colleges. Intermediate and advanced courses should be held in abeyance until there is some evidence that the basic talents have been put to good use.

An excellent list of training courses is provided conveniently in a *Directory of Training, Films, Publications, and Models on Defense Economic Analysis and Program Evaluation*, compiled in 1974 by the Defense Economic Analysis Council.⁵

Formal training in economic analysis and other analytical techniques will prepare the analyst, and materials such as those cited in the notes at the end of this article will provide background and a lot of buzz words for management. Most formal training and published materials, however, really only reach those who must know or sincerely want to know the subject. What about those persons in any organization who harbor an almost in-born distrust of "statistics" and "analysis"? These are the functional technicians and managers who must be converted if

economic analysis is to be accepted routinely as a valuable tool. They also are the people whom at least one major command is teaching to use economic analysis methodology in working problems of choice. The process of application, at "working group" level, will be described briefly later; but how these technicians and middle managers come to know economic analysis is appropriate at this point.

The Air Force Communications Service (AFCS) economic analysis program includes a very practical workshop series that puts the theory, principles, and application of economic analysis into "real world" terms, specifically, communications problems. The workshops are conducted at command headquarters and in the field at numbered air force level by a team of one or two analysts and sometimes a representative from another staff activity. The team attempts to sell economic analysis—so far very successful in AFCS—in introductory briefings to the senior staff, to get its support as the two-day workshop begins. In the workshop, theory and principles are covered in less than a morning. The true learning process begins with an economic analysis of a problem taken from the command files. The problem always involves something for the planners, engineers, programmers, logisticians, and representatives of manpower and personnel, who make up the majority of the attendees, for their expertise is essential to economic analysis in AFCS. The problem is real, and the students relate to it and interact accordingly. Economic analysis is no longer something "they" do; "they" (the statisticians or analysts) just help with the stubby-pencil work.⁶

Equipment. Initially, all that is needed is standard office furnishings and a calculator for each analyst. Electronic calcula-

tors are speedy and quiet and therefore desirable. Office calculators should be equipped with a paper tape readout and be capable of performing most statistical functions. A small, battery-operated calculator for use on the road and in meetings should be available for at least part of the staff.

When the economic analysis function is well under way, a remote computer terminal with access to the command data bank should be considered. The major advantages are savings in analysis time and an increased capability for generating unique outputs, using standard software or programs developed in house. This is a major step and naturally will require either additional training for someone or hiring someone with the needed computer expertise.

Cost Data. Cost and planning factors can be and are provided in tables and other sources, usually by higher headquarters. At lower levels of command—for example at major command level—there may be a need for unique factors. If the expertise exists, such inputs can be developed by the using organization, or they may be developed for the user. At the beginning of a command program, however, most if not all of the factors needed in the crawling stage are usually available. This depends, of course, upon the complexity of the proposed investment or existing program being evaluated. Common sense suggests it is only practical to start with something simple: gain experience, identify additional needs, and then get into developing unique requirements.

Caution. Statistical data—costs included—often are afforded more credence than they deserve. No matter how authoritative the inputs and methodology may appear, most cost estimates, for example, are little more than guesses. Un-

Fortunately, many data collectors, analysts, and managers tend to lose sight of this and certain other points.

Not everything that should be considered in an economic analysis can be quantified. Even when some elements might otherwise be quantified, pertinent data may not be available. And whatever data are available may be subject to a variety of interpretations by the users. Such limitations apply to both empirical and future data—both costs and benefits.

The analyst and those who use the product should always bear in mind that it is dangerous to focus on specifics. It is much more realistic to consider a range of values whenever possible and to think in terms of relationships.

Application

The essential elements of an economic analysis are (1) establishing the objective, (2) selecting alternatives, (3) formulating assumptions, (4) estimating the costs and benefits of each alternative, (5) comparing alternatives, and (6) testing alternatives under conditions of uncertainty.⁷

Generally, the process is similar to that of the scientific method of solving problems. This much seems clear enough, but surely whoever is responsible for establishing a program to do these things will have some very practical and valid questions.

When should an economic analysis be performed? Who should participate? Who should be responsible for its completion? What things should be considered? What sources should be used? How detailed should the product be?

Economic analysis techniques can be used anytime there is more than one way to accomplish a given objective. The process is a logical development in the

evaluation of investment proposals and ongoing programs and is related to some more familiar analytical tools. *Cost analysis* is primarily a budgeting tool. It tells how many dollars are required to accomplish some objective or to determine whether a given proposal is worth further consideration and additional effort, but it does not assist in choosing among alternatives. *Cost comparisons* (a formal process done in accordance with Department of Defense Instruction 4100.33) are undertaken to deal with accomplishment of a given task by in-service civilian versus commercial lease, where the government alternative has been identified, possibly through economic analysis. *Economic analysis and program evaluation* are broader in scope than cost analysis or comparative analysis because they examine all alternatives and employ an evaluation of benefits. It should be apparent from these brief definitions that economic analysis techniques and other types of cost work are not mutually exclusive.

Is it worth the effort?

The key question in determining the appropriateness of an economic analysis is: "Does the potential impact of the decision make all this worthwhile?" As the time of the participants is usually pretty costly and sometimes any delay in reaching a decision can be at least equally costly, it is important to establish some criteria. At the beginning, this can be a simple dollar threshold keyed to the cost of the programs of most concern to management. Of course, any given program—regardless of its cost—may be of sufficient concern to the commander or senior staff to warrant a full-blown economic analysis. Also, there surely are points in between when the use of some of the procedures and methodology of

economic analysis will be useful in helping management reach a decision. Criteria are only guidelines, and practical judgment should be used in every case to determine whether economic analysis is appropriate and its cost justified.

procedure

Although the need for economic analysis may be recognized in Congressional hearings and at the Pentagon, the term itself may frighten many of those whom it is intended to assist. Economic analysis and related techniques suffer from association with the Whiz Kid atmosphere in the DoD of the 1960s. "Systems analysis," "cost-effectiveness," and similar terms aroused suspicion if not antagonism. This must be overcome at all levels. The practical way to do so is to demonstrate applications at the level one is trying to reach and simplify the procedures and methodology to the greatest extent possible.

Participation. There probably are many ways to implement this advice, but AFCS has found that getting everyone involved works pretty well. First, get the commander and senior staff behind the program to a point where they habitually assess a proposal or ongoing program in terms of cost and benefits, asking "Is this the least costly or most beneficial way to go?" Second, insure that middle management is well aware of its bosses' interest. Third, show those who will be working the problem how to respond.

AFCS uses "working groups" extensively at both major command and intermediate levels. Representatives of the staff—planners, programmers, engineers, logisticians, and people from manpower and personnel—meet to resolve problems, formulate positions, and implement programs. Normally part of program imple-

mentation, although it can occur earlier, economic analysis is used by AFCS in determining the best way to provide a given communications-electronics-meteorological service or in evaluating the current methods of doing things.

Responsibility. The economic analysis program in AFCS is a responsibility of the Comptroller, who in turn has passed the authority for policy and implementation to the Management and Cost Analysis staff. Economic analyses and program evaluations, per se, are performed by a committee (working group) of mostly noncomptroller types. Responsibility for the product is vested in the functional manager or someone to whom the functional manager has delegated authority to accomplish whatever is necessary to meet project or program objectives. Normally, it is this "program manager" who has the ball. Someone from Management and Cost Analysis would assume responsibility if the analysis were concerned with a strictly comptroller application or if the office of primary responsibility were not clearly identified.

The point here is that whoever is most concerned with meeting the objective should have responsibility for the economic analysis product.

Process in Brief. The working group is given the objective or otherwise identifies it, then in an interactive exchange determines facts, assumptions, costs in terms of people and material, and alternatives. Comptroller representatives contribute their expertise in the cost and statistics areas. They provide the latest cost factors or develop those otherwise unavailable, generally act as consultants to assure the chairman that a comprehensive analysis is made, and provide whatever statistical help is needed.

The product is normally a complete, well-structured, accurate, and coordi-

nated economic analysis. Seldom are issues raised above the working group level. The commander or other decision-maker is presented with an array of alternatives and a recommendation. Each alternative is shown with its initial investment cost and the cost of operation and maintenance throughout the system's life cycle, all in terms of present value; and the uniform annual (average) cost of each alternative is compared to all the others. This does not mean that the lowest cost automatically determines what is recommended. Quite often the benefits or a simple lack of limitations will actually drive the working group to recommend an alternative that is "most beneficial" and not "least costly."

The working group procedure briefly described here may not be the best approach for other organizations. Whatever the program's structure and operational processes, the key elements listed at the beginning of this section and shown here as applied in AFCS are necessary to make sure the facts are provided in a form that will assist and not confuse or degrade the decision-making effort.

This article is not intended to provide a litany covering all aspects of each step of the economic analysis process. One source, the DOD *Economic Analysis Handbook*,⁸ covers the entire process very well, and the reader should refer to it.

Uncertainty. The final step, however, is worth special mention. Since the costs of future operations, and therefore the relationship of alternatives, are estimates and subject to uncertainty, it is always possible to question their validity and consequently their impact upon the findings of an economic analysis. Furthermore, the benefits and limitations of specific alternatives are often difficult or impossible to quantify. For these reasons, the analyst frequently performs more

than one type of analysis to determine the degree of impact on the outcome of a change in some important element.

Sensitivity analysis is one test. For example, as the DOD-directed discount factor used in calculating present values—and hence the uniform annual cost—is subject to frequent criticism,⁹ various discount factors can be applied to see just how significant the Defense figure really is. Another technique is contingency analysis, in which either a relevant criterion or a major assumption is changed. *A fortiori* analysis would be applicable where intuitive judgment favors a specific alternative, but analysis indicates it would be a poor choice. In this situation, any major uncertainties can be resolved to the advantage of the favored alternative, to determine if the results would change significantly.¹⁰

Format. An economic analysis during its formulation will be quite detailed or at least appear so to the individual responsible for pulling all the pieces together. Another practical advantage of the working group approach, then, is the opportunity to draw on the individual and collective expertise and labor of functional representatives, while a largely independent review of the product by a cost analyst will assure that the final product is properly documented and statistically accurate. The analysis, in spite of many inputs, need not be detailed if it is presented in an outline or summary format and properly documented (so details may be filed and the analysis successfully defended if necessary). Relatively simple formats are suggested, for example, in Air Force Regulation 178-1; DOD is more concerned, however, with application than appearance. "There is no reporting system involved. If you don't like the suggested formats, develop your own."¹¹

Closing the Loop. Feedback is important throughout these processes. A truly professional and competent analyst will not be satisfied to develop procedures and methodologies that simply work. His or her product, of course, must be good enough to withstand the scrutiny of management and critics alike. Additionally, the cycle should generate actual costs and benefits that can be used to update the data bank and thereby improve earlier estimates, procedures, and methodology. What may be successful and fruitful one time may be inappropriate and useless when viewed in relation to empirical data. Feedback requires both added effort and a willingness to accept correction or at least improvement. This is simply a matter of closing the loop. It involves cost tracking and "post-expenditure analysis," another name for program evaluation.

Once an economic analysis has been completed in the planning and programming phases, it's absolutely necessary to track the subsequent decisions and results through budget formulation and execution.¹²

results

An economic analysis should reflect both the environment in which it is developed and the prerogatives and criteria of the decision-maker it is intended to assist.¹³ The output, then, is a product that provides information to the deciding authority in a given decision-making situation by (1) illustrating the nature of the trade-offs between costs and service provided or mission performance and (2) summarizing background factors and nonquantitative considerations influencing the situation. What the decision-maker gets is a presentation of data relating the cost of a proposal to the

benefits expected. This information will be used to decide which way to go, to support that decision if it must be justified to some higher authority or in order to obtain the necessary funds, and to provide a point of departure for future evaluation of the project or program.

ECONOMIC ANALYSIS and program evaluation are concerned with the basic problem of economic choice. Economics is the science that deals with the rational allocation of scarce resources. Analysis refers to a process of systematic investigation. Economic analysis, then, is a conceptual framework for systematically investigating problems of choice; it generally means a kind of "pre-expenditure analysis." Using the same techniques, program evaluation is essentially "post-expenditure analysis."¹⁴

The products of economic analysis, within DOD, are intended to assist management in making rational and supportable decisions. The process is not meant to make the Defense manager's job or that of his staff more sophisticated. Neither is the process itself unnecessarily complicated and time-consuming. It can be, of course, but the key to having a truly practical and useful economic analysis program is to keep it simple and operate as much as possible within existing capability.

The preceding paragraphs have discussed significant elements of what is in fact a successful but still developing economic analysis program at major command level. The need was emphasized. The "who" and "what" were discussed. As for application, many of the specifics were not provided because this tends to bore or even unnecessarily frighten those from outside the comptroller field.

The intent was to motivate nonusers of

economic analysis to try it. The potential for returns that far exceed the investment is tremendous: mission-essential programs approved on the basis of rational thinking instead of emotionalism or whatever; less costly ways of operating and maintaining forces and support ac-

tivities, identified and "sold"; assurance that decisions are based on logic as well as experienced judgment and not just intuition.

Economic analysis is not complicated. It is worthwhile, and *it works*.

Hq Air Force Communications Service

Notes

1. Charles G. Leathers, "Resources Available for Defense," lecture at Defense Resources Management Education Center, Monterey, California, 11 July 1974.
2. Charles J. Hitch and Roland N. McKean, *The Economics of Defense in the Nuclear Age* (New York: Atheneum, 1966), p. 118.
3. *Economic Analysis Handbook*, Office of the Assistant Secretary of Defense (Comptroller), Washington, May 1971, p. 2.
4. Hitch and McKean, p. 120.
5. *Directory of Training, Films, Publications, and Models on Defense Economic Analysis and Program Evaluation*, Department of Defense, Defense Economic Analysis Council, Washington, May 1974.
6. Major John W. Mather, "Implementation of the Economic Analysis Program in the Air Force Communications Service," master of arts

research paper, University of Oklahoma, 1974, pp. 22-26.

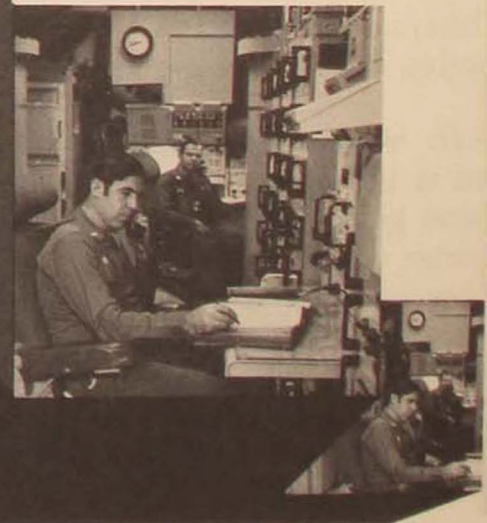
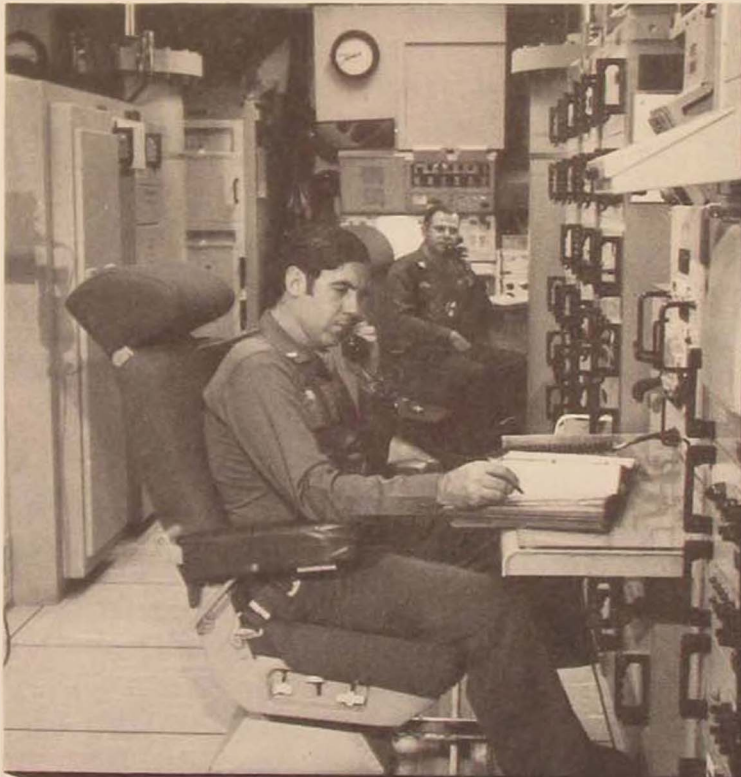
7. *Economic Analysis Handbook*, pp. 2-9.
8. *Ibid.*
9. Major Richard Zock, "Resource Management, Economic Analysis, and Discounting in the Department of Defense," *Air University Review*, XXIV, 2 (January-February 1973), 34-35.
10. *Economic Analysis Handbook*, pp. 8-9.
11. Colonel Vincent J. Klaus, "Why DOD Needs Economic Analysis and Program Evaluation," *Commanders Digest*, vol. 15, January 3, 1974, p. 13.
12. Brigadier General Leslie R. Sears, Jr., quoted in "AMC Works on Program Evaluation," *Commanders Digest*, vol. 15, January 3, 1974, p. 5.
13. *Economic Analysis Handbook*, p. 9.
14. Klaus, p. 13.

THE Air Force environment is replete with the terms “systems management” and “project management.” Systems management is not a theory or practice that belongs solely to “managers” in the Air Force Systems Command or to “system managers” in Air Force Logistics Command. Common usage seems to imply that the term “systems management” refers to the management of all activities associated with acquiring or supporting an Air Force weapon system; however, the term has much broader meaning. Likewise, the term “project management” should not be restricted to the Air Force research and development community. The purpose of this article is to present an expanded interpretation of these two concepts that makes them applicable to virtually every manager in the Air Force.

SYSTEMS AND PROJECT MANAGEMENT

an expanded view

MAJOR EDWARD J. DUNNE, JR.



All officers and many enlisted men in the United States Air Force are managers. A manager may be defined as an individual having responsibility for the use of resources to accomplish goals. The missile crew commander, for example, can be viewed as a manager. The resources he uses are the other crew members, all the regulations and procedures, and the weapon system hardware; his goal is to maintain the weapon system in a combat-ready state. The first sergeant of a communications squadron has various resources of personnel, equipment, funds, tools, training aids, etc., to perform his communications mission. The commander of Air Force Systems Command has numerous highly specialized resources for the purpose of both maintaining a broad research and development capability and utilizing that capability to acquire new Air Force weapon systems.

The concepts of systems management and project management can provide valuable insights to improve managerial capability. As professionals, Air Force managers should constantly review and evaluate their management approaches. This article provides an opportunity to review management approaches from a perhaps slightly different point of view.

Systems management

The word "system" is pervasive and is used in many different situations and contexts. This wide use stems from the meaning of the term—a meaning rich with many implications and potentially high in informational content. But the wide applicability of the word also produces misuse and confusion. A system is any collection of elements formed into a whole to accomplish some goal: a clock is a system; the human body is a system; a

family is a system. The term at once implies boundaries of the system, parts of the system (subsystems), interactions of the subsystems, a purpose or goal, an effect (or output) of the system greater (at least different) than the addition of the effects of the independent elements, and some interaction with the environment outside the system boundaries. All the elements of any military weapon are a system: hardware parts, personnel to operate and maintain equipment, support elements such as aerospace ground equipment (AGE), training capability, etc. This is perhaps the most common use of the term in the Air Force. All the principles, rules, regulations, records, processing equipment, etc., that organize and use information about Air Force personnel constitute a system. Any of the Air Force major commands is a system.

Any individual is a part of many systems—family, work organization, church group, the nation. Normally, systems overlap other systems, with the result that boundaries are often difficult to identify precisely. Systems also exist as systems within systems, as in the hierarchical nature of organizational systems or the universe of earth, solar, and galaxy systems. Thus the concept "system" is at once enlightening—a common frame of reference for much of natural phenomena; yet it is confusing—the complexity which the term makes explicit is often formidable.

So what is systems management? It is basically a frame of reference for a manager in his job. His task is "getting things done through people" or "making decisions concerning the resources assigned to him to accomplish set goals." Systems management is not a substitute for but rather complements traditional management thought and theory. Traditional management approaches identify



Figure 1. Frame of reference for a systems manager

the functions required of any manager—planning, organizing, directing, and controlling. Specific management principles—generalizations concerning successful management practices—are identified: for example, Fayol's 14 principles. Most management actions involve interaction with people, and thus typical management theory stresses communication skills and an understanding of individual and group motivation and behavior. However, systems management is not a substitute for such management thought.

Systems management involves a way of thinking about the phenomena with which and within which the manager must work. The manager usually has resources assigned to him in the form of an organization—a squadron, group, office, division, etc. He is responsible for the accomplishment of specific objectives, using these resources. *His organization is a system he must manage.* It exhibits many characteristics common to all systems: subsystems, interaction of subsystems, an

environment that will influence the system, and others. It has a goal or goals, with inputs to the system and outputs to the environment. His frame of reference for his management actions is his organization as a system within many larger systems, as a system interwoven with other systems, and as a system composed of subsystems. (Figure 1)

The systems manager knows that his organizational system will have a life cycle consisting of (a) start-up, where the management functions of planning and organizing are vitally important; (b) stable operations, where the management functions are all-important, and directing and controlling are most common; (c) major change, where the forces of the environment have forced a system change requiring replanning and reorganizing; and, sometimes, (d) system termination.

Because he is a systems manager, he is aware of at least two characteristics of his organization that may not be emphasized

by the manager who does not adopt the systems outlook or approach. First, the systems manager looks for the prime subsystems of his organization and evaluates the interactions among them. For instance, he is aware of the values and goals of the personnel and the congruence between them and the organization's goals. He is aware of the social needs of the people in his system and the effect these needs may have on the technical subsystem of knowledge and techniques needed to accomplish the goals. He is aware of the formal structure of his organization, a subsystem, and interwoven with it the informal structure, another subsystem. He knows that the total task of his organization has been subdivided and given to subgroups, but that coordination is required to put the subparts together effectively. He knows the importance of the interaction between subparts, interaction in the form of flows of materials, paperwork, funds, good or bad feelings/attitudes. In a word, he is keenly aware of his task of system *integration*.

Second, the systems manager is constantly looking to the environment of his system. He knows that his organization is an open system—not mechanistic and closed but open to environmental forces that are constantly bringing about changes. He anticipates change, controls or shapes it when he can, prepares his organization for it, maintains reasonable stability during it, but never stubbornly ignores or resists change. He realizes that change is a way of life, so he welcomes it and uses it to the advantage of his organization.

A manager at any level can take the approach of a systems manager. From the Chief of Staff of the Air Force down to the crew chief of a B-52 maintenance team—all can take a systems approach to

their management tasks. In so doing, they will use the traditional concepts and theories of effective management, but they will do so with an appreciation of the systems characteristics of their organization and other organizations. They will be especially aware of the integrative nature of their job and the necessity to be open to change.

project management

Effective managers realize that “normal” operations involve organizations that are constantly adjusting to the environment through making minor changes and shifts in emphasis. Occasionally, however, environmental forces develop which necessitate *major* changes within the system. For example, because of new technology the United States Air Force might determine that it must develop a new first-line air superiority fighter. A new, improved, *different* weapon system is determined to be necessary. The alternative is an impaired ability (or inability) of the Air Force system to accomplish its air superiority goal. This is a significant undertaking. The normal operation of Tactical Air Command with the F-4 as the air superiority fighter will change. Air Force Logistics Command must make changes to support a different weapon system. Training, personnel planning, facility planning—all are affected. This is a major change to the normal “steady state” operations of the Air Force system. As another example, a company decides that, to stay competitive, a new product must be introduced to its line. This introduction will be a major change to the company. Engineering, manufacturing, plant layout, marketing, quality control, etc., will have their normal operations changed. A major change for an organizational system is often called a

project, and a special manager is often given the responsibility of project management.

Project management can be thought of as a technique used to accomplish a major change in the organizational system effectively, efficiently, and with minimum disruption to ongoing activities. The project manager is responsible for planning the project, organizing the resources provided to accomplish the change, directing the effort of the resources, and controlling the work progress. He is often provided an organizational system, a project team, dedicated to him and the project. In many respects he has management responsibilities similar to those of other managers, but his task is different with respect to time frame, complexity, span of influence, importance to the overall organization.

time frame

A project is a one-time undertaking with a definite start—a major change is recognized as needed—and a definite end; the change has been accomplished and “normal” operations are under way. The time span of a project can be brief, or it may extend over more than a decade. The C-5A project began in the middle sixties and is still in existence, although it is only a fraction of its previous size and is in the process of dissolution. This limited time frame is in contrast to that of the manager of an organizational system with a continuous, relatively stable task. As an example, for the indefinite future a wing commander is responsible for the manning, training, and operational readiness of his wing and its weapon system.

complexity

The project manager is identified, in

essence, as the general manager for a specific major change to the overall system. The F-15 System Program Office (SPO) Director is the general manager for introducing this new weapon system to the entire Air Force. In the case of a company introducing a new product, the “product manager” is the general manager for getting the new product into “normal” operations throughout the company. The change is usually complex, with interacting considerations across the organization. It involves a large degree of uncertainty—doing something that has not been done before. Usually new ideas and new technologies are being implemented, with associated unknowns. As the general manager for this aspect of the overall system, he must recognize, plan for, and innovate around this inherent complexity and uncertainty. By contrast, the manager of ongoing operations normally has a well-defined task to be done repeatedly. Historical data may exist concerning the task, and only minor changes are expected in the future.

span of influence

The project manager's span of influence is broader than that of the manager of an ongoing organization. Not only must the project manager focus on his organizational system to be managed—his project office—but he must also focus on and operate across the overall organization. In order to implement change effectively, he must know the characteristics of the system being changed. The F-15 project manager must know the entire Air Force system: the subsystems that will be affected by the F-15, the interactions of the subsystems, the external pressures on the Air Force, like potential enemy threat. He must coordinate the activities not only of his project organization but also of many different organiza-

tions within the total Air Force system. A project manager and his project organization could be called the *integrating instrument* for the project effort. This task to coordinate and influence the effort outside his own organization can sometimes be very frustrating for a project manager. He must deal with diverse elements of the overall system that have their own subgoals and interests. Therefore, the project manager, more than the traditional manager, operates in a dynamic climate and must constantly balance and trade off a broad variety of variables in influencing and making decisions for the good of the overall system.

importance

Finally, the project manager's task is different in terms of its importance to the overall organization. The change is being implemented to sustain the continued good health of the organization, perhaps to assure its survival. The task often has high visibility within the overall system and outside—DOD, Congress, the public. The reputation and good name of the overall organization may be significantly affected by the success of the project's implementation. This is not to say that management of ongoing subsystems is not important, but the importance of major changes is normally of a higher order of magnitude.

In sum, the project manager is like other managers in that he has a system to be managed—his project team. He is unlike other managers because he and his office are the instruments of change for the larger, overall organizational system. He is responsible for integrating the efforts of all affected elements of the larger system to implement a major change of significant complexity and importance.

WE HAVE said that systems management is a frame of reference, an outlook, a way of thinking for a manager in fulfilling his responsibilities. The systems manager focuses on his organization to be managed as a system. This point of view identifies the system boundaries and the influences outside the boundaries. It identifies the subsystems within the system and the relationships between them. It places attention on the input from the environment to his system, the transformation within his system, and the output—all in accomplishment of the system goal. The manager with this approach emphasizes two aspects of his job: the integration of the various elements of his system to operate smoothly and effectively and the need to be aware of, anticipate, and take advantage of system change brought about by forces in the environment.

We have also said that occasionally change is of significant impact and cannot be effectively accomplished via "normal" system efforts. An approach to managing the implementation of a major change that has effects across the organization is called project management. A temporary project manager, and perhaps a project office, is established to integrate, across the total system, planning and other activities to assure a smooth change. The complexity, uncertainty, and broad impact of the task demand special management attention—the project manager.

These two management approaches have application throughout the Air Force. The manager of any Air Force organization can profitably view his organization as a system. He can perform his management functions with knowledge of the systemlike characteristics that must be dealt with. This manager is constantly "testing the water" of the environment

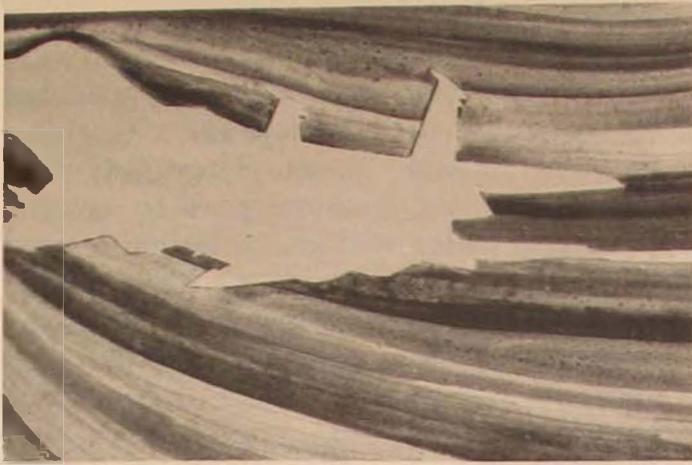
outside his system. When he identifies the necessity for a major change, he will assign special management responsibility for that change to someone within his organization—a project manager. This approach to management, which is not a substitute for but builds on traditional management theory, can be successfully applied by the crew chief of a maintenance crew on up the Air Force hierarchy to the commander of a major command.

To tie these concepts together, consider the crew chief for one of the Air Force's aircraft. The crew chief's system is composed of the crew members, the tools and equipment assigned to them, the work areas, the technical orders and other guidance, and perhaps other elements. The prime input to his system is the aircraft in need of care, maintenance, and perhaps repair. The prime output is a combat-ready aircraft. There may be several meaningful classifications of subparts of the system. There may be subteams of individuals with different skills. He may identify several informal groups that are important to maintaining high morale. He may identify the social needs and values of his personnel, to assess the impact upon the organizational goals. The crew chief will be aware of the

influence of outside forces: the larger maintenance organization, the total weapon system a part of which his crew maintains, the Air Force personnel system, the major command, and also the total Air Force system. For instance, he may become aware of a coming change to some maintenance procedures, a change that will affect almost all elements of his system. His approach is to establish one man, and perhaps others to help him, as the "focal point" for this change—in essence a project manager. This same type of example is easily adapted to an aircraft commander or the man who heads a major command.

Finally, let us return to the opening remarks. Systems management does not belong to those engaged in acquiring or supporting weapon systems but is a frame of reference for management actions available to Air Force managers at all levels. Project management is not restricted to research and development projects but is a management approach that can be used to insure that a major change to any organization is accomplished smoothly. Our challenge is to use these concepts and others to become more effective Air Force managers.

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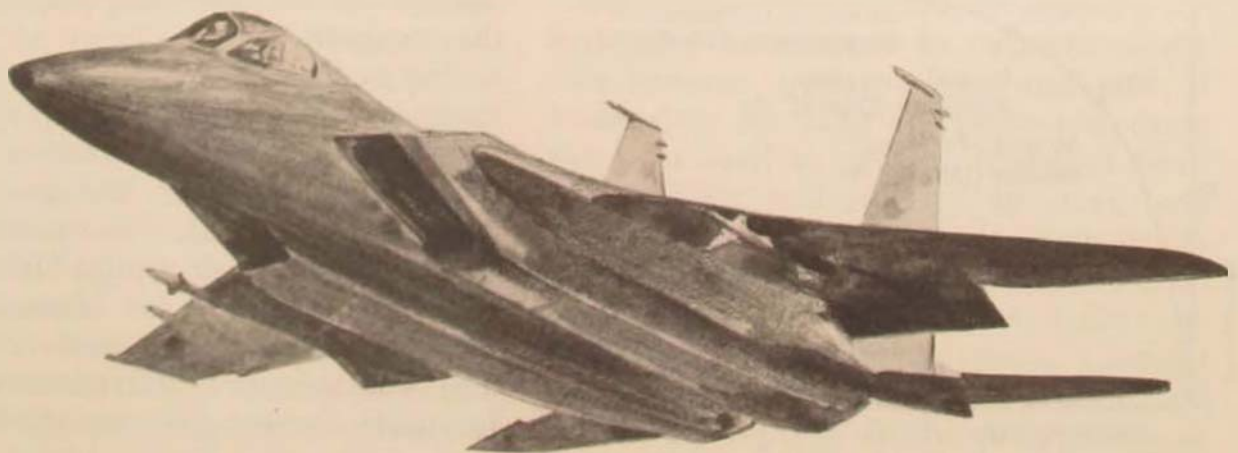
Air Force Review

THE purpose of this article is to provide an insight into the organization and responsibilities of the Air Force Logistics Command's Deputy Chief of Staff for Acquisition Logistics and to discuss some things that need to be done to support the driving objective of my organization. I will touch on our mission, how we go about our business, some obstacles we are encountering in doing our job, and how we intend to solve some of these problems.

Our job is to drive down the ownership costs of new weapon systems. As is well known, the last decade has witnessed a steady increase in that portion of the Air Force budget earmarked for operating and supporting the force in-being. The task we have is certainly not easy; but it is essential if we are to reverse the budget trends and provide the funds needed for modernization of the force. In short, my main job, in concert

A LOOK AT ACQUISITION LOGISTICS

MAJOR GENERAL CHARLES E. BUCKINGHAM



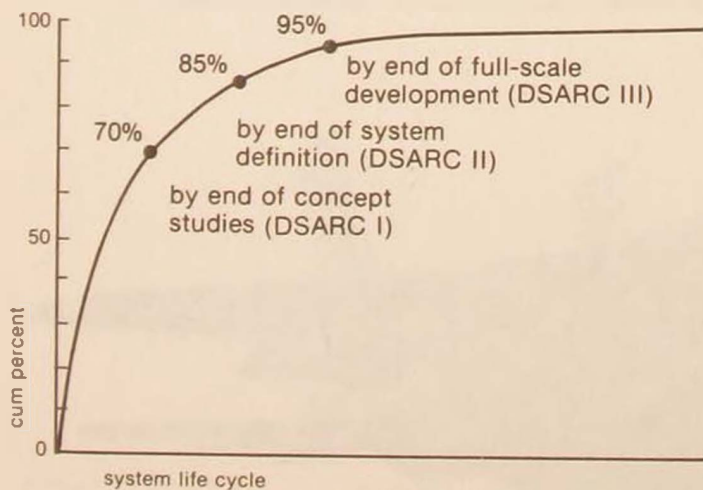
with the Air Force Systems Command, is to see that appropriate actions are taken during the acquisition process that will reduce the cost of ownership without degrading support.

To best accomplish this important task, it is necessary to examine the decision patterns affecting life cycle costs. (Chart A)

This chart, based on a Boeing Company study, indicates that 70 percent of the decisions affecting life cycle cost are locked in by Defense Systems Acquisition Review Council (DSARC) I and 95 percent by DSARC III. This indicates that if we are to be effective in reducing costs of ownership, we must concentrate our activities at "the front end," or prior to the production decision. We are organized to do just that.

The operational portion of my organization consists of directors of logistics, collocated at each of the Air Force Systems Command product divisions, and deputy program managers for logistics (DPML), collocated in system program offices. The logistics directors provide

Chart A. Phasing of system decisions defining total life cycle costs



support to less-than-major systems, interface with the laboratories, and work with the Systems Command planning activities up through the conceptual phase, or DSARC I decision point. They also provide initial logistics support to system program office cadres, pending assignment of a DPML. The DPML's have the job of getting the hard-core logistics requirements into each program and making sure the program manager understands the cost-of-ownership impact of all important decisions. These individuals can and do call upon resources throughout the command to get this job done right and responsibly. Reporting directly to me gives them the leverage and priority needed. The staff, located in AFLC headquarters at Wright-Patterson Air Force Base, consists of a Directorate of Integrated Logistics Management, whose principal responsibility is to develop the necessary tools and techniques to be used by our operational people in the field, and a small Test and Evaluation Office, which interfaces with the Air Force Test and Evaluation Center at Kirtland AFB.

At DSARC I, or sooner if warranted, a management Air Logistics Center is assigned system management responsibilities. Also at this time the DCS for Materiel Management, the DCS for Personnel, and I review nominations for the DPML job and recommend to the AFLC Commander an individual for appointment to that position.

The DPML also wears the hat of system manager. He is supported at the Air Logistics Center by an assistant. When the decision to enter into production is made at DSARC III, the operational responsibility shifts from the Headquarters to the management Air Logistics Center. Then, as the program matures and system management activities at the Air Logistics Center become predominant,

the DPML will physically transfer to the Air Logistics Center. A small logistics contingent will remain in the system program office.

Obviously, the DPML plays a very important role; therefore, we are firmly committed to putting the very best people in these positions, and we have the full backing of the AFLC Commander on this. We are in the process of formulating a career development program to insure a broad range of candidates for these jobs. In addition, we are reviewing the curriculum and attendance requirements for the Defense Systems Management School and the Air Force Institute of Technology to insure that proper emphasis is placed on logistics.

The DPML depends on help from many people to get his job done, and a large part of this help must come from the requirement originators, the operating command. The operating command logisticians must be actively involved in the acquisition cycle, starting with an early scrub-down of the requirement for logistics impacts. Realistic, well-defined operational requirements in which logistics considerations have been included can head off a lot of our problems before they start. The operating command logisticians must also be heavily involved in development of the maintenance concept and in a thorough assessment of the supportability of the system prior to the production decision. It is important to realize that the tough job of including logistics as a primary consideration in the acquisition of new systems requires a unified, documented, supportable stand by all logistics elements involved, including the people in the operating commands.

Now let's consider some problems associated with the Office of the Secretary of Defense (OSD) management techniques

of integrated logistics support (ILS), design to cost (DTC), and life cycle cost (LCC). Integrated logistics support is recognized throughout the Department of Defense as an essential part of the acquisition process. The pulling together of the logistics considerations necessary to achieve effective and economical support is not a well-defined procedure, but it is certainly a goal toward which we must all strive. If we are to achieve this in a meaningful way, we must give the contractor economic incentives to design for supportability and to investigate and recommend design changes that will enhance supportability. Today these incentives simply do not exist, but we have made a start in the right direction on the A-10 program. An award fee of \$3.5 million (\$2.9 million for the airframe and \$.6 million for the engine) is related directly to operating and support costs during the initial operational usage. The lack of demonstrated results, however, makes it extremely difficult to convince everyone in the chain that they should put up money today to save money five to ten years hence.

Adding to the problem are production-oriented, design-to-cost goals. Although the regulatory material states that the design-to-cost goals will consider cost of ownership, I know of no satisfactory means currently existing to do this realistically. We are, however, developing the necessary techniques to provide trade-offs between design-to-cost and cost of ownership. As these are perfected, there will be a need to provide trade-off flexibility. This will not be an easy task because there are tremendous pressures on program managers to stay within development and acquisition dollars, as depicted first in development concept papers and subsequently in the selected acquisition reports. In the early 1960s, as

Program Control Chief of the Minuteman System Program Office, I strongly advocated the need to balance performance, schedule, and cost. Today, that triangle is a part of the program manager's creed. "Cost" then encompassed, and still does, research and development and acquisition costs. It is time we change the triangle to a square, with *support cost* getting equal consideration.

A vehicle by which this can be accomplished is life cycle cost. Training is a critical area; I find very few personnel who really understand life cycle cost. There have been a number of two-day seminars, but one does not learn a process as complicated as life cycle costing during a two-day seminar. We are working with the Air Force Institute of Technology to develop a comprehensive, four-week life cycle costing course. We are also working with the civilian academic community to inject into university design engineering courses a thrust that will cause support, as well as performance, to be viewed as basic design criteria.

The quality and usefulness of our ownership costing techniques are poor in the conceptual phase but improve greatly as we progress into engineering development. During the conceptual phase, we use parametric methods that have produced very weak results at system level. The key is improvement at the subsystem level and relating types of materiel and their physics of failure. We have a joint AFLC and AFSC Life Cycle Cost Working Group that is pursuing this by bringing in development engineers from the various laboratories and technology areas to work on the problem. During the engineering development phase, we have a range of good practical models for evaluating design trade-offs and for planning the supply, maintenance, and

distribution aspects of logistics. We are putting these tools to work on the F-15, B-1, and A-10 programs. When it comes to estimating total cost of ownership, we have no good analytical models and must depend on parametric estimates that offer little in confidence or accuracy.

In the data systems area, the maintenance documentation problems faced in the operational commands are also of concern to us in the acquisition business. As is well known, we have more problems than solutions at the present time. The data we collect at base level and in our centers are not weapon-system-related, they do not capture complete and total costs, and they are far from accurate. I am sure that all the people involved are vitally concerned with improving this situation, including top management in the Department of Defense. The lack of an inclusive data base for existing systems makes it extremely difficult, if not impossible, to accurately project or predict total costs of ownership for new systems coming into the inventory. One of the improvement efforts under way is headed by the OSD Comptroller and is directed toward coming up with a cost-effective system to identify maintenance and operations cost by weapon system. In addition, the Joint Logistics Commanders have been working hard to develop and standardize the way depot maintenance costs will be accounted for by system, and they are putting out a manual on this now.

The concept of life cycle costing is realistically illustrated by our current effort to implement the concept on acquisition of the air combat fighter (ACF). Of particular importance are the progressive provisions being incorporated within the contract to motivate the contractor toward providing a system with full recognition of long-term ownership costs.

First of all, we have required the airframe and engine contractors to submit data to enable us to evaluate the potential impact of logistics support cost of each design during source selection. These data consisted mainly of the predicted reliability, maintainability, and component price characteristics of some 200 to 300 items. Also, as part of his proposal, each contractor was required to submit recommendations for design-to-cost LCC trade studies affecting both producibility and supportability. But one of the key issues in LCC is our capability to verify contractor estimates while still in a competitive situation. In the Air Combat Fighter we have some favorable conditions that can help. First of all, we have flyable prototypes, which provide a reasonable basis to estimate the transition into a production aircraft. In addition, those avionics components that normally drive maintenance costs are an achievable evolution from equipment we already have in the inventory. In line with this, we asked the contractors to scale their predictions from existing equipment. We also asked for a design supportability summary to tell why we can expect improvements and explain how the proposed system will overcome problems we now have in existing equipment. A joint AFLC/AFSC/TAC team has evaluated this information and provided a basis for assessing the reasonableness of contractor estimates. We will also be able to identify those potential high burners on the ACF. About 15 to 17 items that are expected to contribute about half of the total logistics support cost for the system will be subject to a possible award fee, if performance is better than expected. On these items, the contractors are being required to submit a priced option for a reliability improvement warranty (RIW).

Those high-burner items to be in-

cluded under the RIW will be selected at the end of full-scale development. Commitment of organic maintenance resources will be deferred on those selected items, while the contractors perform maintenance and submit no-cost engineering change proposals to improve performance. Under these provisions, the contractor will be required to perform maintenance for up to four years or 300,000 flying hours. The focus of the RIW concept, however, is to motivate the contractor to initiate "no cost to the government" engineering changes to improve item performance and thus reduce his own expenses in carrying out the recurring maintenance under the warranty.

During full-scale development, the contractor will conduct a logistics support analysis to define the aerospace ground equipment (AGE), tech orders, training requirements, and other elements of the support system. We intend to maintain a continuous track of life cycle costs as the system design evolves.

Our deputy program manager for logistics will monitor design trade studies conducted during the full-scale development to make sure the LCC area has been adequately addressed. Just prior to Critical Design Review, the contractors may earn an initial award fee based primarily on possible design cost reduction on the air vehicle. They are eligible for a fee of up to \$1.15 million at this point. A second award fee of \$3.45 million is oriented toward supportability. This will consider cost reductions affecting AGE, training, and maintenance reflected in the DTC/LCC trade studies conducted prior to the flight of the first development, test, and evaluation (DT&E) aircraft.

Shortly after the aircraft enters the operational inventory, we want to see how well the system stands up to the

support predictions and negotiated agreements made with the contractor at source selection. The items not under RIW and other system-level costs and components will then be evaluated during operational test. This test will begin six months after full activation of the first operational unit. The test will be conducted for 3500 flying hours and will be used to determine the field supportability characteristics of those items not under RIW. If the group of items being evaluated performs better than predicted, the contractor is eligible for an award fee of up to \$12 million. If the items do not perform as well as expected, then the contractor must provide product improvement or additional assets at no cost to the government.

This is the first time we have sought such an extensive commitment related to life cycle costing on a program. For the first time, we are requiring contractual commitments on some form of LCC during source selection, establishing a tracking mechanism and appropriate fees to

orient the contractor during full-scale development, and measuring and enforcing support performance once the product is in the field.

Our number one objective is to get credible ways of giving the program manager visibility of the impact his decisions will have on the operating and support costs. I know our program managers; and I know if we give them the facts, we will get the right decisions to drive down the costs of supporting our new weapons. We are going to do whatever is necessary to achieve this objective. The goal is being given priority consideration by the Air Force. It will take highly qualified people to develop the tools that are necessary to effect meaningful reductions in logistics support costs. To this end, it is a command effort of both the Air Force Logistics Command and Air Force Systems Command. We are jointly working toward this goal, and we need all the help we can get from idea-producers throughout the Air Force.

Hq Air Force Logistics Command

FOR a generation of Air Force officers, the abbreviation "sos" has meant the school at Maxwell Air Force Base where lieutenants and captains advance their careers through professional military education. Also, as a mold of character and a seasoning experience for junior officers, Squadron Officer School has done its job well. But this article is not a

chronicle of Squadron Officer School's achievements; rather, it is a look at the "other sos."

The "other sos" is the Special Operations School at Hurlburt Field in a part of west Florida known as the Playground area. Hurlburt Field is officially designated Auxiliary Field #9 of Eglin AFB, which somehow implies that the activities there are connected with the Air Force Systems Command's functions at Eglinmain. In fact, Hurlburt is a Tactical Air

THE OTHER SOS

LIEUTENANT COLONEL H. C. SHALLCROSS



Command base, managed by the 834 Tactical Composite Wing (TCOMPW), and has the responsibility to organize, administer, train, and operate forces in the conduct of Air Force Special Operations. It also acts as the USAF focal point for Air Force Special Operations matters. The Special Operations School, part of the 834 TCOMPW, not only assists the wing in training its forces but also serves as a source for developing and evaluating doctrine to support its mission. (The 834 TCOMPW will be redesignated 1st Special Operations Wing on 1 July 1975.)

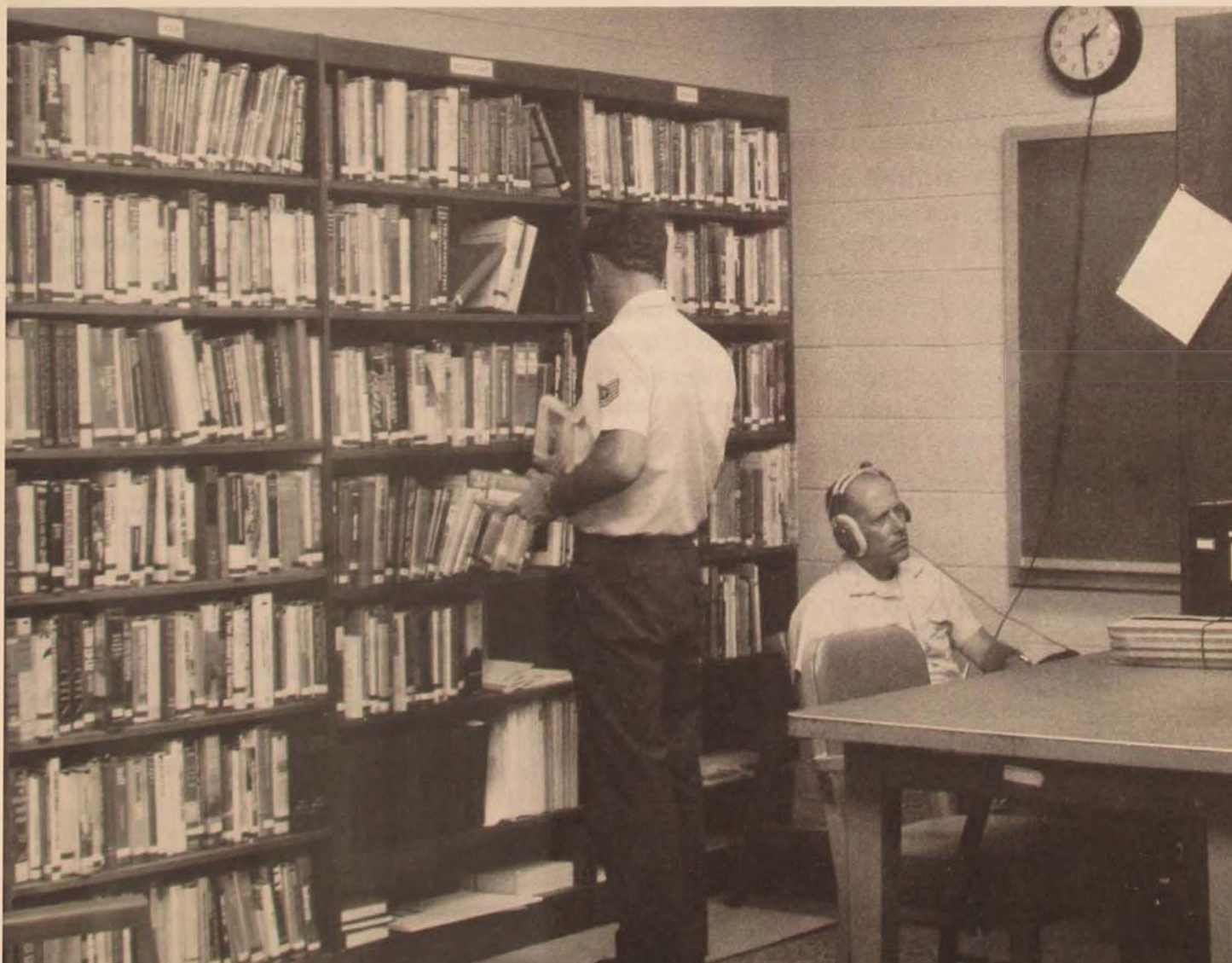
This other sos has been jokingly referred to by some of the staff as "TAC's Ivory Tower." Although that description

is not accurate, it does convey the notion that the school is not a tactics school in the usual sense but an academically oriented institution.

The sos catalog has the usual stuffy mission statement which says that the school is ". . . to provide selected personnel with a knowledge of the geographic, psychological, sociological, and military implications of . . .," and that is about as far as most people read. School catalogs are sterile instruments that rarely reflect a school's distinguishing character, guiding beliefs, or the nature of its instruction. What, then, are the springs that make the Special Operations School vibrate?

In Tactical Air Command's Special Operations School—the other SOS—at Hurlburt Field, Florida, the various courses are presented and achieved through group instruction in the lecture theater, the seminar discussion, and hours of individual study.





The commonality of the two sos's extends to their like origins within Air University, both having been spawned by AU at different times and for different purposes. The first was instituted to train and develop leaders for a fledgling Air Force, the second to meet the unique challenges of a new method of warfare. When "wars of national liberation" and "people's war" burst on the international scene in the early sixties, the U.S. military, from both the viewpoint of tactical doctrine and military forces, was geared mainly to fight either a World War II type of conventional war or an all-out nuclear war. In spite of the fact that our great nation had grown out of a revolutionary experience, we found the concept of political warfare to be an unsettling challenge. How to cope? How to respond? Those were the questions. Insurgency and counterinsurgency were *coined* as the labels to be affixed to the threat on the one hand and the solution on the other.

Many from the vantage point of the mid-seventies say that Khrushchev's 1961 "Wars of National Liberation" speech was directed toward the Chinese, who had accused the Russians of going soft on revolution. We overreacted to the nature of the threat, so say the critics of our Vietnam involvement, as we also did to Lin Piao's pronouncement on "people's war" in 1965. That statement, it is concluded, was to settle internal debate and to let other revolutionaries know (presumably the Vietnamese) that "self-reliance" would be the name of the game in the future. With 20/20 hindsight, much of the debate surrounding the efficacy of establishing special military forces to counter an insurgent threat may seem like so much rhetoric now. Nevertheless, the *perceived* threat during the early sixties seemed to justify unhesi-

tatingly a unique response to an uncommon challenge. The gauntlet had been tossed down; it was up to us to pick it up! Some alternative to thermonuclear war had to be found; thus the doctrine of flexible response and its corollary counterinsurgency, came into being.

The impetus for military response grew out of President Kennedy's direction in January 1962 to establish at the national level the Special Group Counter-Insurgency (CI). Among other things, this group was charged (1) to insure that subversive insurgency as a political-military conflict was recognized as being of equal importance to other forms of conflict; and (2), further, to insure that its threat was reflected in the organization and *training* of the armed forces, particularly among the more senior officers and service schools.

Three months after the implementing directive (National Security Action Memorandum #131, March 1962) was promulgated, the first Air Force Counter-Insurgency Course was conducted by the Air University's Air Command and Staff College on a one-time basis. By the fall of the same year, AU had been directed to conduct a regular Counterinsurgency Course for assignees to attaché positions to Military Assistance Advisory Groups and to the Second Air Division in Vietnam.

Meanwhile, the Special Operations Force concept was being developed at Hurlburt Field under programs known as Project Farmgate, Jungle Jim, and later the Air Commandos. This group and its subsequent evolutionary organizational forms, was charged with the responsibility for establishing counterinsurgency (COIN) doctrine, testing its concepts, developing the necessary hardware, and selecting the personnel needed to do the job.

To fulfill a training need, in October 1964 a Special Air Warfare Indoctrination Course (SAWIC) was inaugurated by the Special Air Warfare Center and was conducted jointly with the Air University and the Air Ground Operations School at Hurlburt Field. This course and the Counterinsurgency Course were destined to meet in the then evolving Special Operations Force's school by December 1966, when COIN training was transferred from AU to TAC at Hurlburt Field. Instruction in the SAWIC, renamed Southeast Asia Orientation Course (SEAOC), and in the COIN course was quite understandably slanted toward the conflict in SEA, particularly Vietnam. The SEAOC was structured for aircrews, whereas the COIN course was geared to the broader aspects of the political, social, and economic causes of insurgent movements in general and Communist insurgencies in particular. To build a broad philosophical base, as well as to enhance the prestige of the course, prominent members of the academic community, the State Department, various government agencies, and other military services helped develop the course and still lecture regularly in the COIN course. Over the years this approach, matched with a well-educated and experienced in-house faculty, has helped to produce a high degree of academic excellence. The COIN course's widespread recognition throughout the services as a professionally conducted one is a tribute to the dedicated efforts of scores of people.

As the conflict in Southeast Asia wound down, the thrust of the COIN course was shifted from the relatively narrow perspective of Indochina to the world at large. Understandably, today some analysts view the future of insurgent movements with skepticism. Chalmers Johnson, in his book *Autopsy on*

People's War, makes a strong case for the demise of revolutionary warfare while at the same time allowing that ". . . some staff officers of Western 'Special Warfare' schools, will find it impossible to agree that an autopsy on people's war is as yet appropriate."

Realistically, we must admit that dissatisfaction among the people of the world is on the rise. Urban guerrilla movements are replacing peasant-based insurgencies. When one looks around the world today he finds much fertile ground to nurture the seeds of revolutionary warfare, which is without doubt a potent force in the human experience. The Communists believe in the inevitability of revolution; that is the message of their slogan, "Long Live the Victory of People's War." It is the nature of history, in their view, and deserves our continued study and attention. As we examine the potential trouble spots throughout the world, we find that the future is not very bright. It is true that some lesser-developed countries (LDC's) are making economic progress, but it is at a rate slower than that of the industrialized nations. The gap is widening, not narrowing. The factors that exacerbate internal strife—inflation, hunger, deprivation—are increasing throughout the world, not diminishing. And modern technology has placed the weapons of war—automatic rifles, hand-held missiles, etc.—within easy reach of dissident groups. These are the themes, the problems, the conditions that continue to be examined in detail in the COIN course.

Since its inception, the COIN course has graduated more than 6000 students. Formerly, most of them were senior officers and middle managers who were on their way to Indochina. Now most are junior officers who are scheduled for Special Operations organizations, intelligence, or

similar assignments requiring a knowledge of counterinsurgency. This trend reflects a changing emphasis as priorities are reassessed and experience levels shift.

JUST how well has the COIN course succeeded over the years? There is no precise means of proving that its graduates better understand politically motivated and psychologically sensitive warfare as a result of their attendance or that they are better prepared to counter the threat. There are few specific facts or statistics to show that those attending the course are more aware of the goals and aims of insurgents and the problems inherent in transitioning societies. There is little empirical evidence to support the belief that individual attitudes have been changed one way or the other. Nevertheless, the sos faculty believes that as a forum for debate, a vehicle for study, a medium for the exchange of ideas on the subject of insurgency, it has been a useful experience and must be kept alive and viable within the Air Force framework of education for its officers. We may be sanguine about the future in the light of our disengagement from Vietnam, but a backward look at civilization and human experience does not provide us with the evidence to justify such optimism. It is unlikely that man has finally decided to settle differences through reason, compromise, and an honest respect for differing opinions. The record of history just does not support that view.

Nevertheless, some things do change. One change has been a clear-cut decision on the part of the United States to lower its military profile throughout the world and pursue a policy of encouraging self-reliance in our security assistance pro-

grams to the third world. In keeping with the changing world situation and U.S. foreign policy, sos was tasked in 1971 to develop a Military Assistance Advisory Course (MAAC). This course grew out of a recognition by the Air Staff that security assistance assignees en route to Military Assistance Advisory Groups (MAAG's) and Military Groups (MILGps) would be more effective with additional specialized training. (Previously this type of training was given by the Military Assistance Institute, Department of Defense, but was discontinued in 1968.) The MAAC was created as a two-week course, offered ten times per year, to be mandatory for all USAF personnel in the grade of colonel and below en route to MAAG's, MILGps, and military missions. The course strives to assist an adviser in developing motivation, acquiring cultural sensitivity, learning about his country of assignment, and knowing the technical requirements of his job. It is the school's contention that today's ambassadors in blue, whether they be sergeants or colonels, will be better representatives of our country than they have been in the past. Increasing demands are placed upon our people to operate effectively in a foreign culture. Consequently, instruction in the MAAC includes not only the security assistance system, its technical programming aspects and procedural details, but also an extensive geographical area and individual-country orientation with special emphasis on how to interact with host country counterparts.

It is recognized that there may be honest and legitimate differences of opinion regarding the best training to be provided a future adviser. Most frequently, selectees to these important jobs are picked on the basis of their proven ability to perform well within the framework of the U.S. military system. But

What kind of background does not necessarily provide him with the best experience to operate well within his host country's military establishment. The judgments on the subject are mixed, the results inconclusive. A recent RAND Corporation study on the subject of U.S. Security Assistance stated:

Whether the challenge of developing adequate manpower for the management of Third World security assistance can best be met by existing institutions within the military establishment or will require new service schools and special training assignments overseas is an organizational question that cannot be easily answered. But just as tailored defense postures and military aid programs are required, specially-tailored training is also needed.¹

It is just that kind of tailored training which the Special Operations School is attempting to provide. Thus far, more than 650 students, including Army and Navy personnel, have attended the MAAC and have been assigned to more than forty countries. Because of the role military attachés have in countries that have no MAAG's or MILGps, these assignees have been attending the MAAC also, and the future of the MAAC as a valuable course for attachés seems well established.

The next course that was added to the expanding course offerings of SOS was the Unconventional Warfare Course (UW). Historically, UW has been a pretty nebulous term, having been defined very broadly at times and very narrowly at others. Unconventional warfare operations, as defined by the Joint Chiefs of Staff, involve:

A broad spectrum of military and paramilitary operations conducted in enemy-held, enemy-denied, or politically sensitive territory. Unconventional Warfare includes, but is not limited to, the interrelated fields

of guerrilla warfare, evasion and escape, subversion, sabotage, direct-action missions, and other operations of a low visibility, covert, or clandestine nature.²

While UW operations are not confined to low-intensity conflicts and may be used at any level of warfare, they are perhaps best suited in areas requiring limited engagement options. Unconventional warfare is almost exclusively a joint venture, and the role of the Air Force in a UW scenario is to infiltrate personnel, resupply long-range patrols, locate targets for air strikes, and support psychological operations.

SOS developed its one-week UW course in response to Air Staff direction and first offered it in October 1972. Designed primarily as an orientation for those assigned to UW contingency planning positions at various staff levels, the course is presently the focus of USAF unconventional warfare expertise. The curriculum includes historical background of UW, national policies and command responsibilities, U.S. military and paramilitary activities, and responsibilities of different services and nonmilitary agencies in the fields of subversion, evasion and escape, guerrilla warfare, and psychological operations. The course uniquely serves as a forum for the advancement of new UW concepts, as a means of exchanging ideas, as an opportunity for the refinement of doctrine and tactics, and, most significantly, as a means for the resolution of real world UW planning and operational problem areas among students from the unified commands as well as from the different services.

A recent addition to the SOS curriculum is a three-day orientation course provided for personnel en route to assignment in Iran as part of a Technical Assistance Field Team (TAFT). Because of

the unique status these team members will have in assisting the Iranian armed forces in their modernization and expansion program, some culture and country orientation was necessary. TAFT members are assigned to more than 15 bases in Iran, a country about the size of the U.S. east of the Mississippi and having extreme ranges in geography, climate, and development. During the three days these students are at the school, they are treated to a rather intensive exposure to Islamic religion, Muslim culture, and Persian history, as well as the customary instructions on "what to bring," "how to get along," and "what the country looks like." The results of this type of orientation have already paid dividends in the reduction of "culture shock" and friction within the alien environment, better working relationships with the Iranians, and increased productivity by Americans. Recently the course has opened its doors to Army and Navy personnel, who have given, along with Air Force assignees, their wholehearted support to the program. As of the second annual training cycle that ended in August 1974, more than 450 students have attended the TAFT/Iran Orientation Course.

In this respect the SOS is making a significant impact on the whole security assistance concept by helping to train these teams, whether they be short-term Mobile Assistance Teams or longer-duration Technical Assistance Field Teams. Clearly, under current U.S. foreign policy, the emphasis is to provide limited assistance, expertise, training, and materiel. These teams offer a unique capability to pass along advice, assistance, and skills that can be used to train a host country's forces in civic action roles or operational tasks such as upgrade training on new equipment, as in the case of Iran, or using U.S. military hardware.

In order to satisfy a long-felt deficiency in the Air Force's arsenal of weapons, SOS has recently developed a psychological operations course which began in January 1975. PSYOP is designed to influence the opinions, emotions, attitudes, and behavior of friendly, uncommitted, or hostile foreign groups to achieve support of national objectives. Many view the Air Force's role in PSYOP as merely a delivery system for leaflets and aerial broadcasts; however, this is an oversimplified, uninformed approach to what can be done in this area, especially in the light of what has been done in recent years in the field of behavioristic psychology and the use of mass media to influence public attitudes. Regrettably the failure to appreciate the power of psychological operations as a valuable adjunct to waging conflict has been a serious omission since warfare began. In this new intensive week-long course, the school hopes to explore human motivation and behavior and techniques for psychological manipulation ranging from propaganda to psychological actions. The PSYOP capabilities of the other services will be studied, along with the theory and practice of Communist psychological warfare and the application of psychological operations to all forms of conflict.

An ambitious undertaking in the time allotted, the course is not primarily designed for the handful of USAF PSYOP specialists serving in a limited number of Pentagon and Unified Command assignments. Instead it is aimed at officers in the fields of special operations, intelligence, military civic action, and plans. Through exposure to this course, they should more fully appreciate the psychological impact of *all* military actions and thus be able to magnify the results of future military actions through the skillful use of psychological operations.

sos is one of the few places in the Air Force that has benefited from the Area Specialist Program inaugurated a few years ago. This resident expertise permits the school not only to support all the catalog courses with quality instruction on all the geographical areas of the world but also to have an on-call capability to support area orientation for training teams and for meeting other specialized requirements.

We now see the world as much more complex than we did after World War II when we divided the world into "them and us" on the basis of ideological alignments. The world is comprised of many countries with varied cultures and different historical traditions, interests, and values. Each problem demands a much more sophisticated and specific approach than in the past. Area and country orientation, to include an appreciation for the differences as well as the similarities of other societies relative to our own, can contribute significantly to our overall objectives in the security assistance program.

WHICH way is the "other sos" headed in an era of austerity and changing priorities? First, its doors remain open for interested personnel who meet the prerequisites listed in AFM 50-5 to attend its courses. Next, in an age when technology alone is thought to be the solution to all

dilemmas, the "other sos," like Air University's sos, concentrates on the human element, seeking to show that well-trained people are equally as important as sophisticated weapon systems. In a period of recrimination and despair over the Indochina conflict, sos seeks to distill the lessons learned and reaffirm the premise that revolutionary warfare is essentially political and therefore must be dealt with in those terms. In the process of readjustment of missions, sos seeks to preserve a cadre of expertise to train personnel to counter low-intensity operations, specifically unconventional warfare and foreign internal defense operations, in the event such operations will be needed in the future. Faced with the trend toward substituting resource managers for field advisers, sos hopes to provide assignees to the military assistance program with a broader view of their role in furthering U.S. objectives. Rather than be content with the status quo, sos, as part of the TAC team, continually looks for new ways by which it can keep the curriculum dynamic and fully utilize its faculty's expertise to contribute uniquely to the Air Force's mission, as in the example of the new psychological operations course. In all endeavors sos seeks to give meaning to its motto: "Strength Through Knowledge."

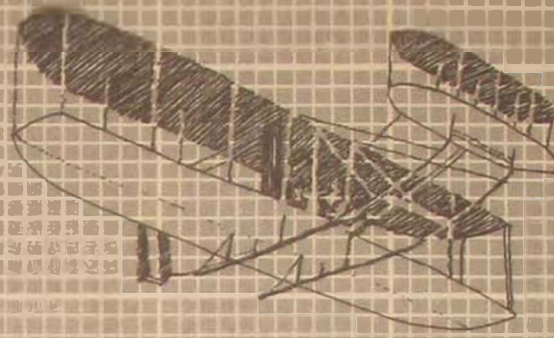
Special Operations School

Notes

1. Guy J. Parker et al., *In Search of Self-Reliance: U.S. Security Assistance to the Third World under the Nixon Doctrine*, The RAND Corporation, Santa

Monica, California, June 1973, p. 63.

2. Joint Chiefs of Staff Publication 1, *Dictionary of United States Military Terms for Joint Usage*, Washington, D.C., 3 September 1974, p. 345.



EVALUATING MILITARY RESEARCH AND DEVELOPMENT

MAJOR WILLIAM D. SIURU, JR.

IN 1907 the Army Signal Corps asked for bids for a flying machine. The one-page bid covered everything from how to make the drawings to what the minimum performance should be. On a specified day, the competing craft were to be brought to Fort Myer and demonstrated to the customer. The Wright brothers won the contract to supply an "aeroplane" and signed a simple one-page contract for its delivery. Evaluation of research and development was quite simple: Did the end item work?

Today evaluation of R&D is not as simple. Most projects are so complex that they take years and often millions of dollars to complete. There are more problems than there are people, money, and time to solve them. Many R&D programs are focused on systems that will not be operational for years and then may bear little resemblance to the original concept. Other technology may be advancing toward a system that will be canceled along the way. Today the Air Force manager of research and development faces an enormous challenge in attempting to insure that limited resources are used most efficiently to give the greatest payoff. To meet this challenge, the R&D manager must become a master of the art

and science of research and development project evaluation.

Out of any research effort come many things—technology, data, information, hardware, and results. These are accompanied by problems—technical, schedule, and financial. It is the job of the R&D manager to appraise this output against some list of criteria that includes the original objectives of the research undertaking and the value of the research results versus the resources invested. He must also determine if the results will be available on time and will not duplicate the work of others. He must know if what is being done has relevance to future military needs and systems. This "output against criteria" appraisal, then, constitutes research and development evaluation. Now let us look at the whys, whats, whos, and hows of the evaluation process.

Why evaluate?

The research and development cycle, from an idea to an operational aerospace vehicle, is long, costly, and filled with pitfalls. The job of the military research and development community is to develop aerospace systems for the various fighting commands, systems needed to maintain and improve the United States' military posture. As part of the R&D establishment, the research laboratories are given the job of translating basic research results and fundamental technical ideas into proven technology that can be used in future systems with minimum risk. Also of importance is the laboratories' responsibility to assist technically in solving problems with weapon systems under development and even those already in the field. Thus research projects must be reviewed continually to insure they are progressing on course to desired

goals and are obtaining benefit from every bit of knowledge available.

It would be nice to be able to solve every technical problem that comes along and pursue every technical breakthrough. But this is impossible because in the Air Force, and for that matter in the entire technical community, there is a resource shortage. Today the shortage is acute, with inflation, reductions in defense money, and people cutbacks all taking their toll. Coupled with this is the fact that today's technology is so complex and costly. Therefore, in miserly fashion, the various levels of management must constantly insure that resources are being spent in an optimum manner. The biggest challenge is not whether a particular technical problem can be solved but whether we can afford to solve it.

Besides watching the financial picture, managers must take a hard look at each project and ask themselves the following questions:

Is it progressing to the objectives set?

Will the results be ready on time?

Have the needs and goals changed?

Do the projects reflect the changes?

Are we duplicating someone else's work?

Can someone else be helped by doing a little more—perhaps another test condition or a minor change in approach?

Have all pertinent technology advances been included? Have we looked recently?

Are we reinventing the wheel?

Evaluations must be made by management to get an overall view of laboratory operations. First of all, to get an insight into the future. When long lead-time items, like facilities, are involved, they must be identified and budgeted many years in advance of actual need. Also needed is an insight into where major

breakthroughs must be made before a piece of technology can advance to a usable stage. Management must look over its entire program to establish priorities based on a relative comparison between competing needs and programs. The management must also be sure the laboratory is covering risky but critically needed technology with options, alternatives, or backup programs.

While the main function of a military laboratory is to develop particular items of technology to satisfy future system requirements and to help solve today's critical problems, the laboratories must also maintain and improve the level of technology in its general area of responsibility. This will assure that the laboratory will be able to solve new problems when they occur. Such things as developing tools, like computer models and experimental equipment and techniques, are important. Also time and resources to cultivate new ideas must be allotted. Within the entire laboratory's budget, some new ideas with great potential must be pursued, even if now there does not appear to be any established end use. The whole laboratory operation must be evaluated to be sure that in the zeal to solve today's problems the future has not been forgotten.

Who evaluates?

Research and development is evaluated at all levels of the military command structure. However, at each level the method and scope are different, since each level's objectives are different. At the higher headquarters level, i.e., DOD and the service headquarters, the need is for only key information over a broad area. Their evaluation is concerned with the overall scope of applicable research and development; for example, total re-

sources and overall trends. The staff officers have too many projects to monitor to spend a great amount of time on the day-to-day problems or the technical details of any one project. These managers are concerned with achieving the proper balance in the total research program and seeing that all the various individual research efforts are properly integrated. However, they sometimes see the need to evaluate a particular area in greater detail, especially when a technology area becomes vital to a particular mission capability or when a breakthrough occurs that has some major implication or future capability.

Within the laboratory, each laboratory commander or director is responsible for the total research program in his laboratory's area of interest. This responsibility means not only millions of dollars in funds, hundreds of people, and upward of billions of dollars in facilities but also the responsibility of assuring that research programs are responsive to military technology needs. Whether it be "signing off" a purchase request or the entire technology plan of his laboratory the commander and his staff must base their decision on a sound evaluation. Once projects are under way, evaluation must continue.

At lower levels of laboratory management, evaluation is really another word for good management practice. Because these managers are closer to the individual efforts, they can sift out the "soft" projects before they are proposed to the boss. These soft projects might be too faint, too risky, or too expensive. Because lower-level managers have fewer efforts to track, they can keep abreast of day-to-day progress.

Outside the laboratory's chain of command, many other organizations are constantly evaluating the laboratory's tech-

nology programs. These include the operational organizations that want to know what they can expect in the way of available technology so that they can formulate realistic system requirements. The organizations developing military systems review laboratory programs to see what proven technology items can be included in the systems they plan and develop to meet the user's needs. Finally, there are many advisory groups that can make, hopefully, unbiased reviews and critiques of laboratory operations. These groups, if appropriately picked for their expertise, can provide valuable assistance to the laboratory manager or for higher headquarters' evaluations. The important thing is that there be a sufficient amount of evaluation that includes both broad views and critical detailed searches.

Up to this point we have neglected the key person in the evaluation, the project engineer or scientist. This omission has been intentional, since we want to dwell more on his role. The project engineer is so important because it is he who either does the technical work or directs the progress of others. In other words, he is the one who produces the results that the others evaluate. Furthermore, he has the important function of communicating results and progress. Finally, he is the expert on a particular technical subject, so he can best evaluate breakthroughs, plan the next step, and identify insurmountable problems. At this point, it is appropriate to mention the project engineer's role with respect to contracted research. He is a contract manager or technical director, not merely a "contract monitor." The project engineer uses evaluations to find out what is going on and, based on evaluations, takes action by reporting to higher managers, or by directing others to do something, or doing something himself.

Unfortunately, the project engineer is often too close to the problem to put it in its proper perspective. Therefore, periodically, higher levels of management must evaluate all projects critically and weed out worthless, costly, or unneeded efforts and must insure that the approach for each project is the best one to reach the final goal.

What is evaluated?

The projects for which the laboratory is responsible get the most intensive scrutiny. These are the contracted and in-house efforts for which the laboratory is supplying its funds, people, and facilities. But there are other technical efforts that laboratory personnel must review and evaluate—granted more informally and passively—as part of their job. These are the efforts under the auspices of other organizations that have a bearing on the laboratory's technical areas. They must be reviewed on a continuing basis to benefit from their results and to prevent duplication. These corollary efforts include:

- Independent research and development (IR&D)—research by contractors funded by the government but not directly controlled by it. Nevertheless, our laboratories periodically evaluate the IR&D, providing guidance as to the most relevant areas for the contractors to pursue and assistance in picking the optimum approach.
- Research pursued by other military laboratories.
- Research under way within the sister services and NASA.
- Other research, usually more basic, conducted by universities and research institutes.

When to evaluate?

The evaluation of research and development has to occur on a continuing basis: (a) before a project starts, to insure that approaches are sound, results are achievable, and there will be a usable payoff at the end; (b) while the project is under way, to make sure it is on track; and (c) finally, at completion, to assure that goals are attained and results get into the hands of the users, and to determine what is the next step the technology should take. However, evaluations should concentrate on the first two periods, since at the end of the effort not much can be done. In reality, technology planners must lay out programs several years in advance and thus must extrapolate results before a program is completed.

All levels of management, from the project engineer overseeing the work at a contractor's facility to the headquarters staff officer, should recognize that evaluations are a management tool and not an end in themselves. It is very easy to ask for so much information in the form of briefings and reports that the people doing the work have little time to make progress. Therefore, considerable thought has to be given to planning an evaluation scheme that provides timely information with a minimum of interference to technical progress.

Evaluations can be divided into two types: first, those that can be scheduled, or the steady state operation; and second, the unscheduled evaluations, or the perturbations on the steady state mode.

A look at the scheduled evaluations shows that a logical planning of evaluations can and should take place to coincide with the budget planning cycle. Each laboratory must decide annually the programs it will pursue in subsequent fiscal years. This planning is usually

firmed up in some type of formal planning document. The plan is usually completed a year before the fiscal year during which the funds will be spent and the work actually done. To complete this plan, the laboratory manager, with assistance from his staff and operating divisions, must concentrate on evaluating the validity of future projects, scrutinizing them for their technical feasibility and their relevance to the overall laboratory mission. However, since these new programs are usually based on previous ones, current and even completed programs also are looked at during the planning cycle.

Through scheduled evaluations, the manager can find out what is going on in his current programs. Therefore, at least once a year, he should look at each program for which he is responsible, emphasizing the technical results and the progress toward planned goals. These evaluations are called, for example, "project reviews." On down the organization hierarchy, the evaluations should become more detailed and occur more frequently. They also become less formal, and if the group is small enough the evaluations can be eliminated if the manager has a day-to-day knowledge of all his project engineers' efforts.

The important thing here is that, except where the supervisor can get intimately involved in all his subordinates' projects, *all* projects get a periodic review. While evaluation or management by exception (that is, leaving a project alone until something abnormal occurs) might work in a more routine situation, it should not be the mode of operation in the research and development environment because:

- The technical workers are so close to the project that they might fail to see where the potential problems are, the

nonoptimum approaches, or the significance of the results.

- Some people will not report on what they are doing unless asked.

- More experienced people, especially those with broad backgrounds, can help relate results to actual needs, prevent duplication, and point out poor approaches.

- Just the requirement to explain this project and results can force the project engineer to think out his ideas in a more detailed fashion.

- Periodically required reviews prevent something from "falling through the crack."

From an efficiency standpoint, it would be nice to be able to operate under the steady state mode, but in the real world this is not possible. Many things can happen that force us to re-evaluate a laboratory's technology program. These outside perturbations usually have several things in common: they usually require urgent responses, are not predictable, and could have a major impact on a laboratory's plans and programs.

For example, a weapon system toward which a laboratory's technology efforts are aimed may undergo a major redirection. It may require a change in technology, may be given a higher priority resulting in a speed-up of the supporting technology efforts or a substitution of less risky technology items, or it may be canceled, requiring the laboratory to change the direction of related programs or to delete them also.

A cutback in personnel or laboratory budget may require a review of where the cuts can best be made. An unexpected technical breakthrough may necessitate a change in emphasis to exploit the breakthrough fully. The converse of

this is an unattainable goal requiring reduction of emphasis in the particular technical area and perhaps an added interest in another option. Before any decision can be made, the responsible manager has to make an evaluation. Because of the short time involved, the project engineer and his immediate management must have information at hand so that a timely and complete evaluation can be made.

How to evaluate?

Now that we have established the whys, whos, and whens of evaluation, we come to the most important and difficult part: how. This part is so difficult because

- end results are usually very difficult to define, if indeed they are even known. Often not enough is known to be able even to establish realistic goals.

- military research and development environment is subject to so many perturbations that cannot be foreseen.

- we may not even know where technology will be used.

- the most important results of an effort may be not what was originally intended but something that was discovered along the way, i.e., spin-offs.

- there is no realistic yardstick to use to measure a technology program.

- comparison of planned and actual schedules and resource expenditures does not tell the entire story; it measures only the input.

- it is difficult to measure brain-power, general knowledge, or expertise, that is, the ability to solve the next problem.

Attempts have been made to mechanize the evaluation process. Mechanization schemes usually involve definition of criteria, preassignment of weights to each

of the criteria, scoring each phase of a project against the criteria, and then looking at the resulting score and comparing this against a perfect score. While this looks like an ideal method of making a very subjective topic more objective, mechanization of evaluation is filled with pitfalls. First of all, establishing the criteria-weight relationship is very difficult, if not impossible, since every project is unique. It is quite easy to assign weight criteria and then score such things as timely reporting, quality of reports, meeting of schedules, and number of financial overruns. But how do you score the technical results? With a mechanized system with preassigned scoring factors, a timely, well-presented, and well-reported project that was completed within project costs and that met stated objectives that were ill-defined at the program onset could receive an A-number-1 score even though the results were mediocre and had little actual usefulness.

However, the history of technology is filled with engineers and scientists who got a project and really "ran with the ball," inventing new concepts, exceeding planned objectives and goals, and making significant contributions to increasing military capabilities. Because of the expanded scope of the project and the enthusiasm of both the investigator and the users, more resources were spent than planned, schedules were slipped to allow more work to be done, and results spread to the final users as they became available; so any final report was anticlimactic and probably late or poorly presented. Under a predetermined evaluation scheme, this latter effort would probably score poorly in comparison with the project first discussed. Yet in the real world, the benefit from the latter project might be an order of magnitude better than that from the first project.

Finally, in mechanizing the evaluation scheme, we could spend too much time in determining the criteria weight relationships and in trying to put numerical values on the various parts and results of the work—time that could be spent more profitably in judging progress and results against the real world environment and in directing the effort to obtain the maximum payoff.

The message is simply this. Mechanization of the information needed for the evaluation is a worthy objective, allowing timely and readily available visibility to the evaluators. The actual evaluation is a human activity.

Evaluation requires experience, depth of technical knowledge, an understanding of what is going on in the military and the R&D community, and sometimes merely a gut feel. These are things you cannot leave to inexperienced people, and you cannot program them on a computer.

Imperfect as they might be, some criteria must be used for measuring technical progress and value received from resource investments. These criteria can be divided into two types: technical goals and objectives, which are hard to measure; and efficiency of resource expenditure, which is somewhat easier to determine.

Objectives and Goals. The results of any of our laboratories must be judged against the long-range objectives and goals of the users of military systems. The goals for each technical area and individual project must be consistent with the overall laboratory goal. In establishing the objectives for a technical effort, we should consider certain things so that measurement of attainment of the goal is made easier:

- The objective should say what

to be achieved and not how it will be achieved.

- The objective should be a clear-cut end point, one that is obvious when it has been reached. A go/no-go criterion is ideal.

- Accomplishment is more easily measured for a quantified objective, that is, a numerical value like a rocket engine specific impulse, a unit cost for a guidance system, or the resolution of a remote sensor. The quantified objective allows the evaluator to determine how close he came if the original goal was not achieved.

Resources and Schedule. At the start of any project, the project engineer must forecast how long it will take to reach the goals and how many dollars or man-hours of effort we have to be consumed. These estimates should be realistic, requiring the project engineer to know the objectives and the approach to be taken. Too long a period to do the job can be as bad as trying to rush the job. Research takes time if it is to have depth, but too much time can not only produce results for a problem that no longer exists but cause the people performing the work to lose interest. Inadequate resources can result in just skimming the surface of each subtask to satisfy the requirement that all tasks be completed. Too many people cause inefficiencies, and too much money is wasteful. Most R&D projects are endless and could be researched in infinite depth as long as there were people to work them or money to spend. The objective is to set aside only the resources needed to provide what is wanted by the user. Once time and resource expenditure schedules are set, it becomes a relatively easy job to evaluate these on some type of resource-milestone chart. A glance will show when a schedule is slipped or when money is going to run

out, and thus when the manager must take action.

Other Criteria. The other criteria are the real hard ones to be set, let alone evaluate. Evaluation of these is based strictly on experience and knowledge of the environment. A good R&D manager has a feel for this that often he cannot define. These criteria include:

- Relevance to the military mission. This requires the evaluator to have a broad understanding of what is happening outside his laboratory.

- Duplication. Not only must the evaluator know what he is doing but he must keep up with what others are doing.

- Soundness of approach. This comes from experience and technical competence.

- Cost/performance. In today's cost-conscious environment, an increase in performance has to be weighed in light of total systems cost, i.e., development, acquisition, and operation. Often to evaluate this criterion, a substudy must be performed to see what a few seconds of increase in rocket engine specific impulse or a few inches in resolution will cost over the entire lifetime of a military system.

- Resources expended/payoff. The resources expended in investigating a piece of technology make a relatively easy item for an experienced laboratory manager to estimate. The denominator is the hard one to come up with because it is often intangible, and the payoff is really unknown since an item of technology can have such a wide range of application. For example, the technology developed for valves and plumbing in a liquid rocket engine is now being applied to making railroad tank cars safer.

It is quite clear that the most valuable

tools of the evaluator are his awareness, experience, and knowledge. The most important part of the evaluation process is to get all the information needed to evaluate in front of the evaluator, whether he be the project engineer or the service secretary.

role of the project engineer/scientist

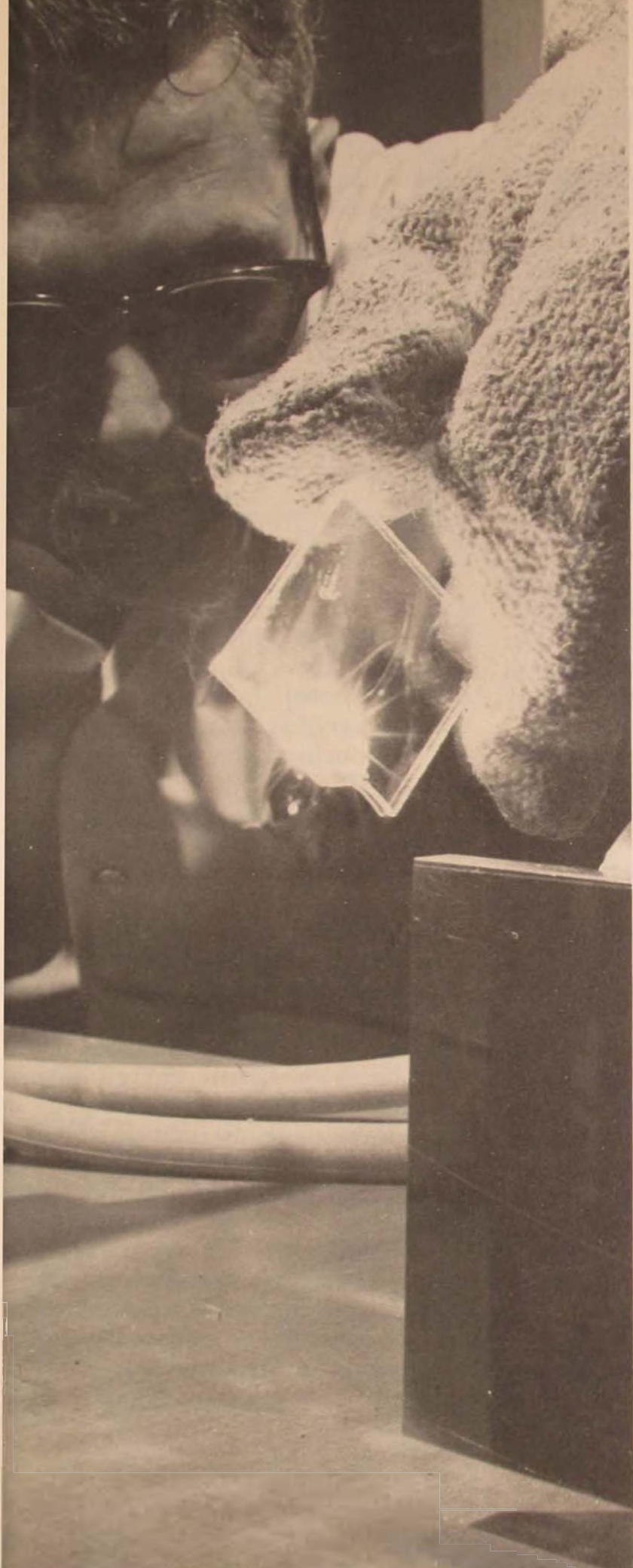
The project engineer or scientist is the keystone in the evaluation process, for it is with him that most of the information rests. He must efficiently obtain the information on which to base evaluations, and he is the one who presents it to higher-level managers.

The project engineer managing a contractual effort obtains his information through progress reports and visits to contractors. It is his responsibility to develop a rapport with the contractor so that he is constantly aware of what is going on in his contract. The project engineer must cultivate a relationship with the contractor whereby the contractor will honestly report progress and problems, will identify where judgment has been applied in interpreting results, where technical difficulties still exist, and what is the level of confidence in the accuracy of the results. To be aware of related efforts, the project manager must follow corollary projects in his own laboratory and with other organizations

working the particular area through visits, reviewing of the technical literature, and attending appropriate symposiums. The project engineer must also obtain an understanding of the system that is the end item where his project will find its application. In short, he must become *the* expert on his contract, for his knowledge forms the basis for all higher-level evaluations. On in-house projects the responsibilities are essentially the same except that now he is the one doing the research and preparing the reports and documenting the action.

THE EVALUATION of research and development projects is a very vital part of the military systems acquisition cycle, especially in today's environment of increasing technical complexity and dwindling resources. The R&D manager must become a master of the art of R&D evaluation. This is truly an art, since no "cookbook" formula has yet been developed to prescribe how to evaluate. Evaluation is based on experience, technical knowledge, and sometimes pure gut feel. The most important thing is to have proper information available to make the evaluation. Thus the project engineer, the person closest to the work, is the most important link in the evaluation process.

Air Force Rocket Propulsion Laboratory (AFSC)



Science Frontier

THE LASER
*its function
and its future*

MAJOR WALTER M. BREEN

ONLY time—and research and development—will tell the laser's future. What is certain, however, is that the laser already has been adapted to warfare and that predictable advances in the military applications of it are expanding.

Communication links having undreamed of data rates, laser radars (ladars) for ultraprecise tracking, and laser guidance systems for unparalleled accuracy of munitions delivery—these are only a few of many near-term military possibilities. To see where we are going in laser research and development, let's examine what lasers can and cannot do, so that we can more realistically evaluate their potential.

The laser name is an acronym for "Light Amplification by Stimulated Emission of Radiation," but technically the laser is an oscillator, not an amplifier; however, the "accurate" acronym was never adopted, for obvious reasons.

Actually, the laser is a generator of light, a very special kind of light that does not occur in nature without man's help.¹ It is emitted in only one frequency (e.g., "red" for a ruby laser—Figure 1), and all the light waves are coherent, that is, the wave crests and troughs occur at the same place. (Figure 2) The single frequency or wavelength is referred to as

Figure 1. The laser phenomenon is understandable with knowledge of the wavelike quality of light, represented by a wavelength, λ . The frequency is the constant velocity of light, c , divided by the wavelength, λ . Therefore, frequency, ν , is c/λ , and time for one wavelength is λ/c . A ruby laser emits light of wavelength 0.7 microns, which is red in color.

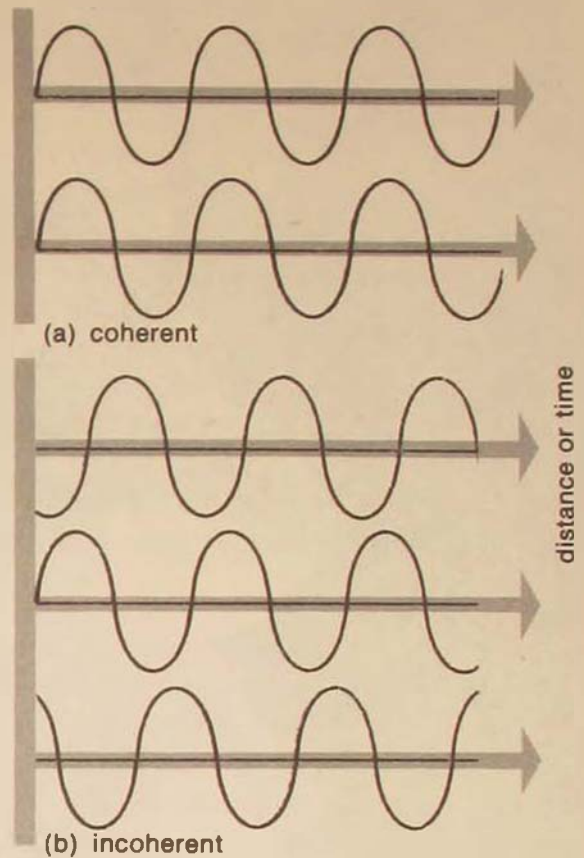
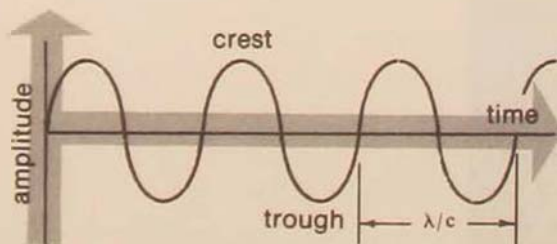


Figure 2. For coherent radiation, all the light waves are in step, as shown in (a). For incoherent radiation, crests and troughs of the light waves occur randomly in distance or time, as shown in (b). The spatial coherence can occur only for single-frequency light.

monochromatic (single-color) light.

The way in which this unnatural light occurs is based on discoveries in atomic physics made during the 1920s. It was found that, on a very small scale, matter could absorb or radiate energy only in certain allowed amounts. The energy in a light wave depends only on the frequency of the light wave; therefore, only allowed frequencies (or wavelengths) can be absorbed or radiated by atoms. This is why the light coming from lasers is radiated at such a constant frequency—only red from the ruby laser, for example. The coherent property of the light also depends on the small-scale behavior of matter.

Coherent light means that all light waves are "in step with each other." This is an important property of laser light and explains why it can transmit energy over great distances. This coherent light is produced in the laser by the "stimulated emission" part of the laser process. One light ray passing through the excited lasing material is the stimulus, and the light rays emitted by other excited atoms are generated in-step (coherently) because of the stimulus.

Lasers consist of a working material (either a solid, a liquid, or a gas), which does the actual lasing. The material is put into an excited condition just prior to the onset of laser action by a process most often referred to as "pumping." Typical pumping methods include flashlamp light, electrical discharge, chemical reaction, etc. Pumping adds energy to the lasing material to put it into an excited condition, also referred to as a condition of "inverted population."

For those lasers that "lase" by having an electron fall from the high-energy (excited) state to a lower-energy (stable) state and thereby emit laser light (Figure

Figure 3. The energy states of electrons in a lasing material. The pump puts an electron in state E_1 into excited state E_2 . When there are more state E_2 electrons than state E_1 electrons, conditions are right for stimulated emission (lasing), forcing the electron to stable state E_3 by emitting laser light of energy $h\nu$. (Note: h is Planck's constant, and $\nu = c/\lambda$ is the frequency of the light.)

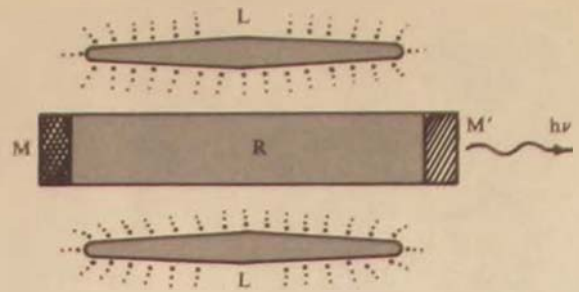
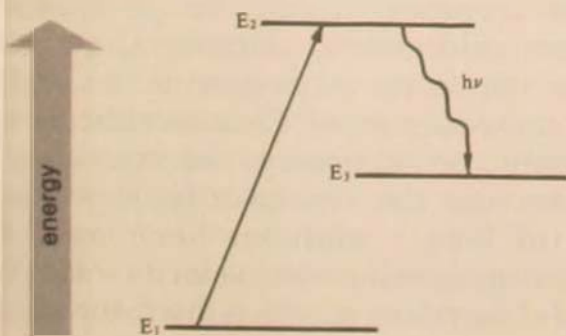


Figure 4. Laser schematic drawing. The lasing medium is a ruby rod (R). The pumping source is a flashlamp (L). End mirrors (M) provide multiple light paths to aid in stimulating emission of coherent, monochromatic light. Mirror M' is partially transmitting, and laser light ($h\nu$) exits the rod.

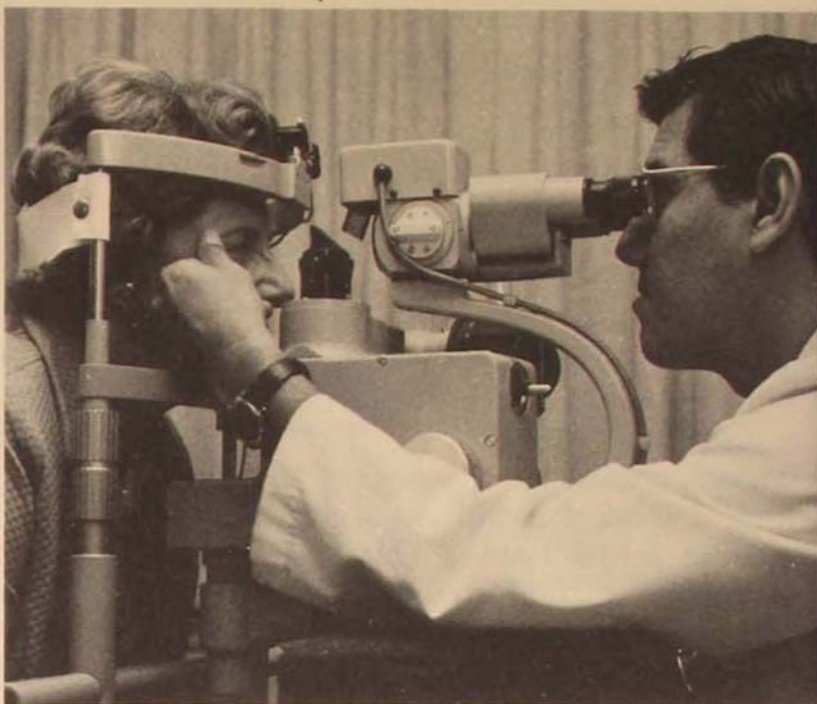
3), population inversion means that more electrons reside in the excited state than in the stable state. The excited electrons were put there by "pumping" them up there. Lasing can be started by a random electron falling from the excited to the stable state by the normal emission process. Stimulated emission or lasing commences for the other excited electrons as the light wave from the normal emission passes by.

As more light waves are emitted, the lasing process (stimulated emission) is accelerated. Mirrors, put on each end of the laser material, can further accelerate the process as each light wave is sent through the lasing material more than once. One mirror is partially transparent so that the light can escape and become the laser output. (Figure 4) The spacing between the mirrors is rather critical to the coherence property. An exact number of wavelengths must fit between the mirrors to retain coherence in the output beam.

The laser schematic shown in Figure 4 is a solid state laser (like a ruby rod) pumped by a flashlamp. The lasing material could also be a liquid or even a gas. Further, the output could consist of



A unique dual laser system is employed in geodetic satellite studies by scientists at the Air Force Cambridge Research Laboratories. A ranging short-pulse laser is housed in the lower left side of the mount; a long-pulse photographic laser is shown (upper right), as well as high-voltage and receiver components.



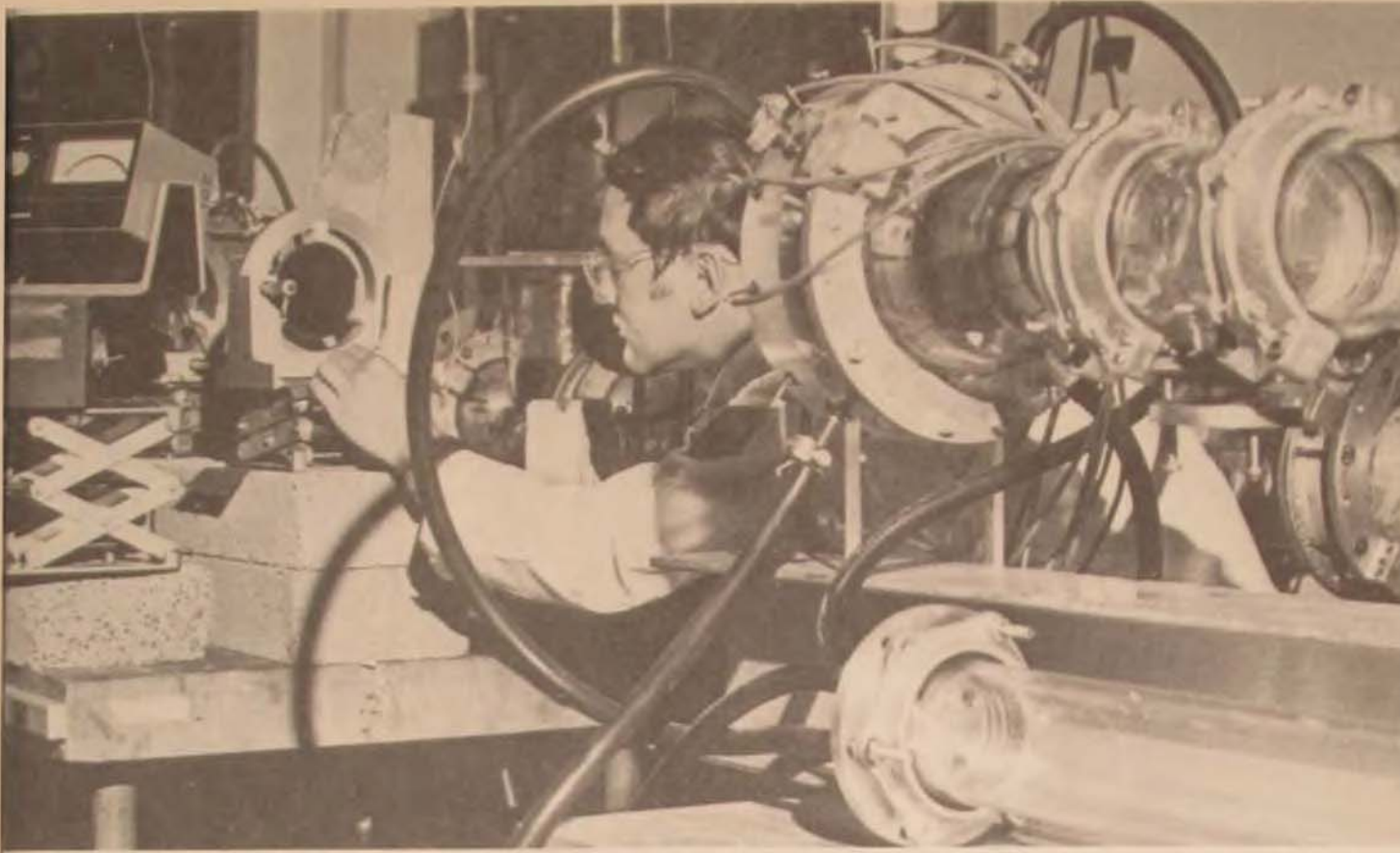
The argon laser is used in the treatment of detached retina and retinal hemorrhage at the Wilford Hall USAF Medical Center, Brooks Air Force Base, Texas.

pulses of light or be emitted continuously, depending on the laser type and design. Whatever the laser type or lasing material employed, all lasers operate basically the same way. The lasing material is put into an excited state, and, in its returning to a stable state by stimulated emission, coherent light is emitted.

applications—what lasers can and cannot do

Lasers are being used extensively in the fields of measurement, manufacturing, medicine, communications, computation, and warfare. In many instances lasers have improved established ways of doing things, while in others they have introduced entirely new and unique capabilities. The science of measurement (me-

trology), for example, has been markedly improved by the introduction of laser techniques. Scientists and engineers have used lasers to measure the characteristics of shock waves (Schlieren photography and holography²), to measure the extent of air pollution (with transmissometers), and to measure the unique characteristics of gases and plasmas (by spectroscopy). Distances have been measured with fantastic accuracy in laser range finders, radars, altimeters, seismographs, and even space-time experiments, to verify the consequences of Einstein's theory of relativity. So accurate is the laser that it has become the new basis for the standard of length and has been used to better determine the velocity of light itself. Lasers are routinely used for align-



A lab technician adjusts the mirror on an in-house laser at the Special Weapons Center and Weapons Laboratory, Kirtland AFB, New Mexico. It is a prototype electrical discharge convection laser.

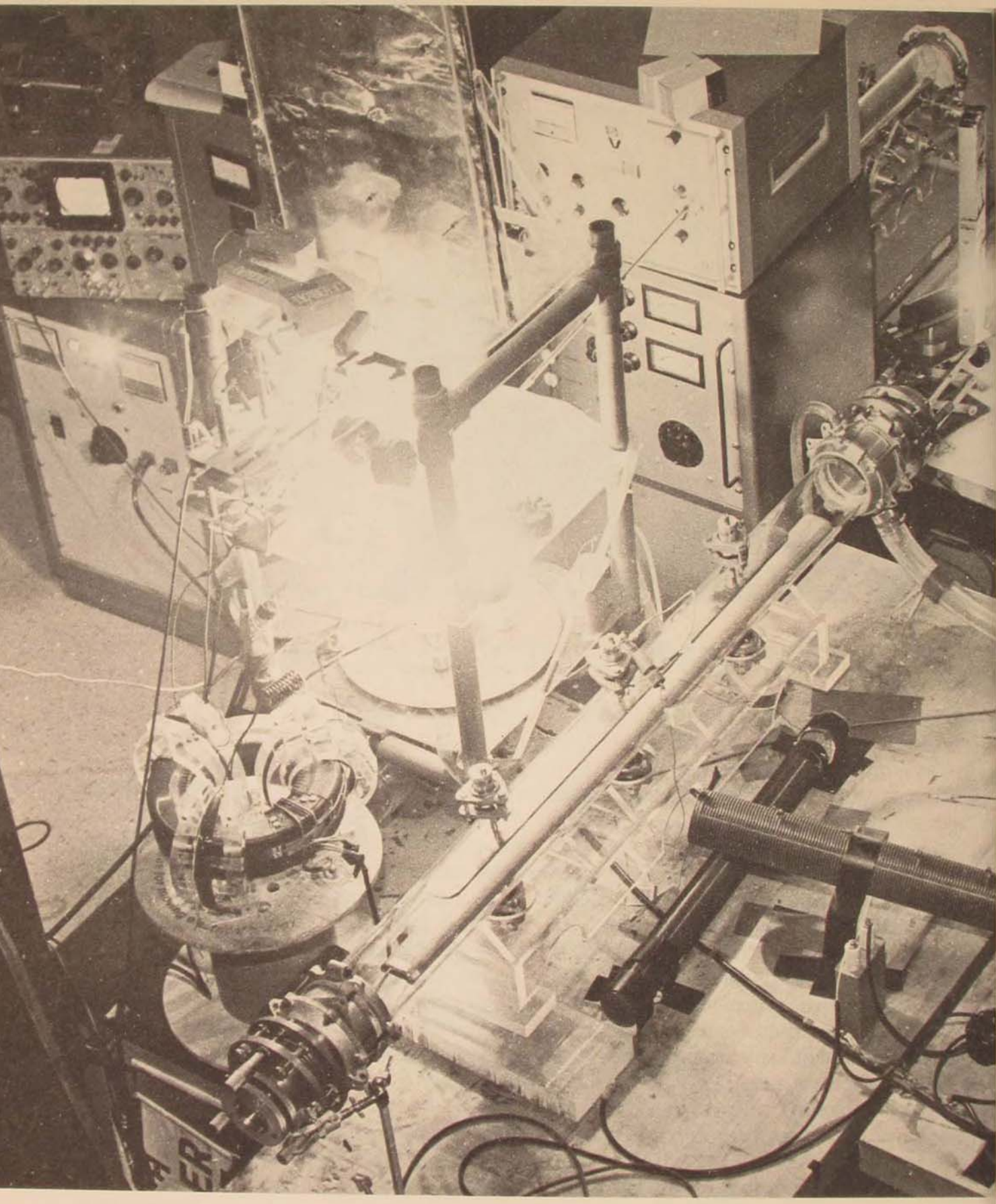
ment in tunnel mining; ring lasers can measure rotation on inertial platforms; and Doppler lasers can measure the velocity of moving objects. These new measurement capabilities have also been extended to the manufacturing field.

Lasers are used in the manufacture of several advanced technology components. Electronic microcircuits can be built and inspected for quality by use of laser techniques. Many metal parts with complex geometry have been cut, drilled, and welded by use of raw laser power. Precision holes can be drilled in hard alloys and diamonds. With automatic lasers, welds have been made much more

reliable, and gyroscope rotors have been dynamically balanced. Chemical compounds have even been modified by laser radiation. Manufacturing is continually finding new uses for lasers.

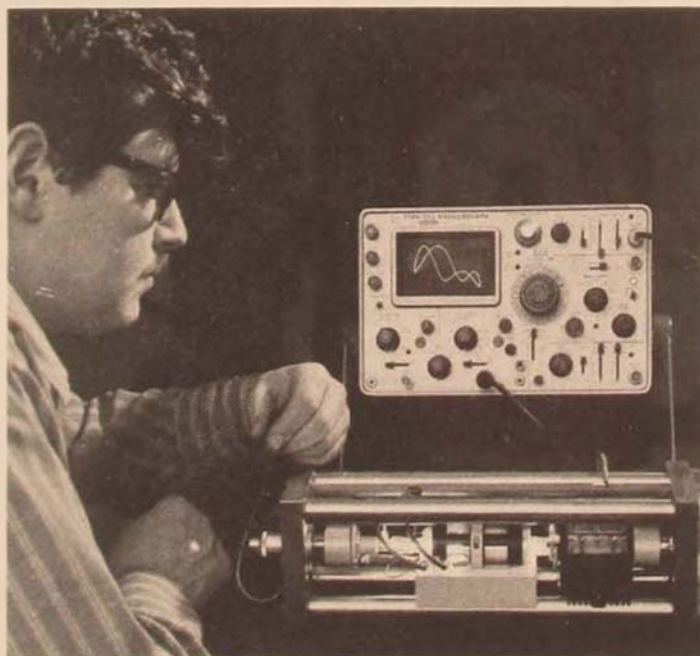
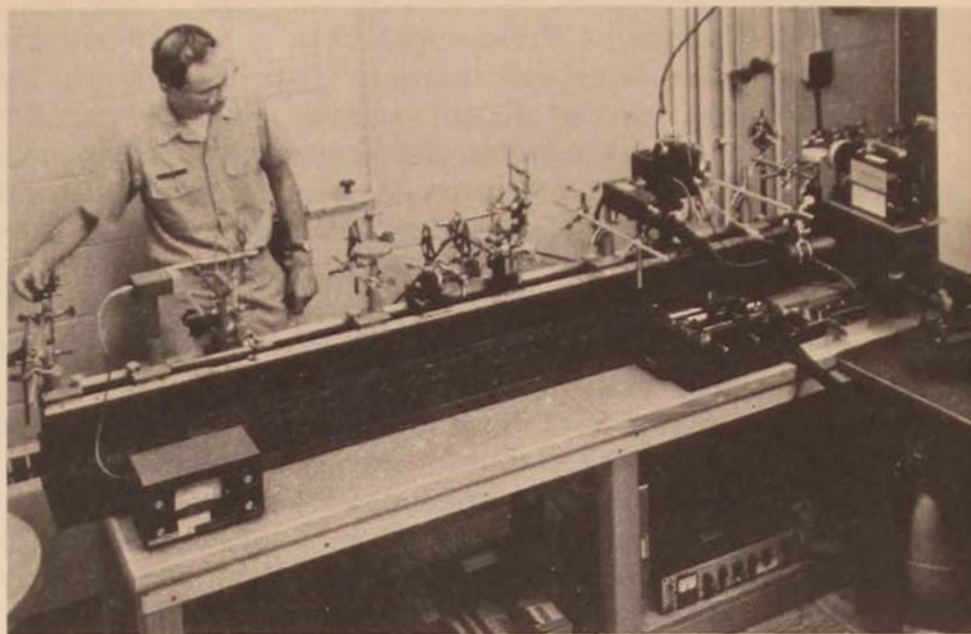
Medicine, too, has benefited enormously. Probably the best-known medical application of the laser is in eye surgery to repair detached retinas. Also used surgically as a bloodless knife, the laser light instantly cauterizes the cut. Small tumors in the eye may be cut out, wounds may be sutured, and small areas may be quickly disinfected. Dentists may soon employ a laser drill—painless, of course. Medical research into the very

Continued on page 66





A continuous avalanche ionization controlled carbon dioxide laser (opposite), developed in-house at the AF Weapons Laboratory for research in the stimulation of continuous fast-flow lasers fired by a series of 28 kilovolt, 50 nanosecond pulses, at 20,000 pulses per second. . . . A scientist (below) aligns instruments on a test bench for laser-induced damage studies that measure all important laser pulse parameters simultaneously. . . . A precision laser instrument (bottom) provides wavelength reference standard for fringe measurement.



foundations of life is being pursued by selectively destroying minute cellular structures in cytoplasm to determine their individual functions. Thus, the laser has become an important new tool of geneticists.

In the field of communications, the laser offers significant advantages as a carrier of fantastic amounts of information. Because of the compactness of its beams, the laser information transmission beam can be made narrower than radio frequency systems, thereby concentrating the signal at the receiver terminal for more effective utilization. Due to the high frequency of light waves compared with radio waves, vastly greater data rates are possible. At the 1973 Air Force Association convention, a manufacturer showed that a laser beam could transmit seven TV channels simultaneously. High data rates make the possibility of using laser transmitters and receivers in data relay satellites very attractive.

The computer engineer, too, can apply optoelectronics and fiber optics in high-speed computer design. Light transmission is being investigated to determine just how fast computers can be made to operate. As in the measurement of shock waves by taking three-dimensional photographs called holograms, holograms can also be used as memory storage devices in computers. Although the stored information can only be read out and not modified (a new hologram must be constructed to change the memory content), the readout process is exceptionally fast. It is done by focusing a laser beam on the desired section of the hologram, and information is extracted in two (or three) dimensions (if phase information is used) rather than the one dimension available in modern-day computers. This parallel readout capability challenges computer engineers to find ways to use the vast

capacity of holographic memories.

Military applications of lasers have only just begun but now are expanding. Perhaps the most publicized application has been laser-guided munitions. The idea of pointing a laser's narrow beam at a target (designation) and having a bomb home in on the target by sensing the reflected laser light (seeker) was applied in the Vietnam war with amazing success. Many families of laser-guided weapons were developed, including the initial Paveway laser-guided bomb system, the pod-mounted Pave Knife designator, both the Pave Spike and the Long Knife pod-mounted follow-ons to the Pave Knife designator, Pave Storm fragmentation weapons, laser-guided artillery, and even laser-guided air-to-surface and surface-to-surface missiles. In "Operation Linebacker, air strikes were launched with surgical precision against key North Vietnamese military transportation and supply targets, many of which had not been previously attacked because of their proximity to dense population centers or civilian-oriented industries."³

Another system proved in Vietnam was used to acquire targets. Known as Pave Arrow, Pave Sword, and Pave Penny, laser seekers were pod-mounted on a variety of aircraft to acquire targets for either visual or automatic weapon delivery. On the ground, laser systems were used for a variety of other military applications like range finding, satellite tracking, "flashlights" for sniper-scopes etc. Finally, in the area of communications systems, lasers are offering promise in line-of-sight communications and light radar (also called ladar).

the future

Laser applications appearing on the horizon will be even more astounding. The

search for new energy sources will depend quite heavily on lasers, as will medical research and new military systems. It may be possible in the near future to initiate the release of fusion energy by using high-energy laser beams. KMS Fusion, Inc., has a privately financed program to develop a system that does just that in a repetitive way, so that energy may be continuously extracted. If this effort bears fruit, and all indications are that it will, fusion reactors could be built to supply all the energy man would ever need, using a most plentiful resource, water, as the source of fuel. Although this approach appears to offer the greatest payoff mankind has ever had, if for some reason it does not work lasers may yet decrease energy costs by separating nuclear reactor isotopes more economically than present techniques do. Finally, lasers might someday transmit power across vast distances with little loss.

Through lasers, medical research can also be pushed into heretofore unknown realms. Recently it was discovered that laser radiation can alter the electrical

conductivity of the blood, a discovery yielding—ultimately—only God knows what. But hopefully applications of this principle may lead finally to a cure for cancer. In any event, the laser has clearly given the medical researcher a new tool to make life better for all mankind.

Nuclear weapon development may involve the application of lasers.⁴ If developed, this technique would lead to really "clean" nuclear weapons, capable of being used without fear of radioactive contamination from fallout. Troops could be moved into attacked areas within a short time. These clean nuclear devices would also have peaceful applications, of course, such as digging canals or dredging harbors.

Much has been accomplished in a very few years, and the outlook is bright for numerous spin-offs to come. It is clear, in any case, that the laser is telling us again that the science fiction of the past sometimes does become the scientific fact of the future.

DCS/R&D, Hq United States Air Force

Notes

1. The description given here of how lasers work is an abbreviated version of that given in a previous *Review* article: "Lasers," C. Martin Stickle, *An University Quarterly Review*, XIV, 3 (Summer 1963), 96-113.

2. Methods of recording the interference features of light waves. Shock waves bend light rays in such a way that boundary layers can be photographed. Holography records the phase of interfering light waves.

Bibliography

- Beeley, M. J. *Lasers and Their Applications*. London: Taylor & Francis, 1972.
- Breen, W. M., et al. "Integrated Circuit Visual Inspection Using Spatial Filtering." *IEEE Transactions on Nuclear Science*, NS-17, December 1970, pp. 178-82.
- Carroll, John M. *The Story of the Laser*. New York: E. P. Dutton, 1964.
- Fishlock, David. *A Guide to the Laser*. New York: American Elsevier, 1968.
- Heavens, O. S. *Lasers*. New York: Charles Scribner's Sons, 1971.
- Klaw, Philip J. "DOD to Coordinate Laser-Weapon Efforts," *Aviation*

and a three-dimensional image can be reconstructed from this recording.

3. Keith E. Verble and Charles J. Malven. "Precision Laser Target Designation—A Breakthrough in Guided Weapons Employment," *International Defense Review*, no. 2, 1974, pp. 204-9.

4. Laser fusion research led to the possibility of developing a laser-initiated thermonuclear weapon. Laboratory sources of nuclear radiation from laser fusion devices are also on the horizon.

Week & Space Technology, 8 November 1971, p. 24.

Klass, Philip J. "Special Report: Laser Thermal Weapons," *Aviation Week & Space Technology*, 14 August 1972, pp. 12-15; 21 August 1972, pp. 32-40.

Lazenby, S. D. "Ferranti Laser Aids to Close Air Support," *International Defense Review*, no. 2, 1974, pp. 210-15.

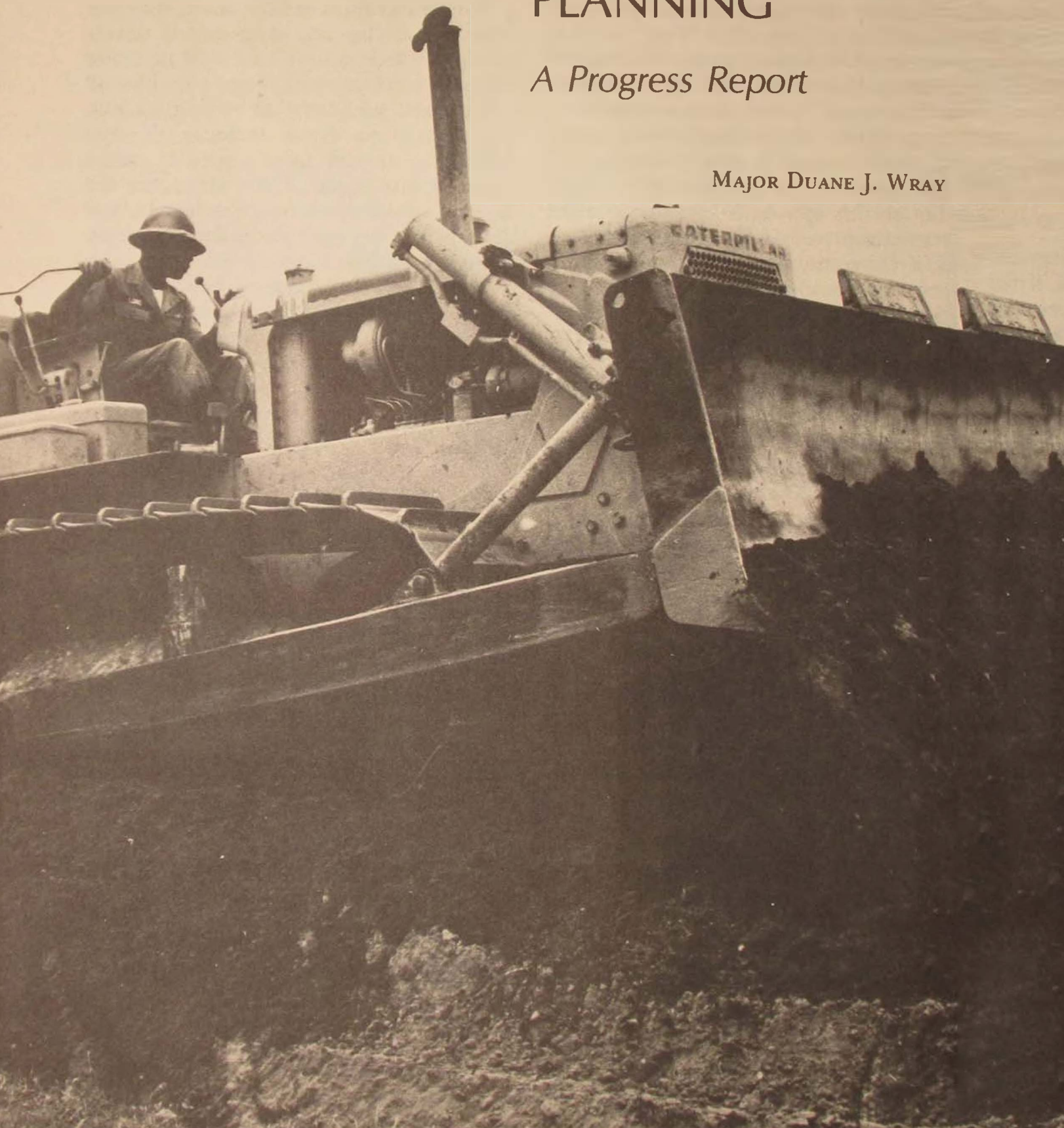
Lengyel, Bela A. *Lasers, Generation of Light by Stimulated Emission*. New York & London: John Wiley & Sons, 1963.

Marshall, Samuel L. *Laser Technology and Applications*. New York: McGraw-Hill, 1968.

BASE DEVELOPMENT PLANNING

A Progress Report

MAJOR DUANE J. WRAY



BASE development planning gained added emphasis following our Vietnam experience. Construction proved to be one of the principal pacing factors in the conflict, since both deployment and employment schedules were dependent upon the construction of ports, airfields, roads, cantonment sites, and logistical support facilities. Base development plans prepared in advance of the conflict were inadequate and later were the subject of criticism from many sources.

Critics of Vietnam base development planning were divided in their recommendations. The Joint Logistics Review Board stated that the base development plan was "suitable for the specific plan but of very little value as the situation actually developed . . . demonstrating a need for a more flexible base development planning system based on gross requirements."¹ The need-for-detail critics countered, "Vietnam contingency planning lacked the detail necessary to provide flexible, salable, and supportable justification for funding for construction facilities, construction forces and their equipment, and prepositioned war reserve stock."²

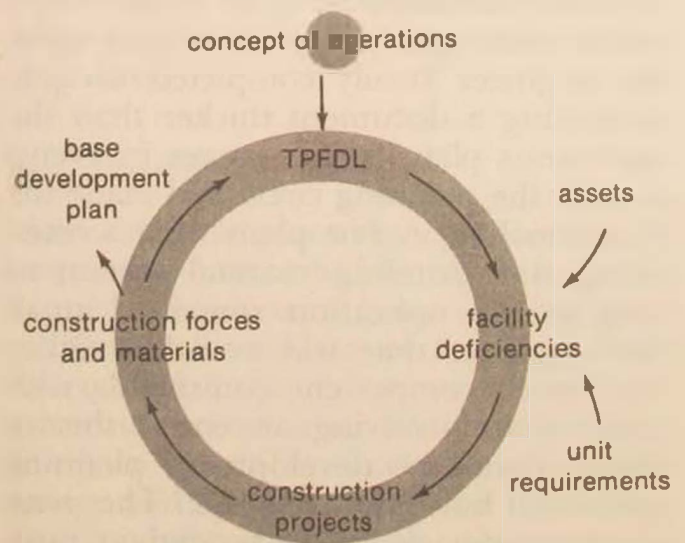
Considerable planning and staff time has been spent since Vietnam analyzing and responding to this and other criticism. The Joint Chiefs of Staff initiated a new base development planning system in 1969 for use in joint operational plans.³ Although the new planning system is simple in concept, progress in the first five years has been slow because of the complexity of the base development planning problem.

the planning problem

Base Development Planning can be described as a circle without definite beginning and ending points. (Figure 1) The force list, or Time Phased Force Deployment List (TPFDL) in the parlance of the Joint Operation Planning System (JOPS), is at the top of the planning circle. The TPFDL provides the deployment schedule of personnel, aircraft, and equipment to the operating bases. Two other items are required at this point from outside the planning circle: (a) facility requirements in the form of planning factors for each unit in the TPFDL and (b) a list of existing facility assets at the operating bases. The planning engineer sums up the facility requirements for all units in the TPFDL, compares these with existing assets obtained from various intelligence sources, and produces a list of facility deficiencies.

Proceeding in the planning circle, the

Figure 1. Base development planning circle



engineer then prepares a time-phased list of construction projects for identified deficiencies. The project list is then used to identify construction forces and materials. The base development plan is a spin-off of the planning circle at this point, becoming a part of the component command plan and later the joint operation plan, which consolidates the requirements of all services. The engineer uses the force and material list to update the TPFDL, closing the loop and providing updated information for the next cycle around the planning circle.

Engineers attempting to complete the planning circle using only manual methods found themselves hopelessly bogged down with a major bookkeeping problem in accumulating the multitude of facility requirements for the hundreds of units in the force list. While the engineer was smothered in his bookkeeping, events outside the planning circle were changing. The concept of operations changed, available assets changed as a result of completion of peacetime construction and new international agreements, and unit requirements changed following acquisition of new aircraft. In Tactical Air Command, we found that it took one man-year of effort to complete a component base development plan supporting a minor contingency operation; and when the engineer finally completed his job, producing a document thicker than the operations plan itself, changes in events outside the planning circle had made the plan obsolete. A few plans were written using this grueling manual system as long as the operation remained small and engineer time was available. Other Air Force component commands with large plans involving an entire theater found that base development planning was an all but impossible task. The press of day-to-day problems tended to push

the base development plan far back on the things-to-do list.

The first four years (1969-1973) of base development effort, following implementation of the Joint Chiefs of Staff revised procedures, produced only a few contingency plans. Major plans, such as the defense of Europe, were started but have yet to be completed. In TAC we found that just making changes to our minor contingency plans was a major effort requiring several weeks to complete. Thus we did not have the ability to respond rapidly to changes as a real contingency would develop. Engineers at the component and joint staff level recognized a need for a more responsive system.

a more responsive system

The Army's Engineer Strategic Studies Group developed an automated base development planning system to assist the engineer planner by relieving him of the burdensome bookkeeping tasks. The system, which the Army engineers labeled Computer Assisted System for Theater Level Engineering (CASTLE), has been adopted by Atlantic Command for joint use and converted to the computer of the Worldwide Military Command and Control System (wwmccs). The Atlantic Command system, which is known as JOPS module T54, is being formalized by the Joint Chiefs of Staff for worldwide implementation. As the Air Force component of Atlantic Command, TAC has evaluated the T54 module and found it to be very suitable for Air Force needs. A new base development plan can now be written in a matter of weeks, and changes can be processed in a few days. The engineer's ability to make quick changes and rapidly evaluate alternatives has made him a more responsive member

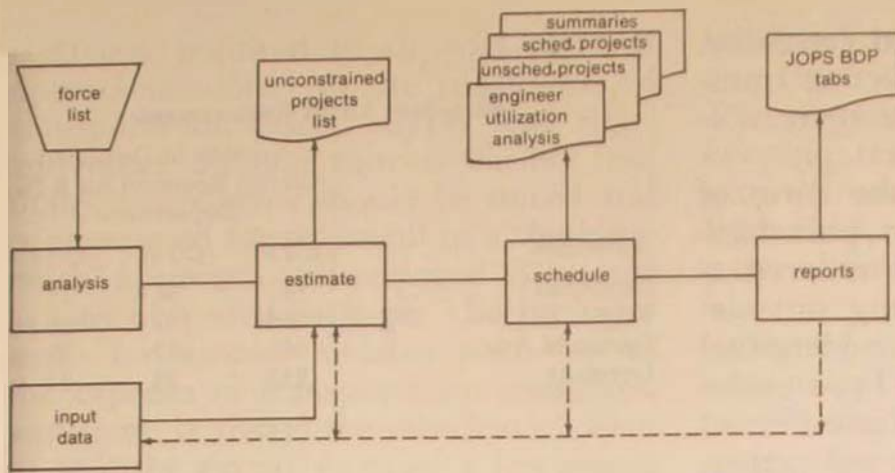


Figure 2. The T54 base development plan (BDP) module

ber of the commander's planning team.

Figure 2 is a schematic illustration of the flow of the T54 module. Processing is accomplished in four distinct phases. First, the analysis phase is a series of reports providing the engineer capsulized information on the forces and location included in the plan. Using this information, he can selectively structure input data such as facility categories, planning factors, and priorities to minimize his workload and maximize the validity of the plan.

Second, the system computes facility requirements for the forces and bases identified in the force list, reduces the requirement by available assets, adjusts for anticipated war damage, and prints a list of candidate projects for construction. The list is reviewed and revised or approved for scheduling.

The third phase, construction scheduling, is the most complex part of the system. The scheduling algorithm compares construction requirements with construction capability in as many as 35 different skills. The available capability is allocated to projects by the scheduling algorithm in priority order within the acceptable time frames established by the engineer. The result is a list of projects

that can be scheduled, a list of those that cannot be scheduled because of skill shortages, and an analysis of skill utilization.

The final phase assembles and processes for reporting the data generated. The reports that are of most interest are the tabs of the JOPS base development plan (BDP). Many other extract and summary reports can also be produced from these data as required for particular management purposes. For example, the Army generates a complete bill of materials for its construction requirements and uses that information to determine war reserve stock requirements. The Air Force needs to establish similar linkages between plan requirements and service readiness.

base development readiness

Now that the planning engineer has a responsive system to identify base development requirements, he can begin to address the problem of readiness. Air Force Civil Engineering has several programs to provide a significant base development capability, including the RED HORSE and Prime BEEF teams, bare base, and modular shelters. Needed now is a

collation of requirements and capability, including the important aspect of transporting the capability to the construction site.

Transportation assets in the form of cargo planes and ships and port handling capacity need to be considered as limiting factors in developing our deployment concepts. Forces are identified by the Plans staff into Unit Type Codes (UTC). The UTC's form the Time Phased Force Deployment List discussed earlier. Units forming the UTC's have progressively become more self-supporting, most having their own vehicle assets and many their own messing and personnel support facilities. Stressing mobility, nearly everyone has developed flyaway kits and air-deployable equipment and facilities, all seemingly striving for the ideal of an "air base in a box."⁴ This has resulted in a duplication or overlap of many common support functions, which, in turn, has significantly increased overall airlift requirements.

The bare-base package was an outgrowth of this concept and does provide the Air Force with a significant capability. The question is, Can we afford to commit the necessary cargo aircraft to deployment of the bare base, particularly in the early stages of a major conflict? The bare base is used here as but one example of the transportation problem. Other functional activities, including reconnaissance, intelligence, communications, aerial port, etc., have developed companion air deployable facility and equipment packages.

A 4500-man bare-base package for three F-4 squadrons, one RF-4 squadron, and one C-130 squadron with intermediate maintenance capability is estimated to require 515 C-130, 304 C-141, or 83 C-5A loads. The accompanying table is an estimate of the number of dedicated C-

Bare-Base Airlift Requirements

Destination	Number of Dedicated Aircraft Required for 5-D Deployment		
	C-130	C-141	C-5A
Caribbean	147	36	13
Korea	466	137	39
Southeast Asia	466	137	39
Germany	233	83	24

130s, C-141s, or C-5As required to complete deployment within five days.⁵ The supporting civil engineering RED HORSE team, mobile communications team, aerial port team, POL, munitions, and vehicle package are not included in these estimates and would add 1196 C-130, 79 C-141, or 224 C-5A loads. This would substantially increase the dedicated airlift listed in the table, exact quantities being dependent upon the onload point of the supporting teams, munitions, POL, and vehicles.

The tabulated data confirm that bare-base deployment requires a very large airlift commitment. Possibly the size of this commitment could be reduced by planning for less than a full "bare" base deployment. After all, nearly every base has some available facilities. If plans were tailored to take advantage of these facilities, deployment transportation requirements would be reduced accordingly.

The T54 module can identify construction requirements in sufficient detail to permit the tailoring of construction units, equipment, and materials, but tailoring will require better intelligence file on existing assets. Intelligence resource need to be dedicated to the collection of facility data, the data to be evaluated by engineers and filed in data codes extractable directly by T54. The objective in this effort is to identify the level of

readiness required to support planned operations subject to the constraints of transportation assets, supply lead time, and other limiting factors. Facility and utility components should be stored and programmed for shipment in a "building block" approach, not required to be sent as part of a total package. The packages make for simpler mobility plans but at the expense of transportation resources, and there is always the question of what to do if the aircraft carrying a key item is lost.

the outlook

The future for progress in base development planning looks bright. The T54 module offers unified commanders and the Joint Chiefs of Staff a common and responsive system for identifying con-

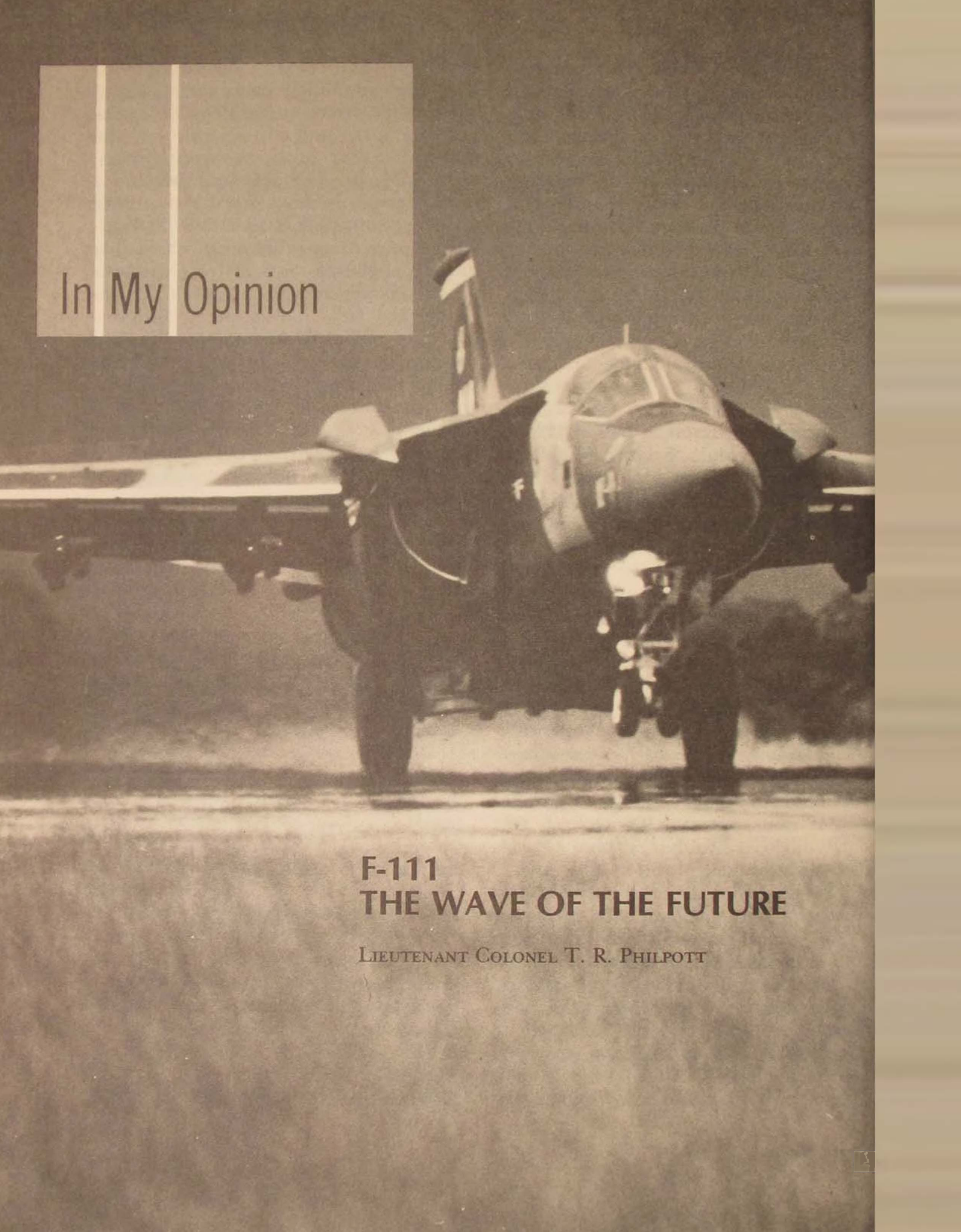
struction requirements in support of joint and combined contingency plans. The engineer can at last drop his book-keeping task and concentrate on the more pressing problem of readiness. With T54, the engineer can become a more active member of the planning team by evaluating alternatives and advising operational planners of facility impacts at the basing and force/weapons mix decision points. In an actual contingency, key base development decisions could be made as the military situation develops, to take advantage of the latest intelligence, available force capabilities, and transportation assets. The T54 is thus responsive to Vietnam critics by providing the civil engineer with a detailed but flexible base development planning system.

Hq Tactical Air Command

Notes

1. U.S. Joint Logistics Review Board. *Logistics Support in the Vietnam Era*, vol. III (Washington, 1970), p. 6-5.
2. Naval Facilities Engineering Command. *Policies and Procedures for Improving Contingency Planning (Lessons Learned from RVN Construction)*, (Washington, May 1969).
3. U.S. Joint Chiefs of Staff, *Instructions for Base Development*

- Planning in Support of Joint Contingency Operations (Washington, October 1969), (SM-643-69).
4. Ted R. Sturm, "Air Bases in Boxes," *Airman*, vol. 14 (February 1970), pp. 4-10.
 5. Major Clifton T. Windham, *Harvest Bare Brochure, Weapon System 437A* (Langley AFB, VA, February 1974).



In My Opinion

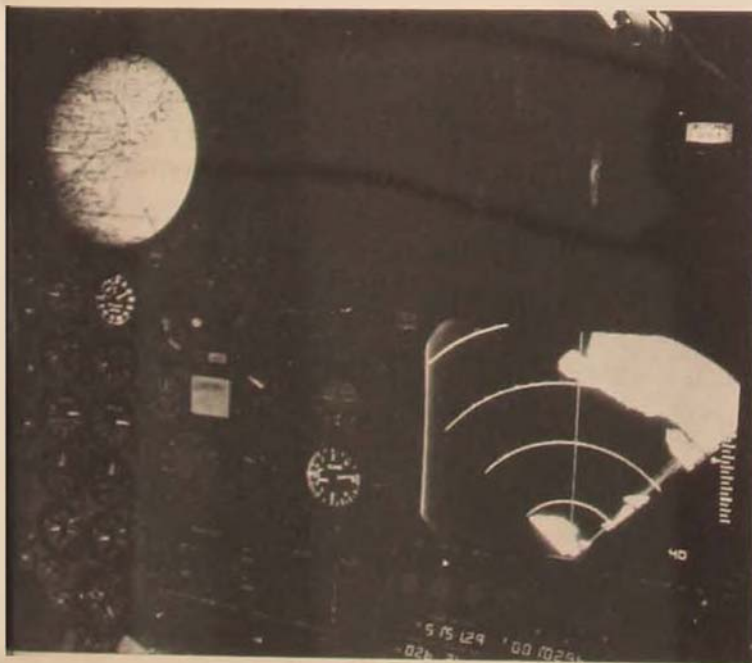
F-111
THE WAVE OF THE FUTURE

LIEUTENANT COLONEL T. R. PHILPOTT

THE F-111 has certainly had its share of publicity since joining the Air Force inventory. Unfortunately, not all of this publicity has been favorable. Nevertheless, despite the controversy surrounding the aircraft (some of it justified, most of it not), there is one aspect of the F-111 that is deserving of considerably more than just passing attention: its avionics system.

The F-111D—only one of the many F-111 models—is the one that I wish to single out as a truly unique aircraft and indeed as the test bed for much of the B-1 avionics system, which may well be the “wave of the future.”

What does the future portend? Well, if the F-111D's Mark II avionics system is an example, the crew members of tomorrow will be in an entirely new environment. The low-level profiles flown, using the new automatic terrain-following radar systems often set to fly at a terrain clearance of only one hundred to two hundred feet, will be commonplace. Crews of the future can anticipate notable innovations. They will no longer be required to carry local area maps and charts on each mission, because a set of maps and charts covering the flying areas will be on color film and displayed on a screen in the cockpit. The display will be tied in with the computer system, inertial navigation system, airspeed and compass system to insure that the chart is always centered on the screen, with the aircraft position in the center and with the aircraft heading and projected ground track displayed on the screen. With the adoption of microfilm, maps and charts for the entire world will be stored in each aircraft.



The advanced Mark II avionics systems in the cockpit of the F-111D show the aircraft attitude on TV at far left; the chart, aircraft position, and heading on center screen; and, on TV at right, the attack radar mode selected and set on a range of forty nautical miles.

Fumbling for the right page in the checklists will be a thing of the past, because at the flick of a switch the checklist that has been put on film will be projected on a cockpit display. In the F-111D the horizontal situation display (HSD) serves a double purpose: showing the maps and charts in one mode and the pages of the aircraft checklists in another.

Navigating from TACAN to TACAN may be a thing of the past. With the F-111D's computerized Mark II avionics system, a tape can be made of a planned route, including such items as enroute check points, turning points, targets, offset aiming points for targets, fuel requirements, and even an alternate route. This tape is then stored in the aircraft computer's memory bank prior to takeoff. Once airborne, the route is called up by the computer, and the auto pilot and inertial navigation system are tied in with the computerized flight program so that the aircraft automatically flies the route as programmed without any additional instruction or action by the crew.

Additional refinements include a data display panel for such items as the distance and time to the next turning point, ground speed and ground track, true airspeed and true heading, wind speed and direction. Also, symbols for each turning point, target, and check point for a given route are displayed on the chart and map display (HSD) as the route is being flown. Of course, if for some reason (bad weather, etc.) the crew wishes to change the route or destination, a computer terminal in the cockpit is available for feeding new or corrected information to the system. The computer will then calculate the new heading and turn the aircraft, and the display panel can show distance and time to go as well as fuel required if desired. The system

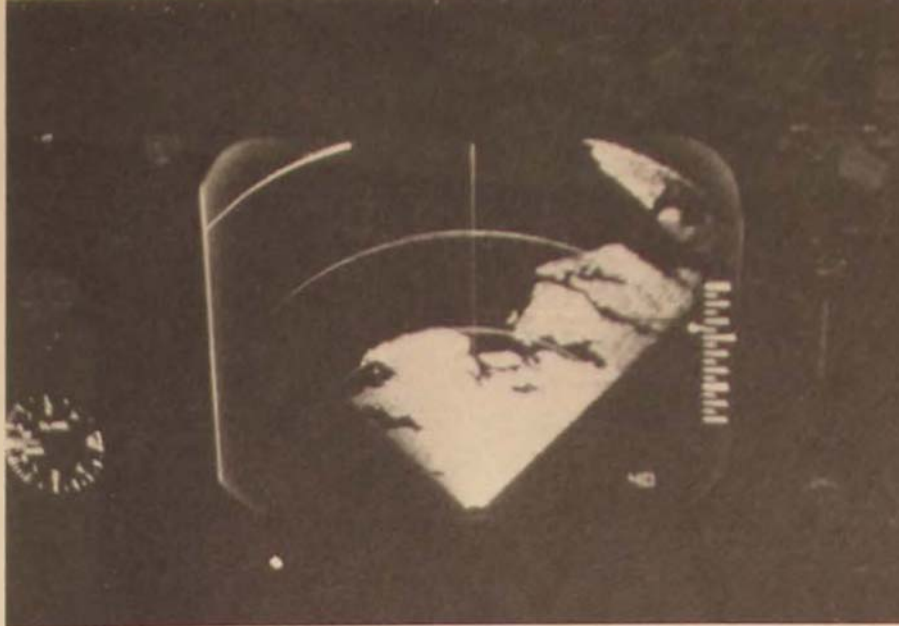
even provides for a backup computer if the primary computer fails.

The radarscope found on other aircraft has been replaced by television providing many advantages without detracting from the system. Radar images can be displayed on the TV screen just as easily as on the former radarscope. Additional features include an expanded mode that allows for a radarscope presentation of the immediate area around the radar cross hairs regardless of the range. The advantages of being able to concentrate on and expand a particular target while still forty or even two hundred miles away are obvious.

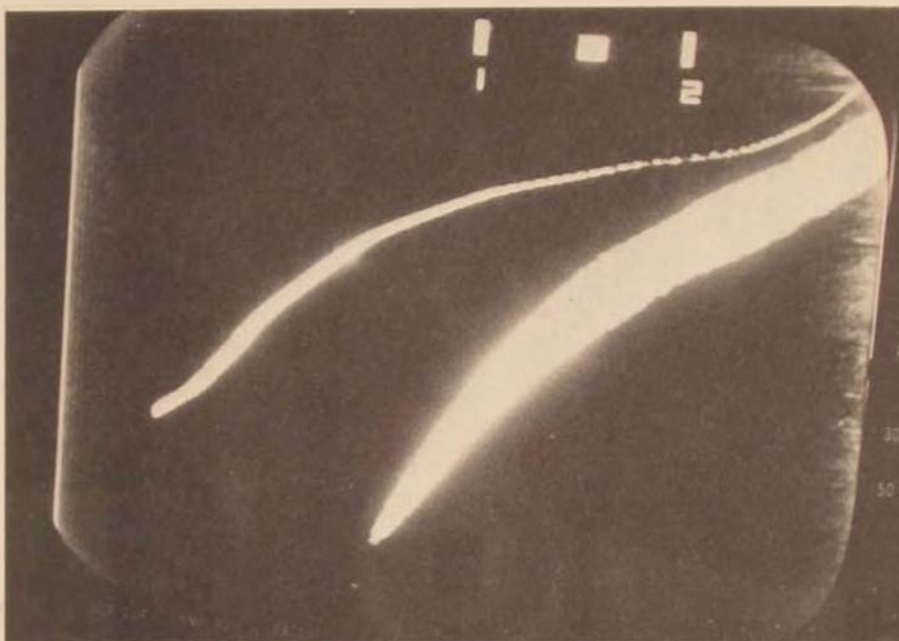
Other modes of operation allow for the aircraft attitude to be displayed on the TV along with airspeed, heading, and altitude; the E-scan presentation used when flying low-level terrain-following radar routes; a situation display that depicts only obstacles above the aircraft for flying low level; and numerous air-to-air modes for air intercept work as well as a moving-target indicator mode for picking out moving vehicles and trains. Other modes that have been incorporated but at present are not activated in the F-111Ds allow for the addition of a low-light TV system and infrared display. Using the radar mode at long range to acquire the target complex, we can switch to the IR or TV modes, which are tied in with the computer to be aimed at the cross-hair aiming point. At short range, by using a zoom feature, we can refine the cross-hair placement to a very small area.

The bombing tables, ballistic curves, and bombing calculations for the F-111 are all things of the past. The ballistics of the various weapon systems are put on computer tapes and selected when desired. The stored ballistic information, coupled with airspeed, altitude, and

This TV display shows the attack radar mode at a range of 40 nautical miles. If desired, the latitude and longitude of the aircraft, along with aircraft heading, can be displayed.

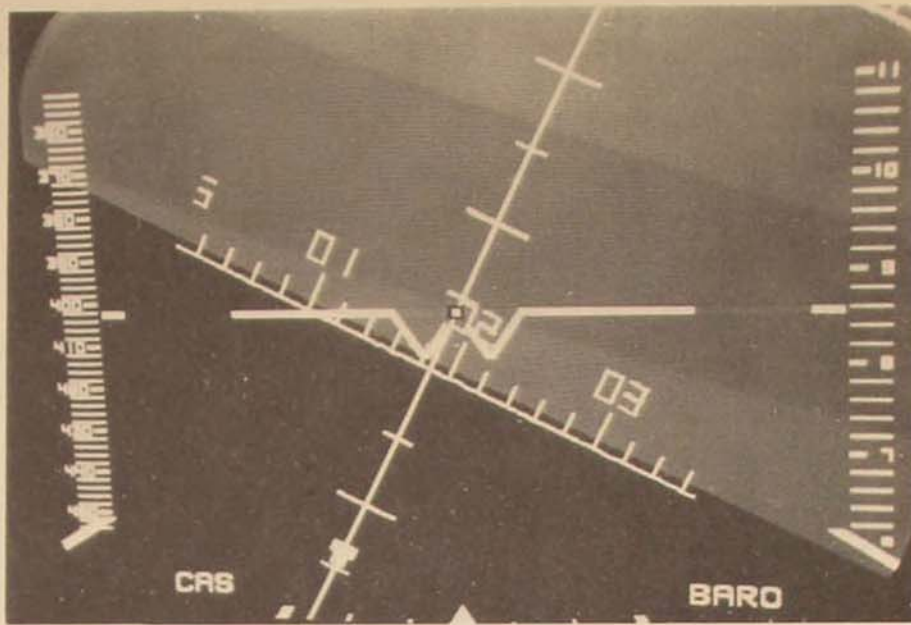


The TV display of a typical "E" scan presentation as seen when flying on a low-level terrain-following mission. Since both crew members have their own TV display, the normal practice is for one TV to be set on "E" scan and the other TV to be set on a ground map or on situation display mode.

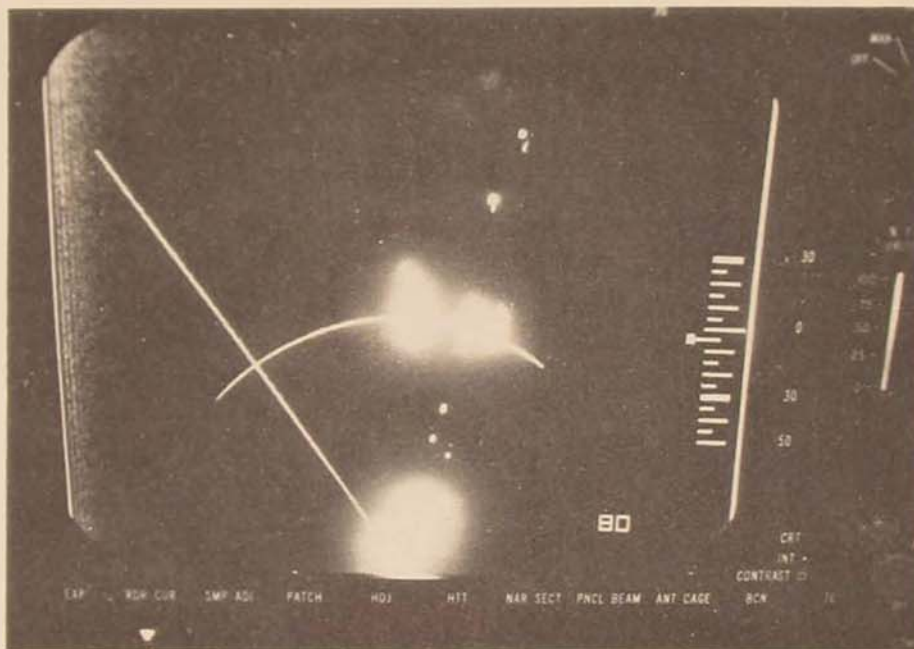


A close-up of the horizontal situation display (HSD), showing the chart mode selected. The black line shows the aircraft track, the white line the bearing to the last check point. The triangle in the center gives aircraft's present position.

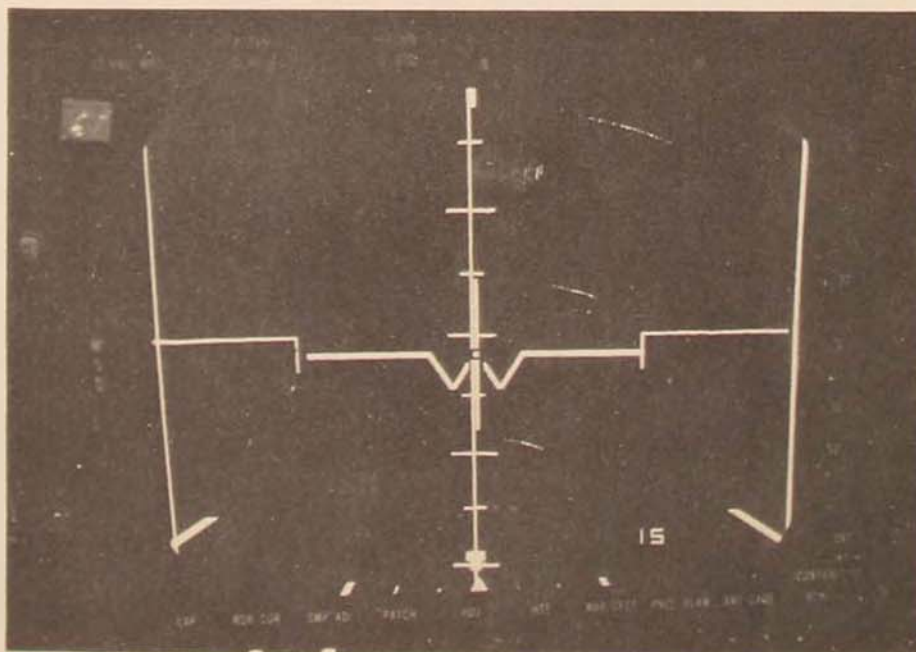




The vertical situation display (VSD) shows the aircraft attitude—dive/climb or bank—as well as aircraft heading, altitude, and airspeed.



The TV display, showing the attack radar mode at a range of 80 nautical miles. If desired, the latitude and longitude of the aircraft, along with the aircraft heading, can be shown.



Two displays are present at the same time: a simplified aircraft attitude is imposed over the ground returns shown from the situation (SIT) mode radar display. The SIT display shows only obstacles that are above the altitude the aircraft is flying.

heading information supplied to the computer, allows for instantaneous computation of the proper release point. The crew needs only to arm the weapon system, and it will then fly automatically to the target and compute the correct release point for the bombs. This allows the crew to take evasive actions until one second prior to release, with the computers continuously recomputing the release point. If for some reason the crew does not fly over the target or within "X" number of feet, the bombs will not release in the automatic mode. They can, of course, always be dropped manually or jettisoned.

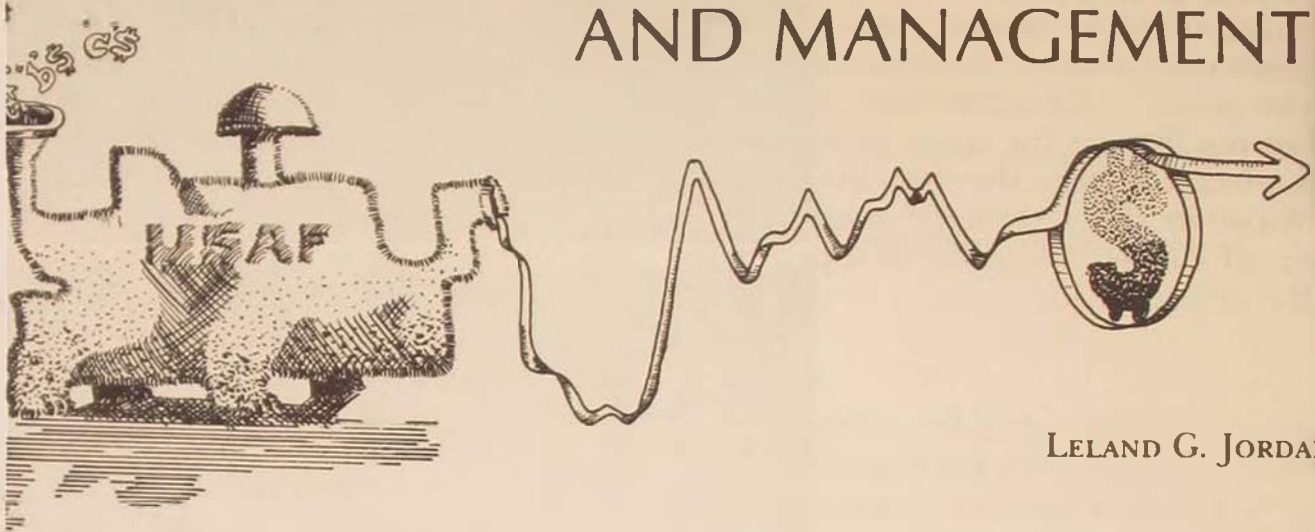
I HAVE covered only a few of the revolutionary concepts that are employed today in the F-111D's avionics package and that will be commonplace in the Air Force of the future. The backup computer system has been only briefly mentioned, and the primary and two alternate radar systems, along with the heads-up display (HUD), have not been mentioned at all. The HUD is an optical sighting glass, one for each crew position, on which target cross

hairs, target information, and flight data are projected. The symbology, cross hairs, etc., are focused at infinity so as not to interfere with the crew members' view when making a visual target run. A multitude of data is also displayed on the HUD. Typical data displays might be low fuel warning, a breakaway signal, a roll up signal, or a fire or caution signal.

In all fairness it must be admitted that some of the technical problems still have to be ironed out. Expected life of some components has not been as long as originally planned for, and often funding for spare parts has not been enough. Yet, a great deal has been learned. The feasibility of using advanced state-of-the-art avionics equipment has been proven. It is also evident that the crew members of the future not only will have to possess all the attributes of the past but also will have to be highly knowledgeable in the use of the advanced electronic equipment as well as skilled in the arts of computer-operated components. While not all the facts are in yet, it is clear that today's F-111 may well be the wave of the future. Indeed, it is here today.

522d Tactical Fighter Squadron

OUTPUT MEASUREMENT, PRODUCTION COST, AND MANAGEMENT



LELAND G. JORDAN

OUTPUT measurement and management indicator systems provide information concerning the output of production processes and the relative quality or efficiency of that output. The selection of valid standards against which relative quality or efficiency can be judged is difficult but possible.

To date, the Air Force output measurement and management indicator system has not been effective in providing decision-makers with the accurate, pertinent information needed or intended. A revision to both the philosophy and methodology would appear to be indicated. Such a revision has been identified and discussed in the context of a particular management indicator system, but it applies to output measurement and management indicator systems in general. In this article the present Air Force output measurement and management indicator system is described, the reason for the lack of success of the system is suggested, some requirements for a successful system are identified, and a basic question concerning Air Force management philosophy is posed.

system description

The stated objective of the Air Force output measurement and management indicator systems is to support and influence management by improving the capability to describe outputs and the quality, availability, and utility of output measures and management indicators. Output measures are generally described as production measures, and management indicators as rates, such as cost per unit or percent of programmed production accomplished. The system, known as the Cost Center Performance Measurement System (CCPMS), which the Air Force implemented in 1972, was an attempt to provide cost-output information to managers. The governing manual, Air Force Manual 178-430, provides a statement of the CCPMS objective, describes methods for selecting and validating cost center performance measures, and discusses their use.

The CCPM system is to select an output measure, which is then related to dollar costs via regression analysis. The output measure having been selected and the regression analysis completed, the resulting equation is used to compute a standard cost. The major command can use the standard cost to estimate the expected total cost for a given level of production. The expected cost is then compared to the actual cost. However, regression analysis and statistical prediction are not exact sciences; therefore, the predicted costs are ranges, not point estimates. Figure 1 illustrates the uncertainty in such a predicted cost.

The cost-output regression provides an equation—in this example it is presented by a straight line—relating production to

cost. For the line in Figure 1, if "Q" items are produced, then a cost of "b" dollars is expected. But because of the uncertainty, a cost of less than "a" dollars but more than "c" dollars is considered

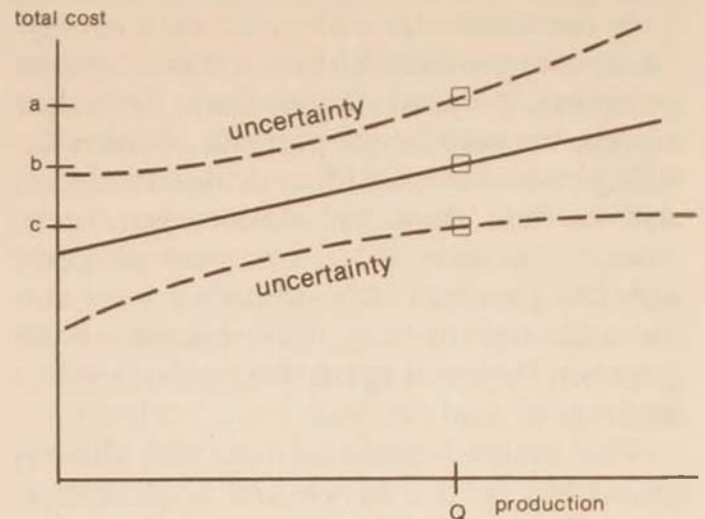


Figure 1. The uncertainty in regression analysis and statistical prediction of the cost of production

reasonable. That is, the regression equation enables us to say that "for a production of 'Q' units the total production cost will probably be between 'a' dollars and 'c' dollars with 'b' dollars the most likely estimate." The regression equation explains the variation in cost that results from varying the production quantity. The uncertainty, that is, "a" minus "c" dollars, accounts for the variation in cost that is not attributable to changes in the production quantity.

The standard cost for "Q" items is simply "b" divided by "Q" or the average expected cost at that point on the regression line. Clearly the standard cost is different for different production levels,

since the fixed cost is spread over more or fewer units as the production quantity changes. The standard cost derived from the regression line, therefore, helps management estimate how total cost changes with production quantity.

The range "a" minus "c" is a probability range; that is, the total cost is expected to be between "a" and "c" some specified percentage of the time. For example, "a" and "c" may be chosen so that for nine out of ten times that "Q" items are produced, the total cost will be between "a" and "c" dollars. In other words, we may be 90 percent certain that if "Q" units are produced, the total cost will be less than "a" dollars but more than "c" dollars. That certainty percentage (90 percent) or confidence level can be adjusted to, say, 67 percent or 99 percent, depending on the analyst's selection of "a" and "c."

The major command provides the relationship to the functional organization and directs that if the costs fall outside the uncertainty bounds (that is, if the total cost is less than "c" or more than "a") then a further analysis should be conducted. The idea, of course, is to provide an exception reporting system for management.

purpose

The preceding discussion has been a very brief summary of parts of the CCPM system as described in AFM 178-430. The manual itself provides a detailed description of regression analysis and the use of the resulting cost-output relationship. In fact, the manual does an outstanding job of explaining how to select an output measure and fit a regression equation. So the intent of this discussion is to provide sufficient background to allow discussion of the philosophy or

theory of this Air Force output measurement system, not the statistical techniques.

CCPMS sounds like a valuable management tool. It also sounds very much like the quantitative techniques used in industry. Yet it was not accepted by the functional managers. The most frequent comment made about the system was that it did not contribute to management; that it was a wasted effort. Why? What was CCPMS missing?

The candidate answers to that question are numerous. The inclusion of costs not controllable by the manager is considered by some individuals as the primary fault of CCPMS. The extent to which the manager can control his costs is important but secondary to the major philosophical thrust of the current argument. While a major portion of the costs is military personnel costs and not within the production manager's control, several solutions to that complication are available. The essential point is that whether or not the production manager can control his costs is material only after the decision process has been cleared to function. That is, if the information is not to be used, its purity is immaterial. Decision information systems should be designed in the same way decision networks are solved—from the last decision to the first. The purity or controllability of the costs is, therefore, a secondary consideration. Product quality and the danger that managers may make short-term gains at the expense of long-run results are also secondary to the thrust of the current argument. For the purpose of this discussion, therefore, it is assumed that costs are controllable, quality is satisfactory, and no short-term suboptimizations are being made. These may be real problems, but their solution is not the intent of this discussion.

Information system design

Decision information systems should be designed after the decision is identified. The information system can then be designed to collect data and present information that will assist an executive in making the identified decision. Of course, information systems are more frequently designed for a general class of decisions rather than one decision; however, the principle is that one should not build an information system and then go out, like Diogenes with his lamp, searching for a decision. If information systems are not useful, it may be because they do not provide information that aids in decision-making.

The efficient standard

The information presented by CCPMS is useful in estimating the dollar changes associated with proposed or planned changes in production quantity. It is not useful for improving the effectiveness or efficiency of the production operation, nor is it useful for identifying the particularly efficient or effective manager. Yet it is the efficient manager who can tell us how to improve the operation in similar organizations. CCPMS is based on regression analysis; it uses a regression equation to estimate a standard cost. But the regression equation explains the cost variation due to production-level changes and simply provides an interval estimate to account for the cost variation resulting from things other than production-level changes. The problem is that to identify outstanding managers we need to look at the cost variation resulting from management actions. *That is, we need to look at the variation that the regression equation does not explain.**

*The unexplained variation includes variations resulting from managerial policy as well as other unexplained variations.

If the regression equation predicts the cost as less than "a" dollars but more than "c" dollars, we need to find the manager who consistently comes in with a total cost less than "c" dollars; he is the efficient one, the one who produces at a lower cost than expected. The analysis techniques required are known, and the data are available in the CCPMS files; therefore, it should be feasible to identify the efficient manager.

Once identified, the efficient manager becomes both a standard and a source of improved operating techniques and procedures. Again, the regression estimate is not an efficient standard; it is essentially an average, a standard of mediocrity. The hundred-yard dash is an analogous situation: the world record in the hundred-yard dash is 9.1 seconds; the average time is not recorded! Times in the hundred-yard dash are not judged as good or bad by how close they are to the average time but by how close they are to 9.1 seconds, the world record. The average time would be a mediocre standard; 9.1 seconds is an "efficient" standard. CCPMS used the average performance as a standard, but managers do not need much help in identifying the average; identifying the efficient manager is more difficult, and assisting that identification is a proper function of management systems.

That is the problem of output measurement in the Air Force so far. The final step has not been taken and an efficient standard identified. There has been a fear by functional managers that the standard costs will become a rating system. AFM 178-430 specifically denies that possibility and states: CCPMS is not a rating system. But it should be! Rating people—identifying the efficient and the inefficient—is a major management task and should not be denied. If Air Force

managers are unwilling to take the rating responsibility, then cost-output relationships are unnecessary, for they provide decision information—useful only if managers accept their responsibility to decide.

the challenge

If the decision is made to use output measurement as a tool for identifying efficient and effective managers, then other questions must be addressed. How about costs not responsive to the manager's actions? How do we judge quality? How do we assess short-term optimization? These are important questions if a management tool like CCPMS is to be utilized; they are irrelevant if the regression line continues to be the standard. The decision to extend output measurement methodology to provide for selection of an efficient rather than a mediocre standard must be reached before the secondary questions are pertinent.

It is always easy to be critical but frequently difficult to offer constructive criticism—to propose a remedy along with the faultfinding. The criticism presented here is constructive; a remedy is offered. The analysis techniques for implementing that remedy, for identifying

the efficient manager, are not presented, but they do exist. Competent analysts should have little difficulty grasping those techniques. Since this article is intended for a broader audience, a detailed presentation of the analytical techniques has not been included. Suffice it to say that the efficient manager should be selected by identifying and further analyzing those bases or shops which consistently operate at a lower cost per unit than the cost-output regression says they should.

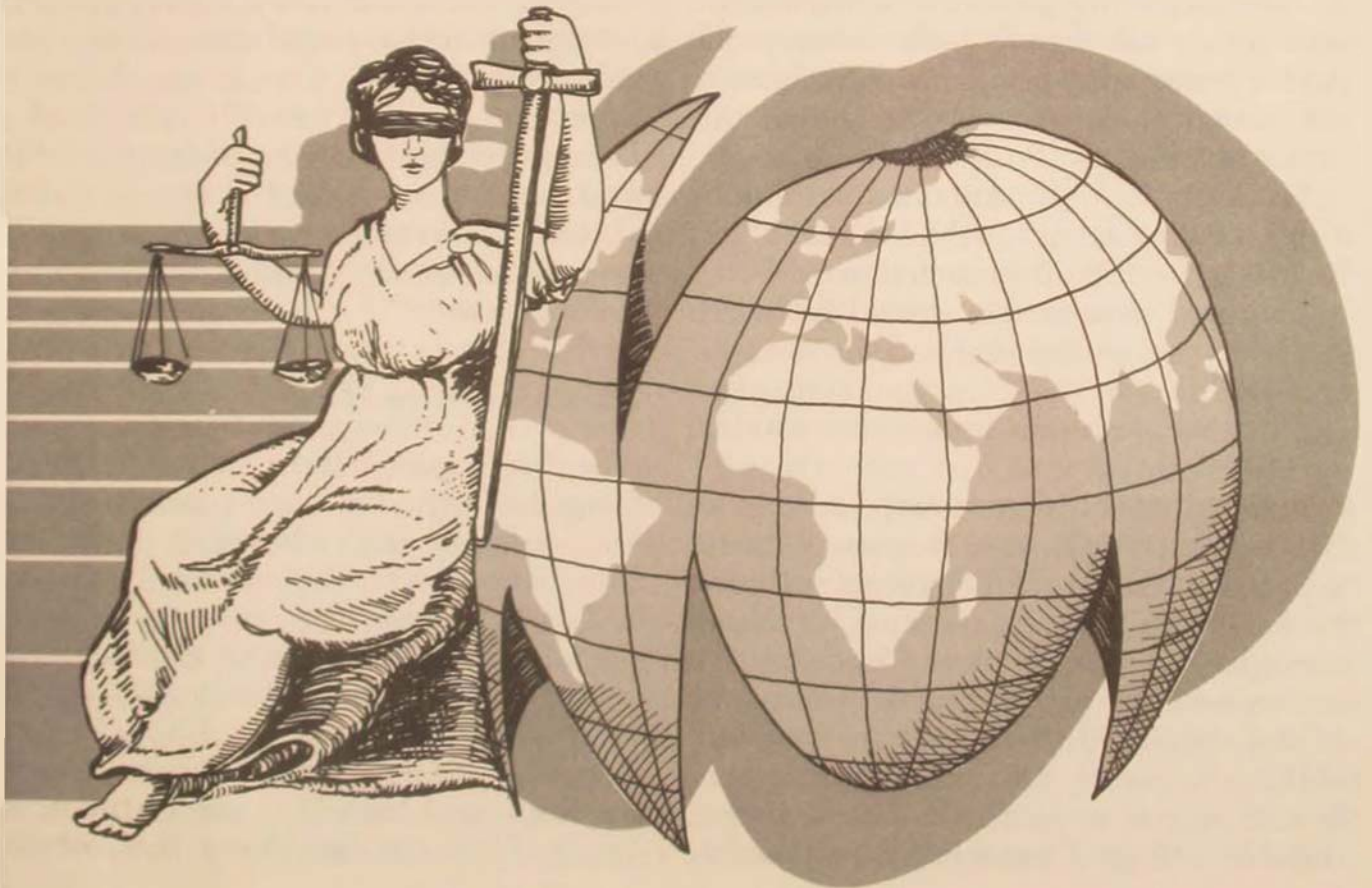
The philosophical question posed by this article concerns the desire to select an efficient standard. If the Air Force management philosophy is to satisfice, that is, to accept a merely satisfactory or average management performance, then cost-output systems are not needed. Conversely, if the Air Force management philosophy is to optimize, to manage as efficiently as possible, then cost-output systems are needed because such systems can substantially simplify the complexities involved in finding the efficient manager and hence the efficient production methods. However, effective worthwhile cost-output systems must be designed differently than the CCPM system was designed; they must be designed to locate and use an efficient standard.

Hq Strategic Air Command

Military Affairs Abroad

THE MILITARY DECISION-MAKER AND FOREIGN TRIALS

CAPTAIN RICHARD J. ERICKSON



WHY should the military decision-maker be concerned about such esoteric subjects as foreign criminal jurisdiction and Status of Forces Agreements (commonly referred to as SOFA's) as they relate to foreign trials? Why not leave such complexities to diplomats and lawyers? There are at least two basic reasons why the military man needs to know about these matters. The first is a professional one; the second, a personal one.

First, as a member of the military community, the military man must be knowledgeable about various problems confronting the Air Force in its worldwide operations. This is necessary for him to be a well-rounded individual as well as an effective decision-maker. There are not enough specialists, diplomats or lawyers, to deal with every problem in this area. Many of the decisions will be his. Regardless of duty assignment, one's understanding the fundamentals of foreign criminal jurisdiction and SOFA's can significantly enhance job performance and positively contribute to the accomplishment of the global Air Force mission.

Second, the military man should be aware of the extent to which he is subject to foreign criminal jurisdiction while he is stationed abroad. He should be familiar with the protection and services accorded him by the U.S. government in conformity with pertinent international agreements.

A word of caution is necessary from the outset. Although it goes without saying that Air Force personnel will have to deal with foreign criminal problems overseas,¹ it is sometimes forgotten that such problems can also arise within the United States and require a decision-making response. Normally this happens in one of two ways. In the first instance, the Air Defense Command is responsible

for protecting, to the maximum extent possible, the rights of Air Force personnel who may be subject to criminal trial or imprisonment in Canada, while the Air Training Command is similarly responsible for cases arising in Mexico.² In the second instance, each installation in the United States which has foreign military personnel present, whether as students for training or as visitors, must be prepared to resolve potential status of forces problems. This is so because SOFA's are reciprocal agreements.³ The unique status enjoyed by American military personnel abroad as a result of SOFA's must be extended also to foreign military personnel in the United States. Consequently, foreign criminal jurisdiction and SOFA problems may confront the military decision-maker whether stationed at home or abroad.

So that the military decision-maker has a basic understanding of the problems that may confront him, several aspects of foreign criminal jurisdiction and SOFA's will be explored. The areas discussed represent an effort on the part of the U.S. government to provide protection and services to U.S. military personnel abroad in accordance with the resolution accompanying the Senate's ratification of the NATO SOFA.⁴

allocation of jurisdiction

The first issue to be resolved when an alleged offense has been committed by a U.S. military man abroad is "Who has jurisdiction over the matter?" When a U.S. serviceman, for example, commits the offense of robbery in Germany, his single act violates both the law of the United States and that of the Federal Republic of Germany. The simultaneous application of both U.S. and German law results from the fact that a U.S. service-

man takes U.S. law with him when he travels abroad. The Uniform Code of Military Justice (UCMJ) "applies in all places."⁵ At the same time, of course, German law is applicable within the territorial limits of Germany. Because the law of both legal systems has been violated, both can proceed.

Potential prosecution by more than one jurisdiction is highly undesirable for several reasons. First, it may provoke a serious dispute between allies as to which authority may properly proceed. Obviously it is not possible for both the United States and the foreign government concerned, at the same time, to arrest the suspected offender, hold him in pretrial confinement, try him, and, if he is found guilty, punish him. It would be wise, as a practical matter of good foreign policy, to minimize such situations. Second, for purposes of military efficiency and effectiveness, there are certain categories of cases over which the United States will always want to be guaranteed that it alone can exercise jurisdiction. These have been termed "official duty" cases and will be discussed at length later. Involvement of a foreign government in such matters could only adversely impact on the operation and management of the U.S. force. Third, and finally, there is the concept of fundamental fairness. Because an offense occurs abroad, an American serviceman may be twice punished—once by the United States and once by foreign authorities. Yet this result does not seem fair or just.

All these reasons—foreign policy, efficiency and effectiveness of the U.S. force, and concepts of fundamental fairness—suggest that a means of allocating jurisdiction is both necessary and essential. Allocation of jurisdiction would provide each government with a clearer

picture of who possessed the primary right to proceed in a particular case to the exclusion of the other government. The term "primary right" is used because if the government possessing the primary right fails to exercise jurisdiction, then the other government has a right to initiate discussions in order to obtain jurisdiction. However, if the government possessing the primary right does exercise its jurisdiction, then the other government is precluded from exercising jurisdiction in that case.⁶

The problem of allocating jurisdiction can be settled only in terms of rules and principles of international law. It is international law that governs the relationships among states. There are two basic sources of international law, either of which could provide guidelines for resolving the problem. They are international custom and international convention.⁷ International custom may be defined as the practice among states as to how to conduct their relations with one another which they have come to regard as legally binding in the absence of a formal written international agreement. International convention may be defined as a formally expressed agreement between two or more states regarding the establishment, amendment, or termination of their reciprocal rights and obligations.

If international custom contains satisfactory rules and principles for the allocation of jurisdiction, then an international convention to that effect would be unnecessary. What are the customary rules of international law relative to the exercise of jurisdiction by a foreign state over the visiting forces of another state within its territory? The question was considered by Chief Justice John Marshall in the *Schooner Exchange* case decided in 1812.⁸ According to the facts of

that case, the schooner *Exchange* was plying the high seas when she was seized by the French, renamed the *Balaou 5*, and assigned to the French fleet. As chance would have it, a storm arose, damaging the vessel at sea and forcing her into the port of Philadelphia for repairs, where the original American owners recognized her. They brought suit to recover her, and the issue taken on appeal to the U.S. Supreme Court was whether U.S. courts had jurisdiction to decide the dispute. Marshall, speaking for the Court, decided in the negative. He stated that it was an established principle of customary international law that forces temporarily passing through the territory of a friendly state with its permission in time of peace were exempt from the host country's jurisdiction. The *Balaou 5* was exempt from U.S. jurisdiction; and if the American plaintiffs had a meritorious claim against the vessel, they would have to pursue it in the French courts.

Unfortunately, the principle of the *Schooner Exchange* case is not very helpful today. U.S. forces around the world are not *temporarily* passing through friendly foreign territory. They are, and many have been for more than 25 years, *permanently* stationed there. Although legal scholars are not entirely in accord,⁹ and that in itself is troublesome, the generally accepted view is that forces permanently stationed abroad are, as far as customary law is concerned, subject to host government jurisdiction.¹⁰

The only remaining source of international law that may be relied on to resolve the problem of allocating jurisdiction is international convention. It is an accepted principle that states can voluntarily cede jurisdictional rights by agreement. This is precisely what the United States has asked foreign governments to do. In SOFA's, foreign governments agree

that in certain cases they will forego exercising their jurisdiction (which in the absence of such an agreement they would have a sovereign right to do) and instead will permit the United States the primary right of jurisdiction. From this viewpoint it is clear that SOFA's do not decrease rights of U.S. servicemen but rather expand them by guaranteeing that in certain matters the foreign government will not act and that the United States alone will proceed.

The United States has successfully concluded SOFA's with all foreign governments where substantial U.S. forces are stationed, with the single exception of Thailand.¹¹ In each of these agreements the NATO SOFA formula for the allocation of jurisdiction has been adopted, with minor modifications, as the standard.¹² Although it was not originally intended that the provisions of the NATO SOFA should constitute a precedent for subsequent negotiations with other states, in actuality that is what happened.¹³ Consequently, by reviewing the NATO SOFA formula, one can gain a basic understanding of how the United States and its allies have undertaken to resolve this potential problem.

The NATO SOFA formula provides guidelines for both exclusive and concurrent jurisdiction situations. When the law of only one state, either U.S. or foreign, is violated, then the matter is considered as exclusively within the jurisdiction of the state whose laws were disregarded. The NATO SOFA describes exclusive jurisdiction from two vantage points: that of the sending state (the U.S. in the case of U.S. forces stationed abroad)¹⁴ and the receiving state (the foreign or host government).¹⁵ An example of an incident that would be within the exclusive jurisdiction of the United States as the sending state is AWOL. Absence without leave

is a violation of Article 86 of the Uniform Code of Military Justice. Such an offense, however, would not be a violation of foreign law. What this means, then, is that all AWOL cases will be dealt with by the United States alone. An example of an incident within the exclusive jurisdiction of the foreign government as the receiving state would be the taking of photographs by a U.S. military man in a restricted area of the host state. Such an act would violate foreign law. In the absence of a U.S. service regulation (which is the usual case), it would not violate U.S. law. What this means, then, is that the foreign government alone will deal with incidents of this nature.

The great majority of cases that arise are concurrent, however. When the law of both the sending and the receiving state is violated, then the matter is concurrent. If a U.S. serviceman stationed abroad commits a robbery, then both U.S. and foreign law have been violated, and the matter is one of concurrent jurisdiction. Which government will have the primary right to proceed? The NATO SOFA begins with the premise that the authorities of the receiving state will have the primary right.¹⁶ But two basic exceptions to this premise are recognized. They are the "inter se" and "official duty" exceptions. If a case can be characterized as either "inter se" or "official duty," then it will be a matter for the United States as the sending state. The U.S. will have the primary right, and the foreign government will be excluded from proceeding. It is extremely important that military decision-makers thoroughly understand the concepts of "inter se" and "official duty" because it is they who must determine if incidents involving their personnel can be characterized as such. It is also they who must make the official representations to the foreign

government in order to preserve the U.S. primary right. Misunderstanding by military decision-makers may not only impair the rights secured to U.S. military personnel by the SOFA but may also lead to serious international disputes at the highest levels of government.

For a case to be "inter se," it must be one in which the alleged offense was committed by a member of the U.S. force *or* a member of the U.S. civilian component *solely* against the property or security of the United States *or* the property or person of another member of the U.S. force, civilian component, or dependent.¹⁷ Although "inter se" cases may be broadly categorized as cases between Americans, this is not entirely accurate. It is important to note who is excluded and who is included by this legal test. First, the phrase "members of the U.S. force" has been interpreted to include Reserve or National Guard units. So, if a National Guardsman steals from another while stationed in England, the case may be characterized as "inter se." Second, the phrase "civilian component," by the terms of the NATO SOFA, specifically excludes individuals who are stateless (i.e., nationals of no state), nationals of the host country, nationals of a non-NATO country, or those ordinarily resident in the foreign state where the force is located.¹⁸ Thus, if a Spanish national employed at a U.S. military installation in Spain commits a theft or is himself the victim of a theft, he cannot be considered as a member of the U.S. "civilian component," and the case cannot be characterized as "inter se." Likewise, if a U.S. national has been living in Italy since the end of World War II and is hired to work at a U.S. military installation in that country and thereafter he commits a crime or is the victim of an offense, he cannot be considered a mem-

ber of the U.S. "civilian component," and the case cannot be characterized as "inter se." Finally, if a dependent is involved, the case can be characterized as "inter se" only if he is the victim. If he is the wrongdoer the case cannot be "inter se" because the legal test permits only two classes of wrongdoers: members of the U.S. force or members of the U.S. civilian component.

Incidents will arise which will not fit clearly into the legal test of "inter se," and military decision-makers in conjunction with their staff, especially the JAG, will be confronted with the task of reaching an understanding with foreign authorities. This is done by *ad hoc* negotiation. Past decisions reached through *ad hoc* negotiations can be relied on as guideposts to assist in settlement of future disputes. The precedential value of past decisions highlights the importance of positions agreed to in current negotiations, as they will become the basis on which future decisions may rest.

The second exception to the general premise that the receiving state has the primary right to exercise jurisdiction in concurrent situations is "official duty." A case may be characterized as "official duty" if the alleged offense is committed by a member of the U.S. force or member of the U.S. civilian component *and* arises out of any act or omission done while in the performance of official duty.¹⁹ In order for the United States to be able to carry out its military mission and, supplemental thereto, maintain good order and discipline, it is necessary, if not imperative, that the foreign government be excluded from interfering in the daily operations of the force. In the absence of an "official duty" exception, that is precisely what could happen.

The application of the "official duty" concept to actual situations can be diffi-

cult. Two examples may serve to give a better feel. The first involves a guard on sentry duty. He has been ordered to protect a firing range. In the process of doing so, he uses excessive force and kills a foreign national.²⁰ This incident can be characterized as "official duty" because the guard's use of excessive force occurred in the performance of his duty. This is a prime example of an "official duty" type of situation. The issue is not whether the guard exercised bad judgment but rather which sovereign, the United States or the foreign government, will have the primary right to proceed. The second example also involves a guard on sentry duty assigned to protect a firing range. This time, because of his enmity for local nationals of the country where he is stationed, he decides to fire his automatic weapon into a passing passenger train. A passenger is killed. This is clearly not an "official duty" case because the train represented no threat to the firing range. The guard acted beyond his orders.

Certain principles can be distilled from these two examples that can assist the military decision-maker in determining whether a factual situation qualifies as "official duty." In the first instance, the duty status must be identified. Was the duty or service required or authorized to be done by statute, regulation, or order (whether written or verbal) of a superior or by military custom? In addition to the duty status, the act done must also be identified. Was the act related to the duty status? If both questions are answered affirmatively, then the incident may be characterized as "official duty." But, to repeat, not all acts done while on duty are "official duty" (as in the second or passing train example). Likewise, the commission of a wrongful act per se does not remove a case from the "official

duty" category (as in the first example). To hold otherwise would make the "official duty" exception meaningless. The issue is never whether there was a wrongful act but whether the alleged wrongful act was done in the performance of "official duty."²¹

Once it is decided that an "official duty" situation exists, then a duty certificate must be issued by proper U.S. military authorities. The duty certificate is an official communication with a foreign sovereign regarding a foreign criminal jurisdiction matter that the U.S. has characterized as "official duty." Of course, the foreign government may dispute the U.S. view, and negotiations may be necessary. Since the duty certificate is an official communiqué with foreign authorities, it should be prepared so as to avoid offending the foreign government. A few recommendations may prove helpful. A duty certificate should never be a form letter with blanks filled in. It should always be written so as to contain a clear statement of the facts of the case and the U.S. reasoning as to why it is believed that the incident is one of "official duty." The tone of the certificate should be deferential yet firm, never offensive. Finally, it should never be signed by a junior officer; the most senior officer available should be encouraged to sign such a communication.

waiver of jurisdiction

Even if the foreign government has jurisdiction, the United States may request that the foreign sovereign relinquish its jurisdiction and permit the United States to proceed with the matter. The U.S. government has a policy of maximizing jurisdiction, but it does not

have a policy of requesting a waiver in every case.²² This means that certain conditions must be met before the United States will request a waiver. For military personnel a waiver may be requested if it appears probable that the United States will not obtain jurisdiction under the SOFA allocation formula and, further, that the accused may not receive a fair trial.²³ The military decision-maker is cautioned not to conclude that a trial will be unfair merely because it does not conform to trials held in the United States. A more sophisticated approach is required to determine if, on the whole, the foreign trial will be unfair. For civilian personnel and dependents, the same conditions necessary for request of waiver for military personnel apply, and in addition a waiver may be requested if the local commander determines, after careful consideration of all the circumstances, "that he can take suitable corrective action under existing administrative regulations."²⁴ Then he may request the local authorities to refrain from exercising their criminal jurisdiction.

If a waiver is requested, the NATO SOFA provides that the foreign government "shall give sympathetic consideration."²⁵ Experience shows that a very high percentage of U.S. requests for waiver are granted. For the period 1 December 1970 through 30 November 1971, 94.4 percent of all U.S. requests under the NATO SOFA were granted, and 88.4 percent of all U.S. requests under all SOFA's were granted.²⁶

Many NATO countries have agreed, in supplemental arrangements to the SOFA, to procedures for handling waivers. In the German supplemental, for example, the U.S. is granted a blanket waiver in all cases, and the Federal Republic reserves the right of recall "where competent German authorities hold the view that,

by reason of special circumstances in a specific case, major interests of German administration of justice make imperative the exercise of German jurisdiction."²⁷ According to this arrangement, a case that would normally belong to the Germans is automatically waived to the United States unless the German authorities undertake affirmative action to recall the case. In the absence of recall, the matter will belong to the United States. Thus, in addition to the SOFA it is extremely important that military decision-makers become familiar with any supplemental arrangements that may have been agreed to between the United States and the foreign government concerned.

On the other hand, it must be acknowledged that a foreign government may request that the United States waive its jurisdiction and permit foreign authorities to deal with a matter. The United States, like the foreign government, is required to give "sympathetic consideration" to such requests. Admittedly, cases will arise in which waiver of U.S. jurisdiction may be advisable, a prime example being one in which a husband and wife are both charged with an offense that should be litigated in one trial but the wife is not subject to the UCMJ.²⁸ A single trial can be achieved by waiver of U.S. jurisdiction over the husband so that the foreign government can try them both. It is important that the local military decision-maker realize that he lacks the authority to make this decision. U.S. jurisdiction can be waived only by the Office of the Secretary of Defense,²⁹ and in cases of request for waiver in "official duty" matters, the approval of the White House must be sought. Local commanders do have a great responsibility, however, in setting forth the facts of a case so that decision-making authorities can do their job well.

pretrial confinement in foreign prisons

Up to this point the focus has been on methods and means by which the United States may obtain jurisdiction over a case from foreign authorities. Focus now shifts to a consideration of the nature and kind of protection which the U.S. government is obligated to provide military personnel abroad should the foreign government retain jurisdiction.

The term "protection" does not mean that the United States will interpose itself between the foreign government and the accused, frustrating the foreign criminal process. Rather, it means the assistance and services rendered by the United States.

The first concern is to assist the accused in avoiding pretrial confinement. In many foreign countries pretrial confinement can last several months or even years. Foreign prisons are not pleasant places. Moreover, in terms of the military mission, it is desirable to have the accused at his job until trial rather than languishing in foreign pretrial confinement.

One purpose of pretrial confinement is to insure that the accused will be present at his trial. The "administrative hold" process is designed to provide such assurances to foreign authorities so that the military man need not be placed in pretrial confinement.³⁰ When the military becomes aware that charges have been filed against an individual or that he is under investigation, the individual is placed on administrative hold. He cannot be transferred out of the country until the charges against him are disposed of.³¹ This permits the U.S. government to make a representation to foreign authorities, in the form of a guarantee, that the accused will be produced at trial. In short, the United States

assumes responsibility for the accused, and the foreign government no longer needs to place him in pretrial confinement.

As a result of administrative hold procedures, most servicemen abroad avoid pretrial confinement. In cases where assurances of administrative hold prove inadequate, military decision-makers are authorized to make use of appropriated funds to post bail.³² Bail plus administrative hold generally proves adequate.

The military decision-maker, as well as the accused, ought to be aware of a number of implications of the administrative hold policy. First, one of the best ways to create an international incident is to give assurances to a foreign government that an accused will be available at trial and then be unable to produce him. When such assurances are given, the military decision-maker must make certain that the individual is present. Failure to honor such an assurance will have very adverse effects on later cases—credibility will be lost, and the foreign government will almost surely insist that future military personnel under charges be placed in pretrial confinement. Second, administrative hold action creates hardships both for the accused and for the military. The accused may be placed on hold for a long time, which can be especially difficult if the accused is on an unaccompanied tour or is required to remain abroad beyond his date of return. It can be difficult (and expensive) for the military service concerned because it cannot freely transfer personnel where needed. However, the purpose of administrative hold is to keep the accused out of a foreign prison while awaiting trial. If that is a desirable end, then the hardships must be endured. Of course, by far the most desirable situa-

tion is the avoidance of foreign involvement in the first place. Every military decision-maker should have a preventive law program to minimize these kinds of problems.

Another purpose of pretrial confinement is to restrain an accused suspected of a serious or violent crime, especially if he is likely to commit the offense again. The decision may be made by the foreign government that such an individual should be left in pretrial confinement. Whether the accused is left in pretrial confinement as a result of a decision to leave him there or because the United States failed to achieve his release through the administrative hold procedure or through offers of bail, the U.S. government has a duty to him: “. . . insofar as practicable and subject to the laws and regulations of the country concerned and the provisions of any agreement between that country and the United States,” the United States is obligated to see that he is fairly treated at all times and “when confined in a foreign penal institution,” to see that he is “accorded the treatment” and “all the rights, privileges, and protections of personnel confined in US military facilities.”³³ This requires that military personnel in foreign prisons be “visited at least every 30 days, at which time the conditions of confinement as well as other matters relating to their health and welfare will be observed and reported.”³⁴ The individual's commanding officer or his representative is encouraged to make such visits. Chaplains and medical officers should make periodic visits. Also U.S. military personnel confined in foreign penal institutions are to be “provided with medical and dental treatment, medicines, health and comfort items, clothing, and supplemental food stocks, all to an extent not to exceed the type and quan-

tity furnished prisoners in US military confinement facilities."³⁵

standards for foreign trials

The parties to the NATO SOFA have agreed that whenever U.S. military personnel, members of the civilian component, or dependents are prosecuted by foreign authorities, such persons will be entitled to a number of trial safeguards. These include having a prompt and speedy trial; being informed, in advance of trial, of the specific charges against them; being confronted by witnesses against them; having compulsory process for obtaining witnesses in their favor; having legal representation of their own choice or having free or assisted legal representation under the prevailing conditions in the foreign state; having the services of an interpreter, if the accused considers it necessary; communicating with a representative of the U.S. government and, when the rules of the court permit, having such representative present at trial.³⁶ These are significant rights, especially since martial law prevails in many countries.

The purpose of the trial safeguards is to provide the accused with a fair trial. In addition to the provisions of the NATO SOFA, a triservice regulation sets forth guidelines that can be used to determine if a local proceeding is fundamentally fair:³⁷

- the criminal statute alleged to be violated must set forth specific and definite standards of guilt
- the accused shall not be prosecuted under an *ex post facto* law or a bill of attainder
- the accused must be informed of the charges against him and have a reasonable time to prepare a defense

- the accused is entitled to be represented by counsel
- the accused is entitled to be present at his trial
- the accused is entitled to confront witnesses against him
- the accused is entitled to compulsory process for obtaining witness on his behalf
- evidence obtained by unreasonable search and seizure is prohibited
- the burden of proof is on the government
- the accused is entitled to be tried by an impartial court
- the accused may not be compelled to testify against himself
- the accused shall not be subject to cruel and unusual punishment
- the accused is entitled to be tried without unreasonable or prejudicial delay
- the accused is entitled to have an interpreter when he does not understand the native language in which the trial is conducted
- the accused is entitled to a public trial
- the accused is entitled to protection against double jeopardy.

In applying these guidelines one must recognize the critically important fact that they are only guidelines. They are not requirements that must be fulfilled word for word or line for line. The spirit is what is important. Foreign criminal procedure is foreign and cannot be expected to be identical to that found in the United States. But difference does not mean unfairness. The guidelines must be applied in the context of the foreign environment to see that, all factors considered, the trial is fundamentally fair.

U.S. funded participants and observers at foreign trials

A U.S. serviceman under charges in a foreign criminal proceeding is entitled, if he so desires, to have a local defense counsel hired to represent him. The services of the local defense counsel are to be retained and paid for by the U.S. government out of appropriated funds.³⁸ Air Force commanders should be aware that such funds are chargeable to the base for operation and maintenance purposes (O&M or R&D, as applicable).³⁹ These expenses can be extensive while at the same time they cannot be accurately budgeted for since the number and kind of foreign criminal jurisdiction cases cannot be foreseen.

The local defense counsel is a member of the foreign bar admitted to practice before the local courts. He is responsible for the case of the accused and is charged with preparing the defense before the foreign tribunal. No judge advocate or other military officer is to preempt him. If the accused does not understand the native language, and if he so desires, an interpreter will also be hired and paid for by the U.S. out of appropriated funds.⁴⁰

In addition to the local defense counsel, a U.S. trial observer will be present at the foreign criminal proceeding. The trial observer must be a military man of mature judgment; in cases involving other than minor offenses, he must be a judge advocate. An offense cannot be considered minor if there has been serious personal injury or extensive property damage or if the punishment upon conviction is normally confinement, whether suspended or not. In these cases the trial observer must be a judge advocate.⁴¹

The trial observer is a representative

of the United States. He is neither prosecutor nor counsel to the accused. The local defense counsel functions as counsel to the accused. The trial observer, therefore, may not enter into a confidential relationship with the accused. He is not considered a member of the defense team nor is he to attempt to interject himself into the trial proceedings. If the occasion necessitates and circumstances permit, he should take appropriate measures to advise the local defense counsel of the rights of the accused under applicable SOFA and supplemental agreements. On request of the court and the local defense counsel, he will obtain witnesses and evidence available from the U.S. government. But his basic function is to see, hear, and report all proceedings associated with the trial. He is to note the progress of the trial and report any violations of trial safeguards. He is there principally to insure that the accused receives a fair trial as guaranteed to him under the SOFA.⁴²

After the trial is over, the trial observer is to file his report. This report may be regarded as the "key" to supervising the entire foreign criminal process. The report is to contain the factual description or summary of the trial proceedings. The trial observer should set forth specific instances, if any, of denials of trial safeguards secured by the SOFA. He should not, however, draw the general conclusion as to whether the accused received a fair trial under the circumstances. This decision is usually left to higher reviewing authorities.⁴³ In Pacific Air Forces (PACAF), trial observers have been assigned this additional task of drawing the general conclusion as well.

Because of extensive, firsthand experience, trial observers can provide another service in addition to their reports. They can make management recommendations

to higher U.S. authorities for improving procedures or avoiding problem areas. Perhaps the trial observer's recommendations can be implemented by the U.S. government unilaterally. Perhaps they will require negotiations between the two governments. In any case, improvement of relations can only inure to the benefit of all.

The Task Force on the Administration of Military Justice suggested that "a military adviser be provided to the accused in all cases in which foreign governments exercise their jurisdiction to try a military serviceman in their courts."⁴⁴ The Task Force based its recommendation on the belief that such an adviser would provide the accused serviceman with someone who speaks his own language and who has a direct and immediate interest in his specific case. The Task Force was of the opinion that neither the local defense counsel nor the U.S. trial observer could assume that role.

To implement the Task Force recommendation, provision was made for the assignment of another judge advocate as military legal adviser (MLA) when the occasion warranted and circumstances permitted.⁴⁵ This American military lawyer, unlike the trial observer, may enter into a confidential relationship with the accused. His primary responsibility is to insure that the accused is aware of his rights and obligations under applicable agreements and regulations. He may also render assistance to the local defense counsel or to the accused directly. But he is not to pre-empt the local defense counsel. Like the trial observer, the MLA is not a member of the local bar. In rendering assistance directly to the accused, the MLA may represent him or defend him in related U.S. criminal or administrative proceedings growing out of the offense before the foreign tri-

bunal. He is also responsible for looking after the totality of interests of the accused vis-à-vis the military, such as pay matters and the like.

Since the roles of the trial observer and the military legal adviser are inconsistent (the trial observer's duty is to protect the interests of the United States; the military legal adviser's duty is to the accused), the same individual cannot be detailed to both.⁴⁶ Nor can the same person be appointed trial counsel in a related court-martial proceeding growing out of the incident and also be named as military legal adviser.

other assistance

There are several other services that the U.S. government may provide to servicemen facing charges in foreign courts. The government is authorized to expend appropriated funds to pay the court costs of the accused.⁴⁷ This may remove a financial burden from the shoulders of the accused that could be significant. The United States may offer settlement assistance of outstanding claims against the accused.⁴⁸ In many countries the settlement of an outstanding claim may have the result of terminating the case against the accused. The military decision-maker must always remember that claims funds can facilitate a rapid disposition of the entire affair.

The U.S. government can offer investigative assistance. The NATO SOFA recognizes that "the authorities of the receiving State and the sending State shall assist each other in the carrying out of all necessary investigations into offenses, and in the collection and production of evidence, including the seizure and, in proper cases, the handing over of objects connected with an offense. . . ."⁴⁹ A word of caution is necessary. If the

military decision-maker plans to send U.S. investigators into the foreign civilian community to assist the accused, or the foreign court for that matter, he should advise the local police authorities of his contemplated action. Foreign nations are extremely sensitive about having U.S. "agents" roaming about their country. Serious incidents have arisen in the past because local police were not informed. By informing them we can avoid such incidents, and in most cases the local police will welcome whatever assistance U.S. investigators can provide.

Finally, the U.S. government can use diplomatic channels. This option is available, for example, to protest inadequate treatment given an accused held in pre-trial confinement or the absence of a fair trial as judged by the trial safeguards. The latter protest will be based on the trial observer's report and the facts contained therein. Diplomatic channels may prove helpful in achieving action that other channels were unable to accomplish.

DURING World War II a B-17 crew was asked to test a new engine. The plane

climbed to something over 16,000 feet, and the pilot feathered the three regular engines to determine if the new one would work. Then, for a laugh, he feathered the fourth engine. When all four propellers had stopped, the plane soared downward. Then, the exhilarating moment having passed, the pilot pushed the button to unfeather the engines. At that precise instant he realized that he could not unfeather an engine without power and that there is no power unless one engine is going. As the plane glided quietly toward the Newfoundland mountains, the copilot chuckled, turned to the pilot, and said, "Boy, you sure got a problem!"

It's clear that the pilot in this story is not the only person who's "got a problem." The entire crew has a problem. So, too, with foreign criminal jurisdiction matters and SOFAs. These are problem areas that are not solely the responsibility of the diplomat or the international lawyer. The military decision-maker is involved on a day-to-day basis. How well he performs can have a direct impact on the military mission and the foreign policy of the United States.

Air University Institute for Professional Development

Notes

1. Not so obvious, however, may be the number of criminal jurisdiction cases.

Foreign Criminal Jurisdiction Cases

	1970-1971	1971-1972	1972-1973
All services, all cases	43,280	43,106	53,993
All services, all military	40,912	42,599	51,044
All services, all civilians and dependents	2,368	2,507	2,949
All Air Force cases	6,768	7,083	8,251
All Air Force military cases	6,210	6,445	7,490
All Air Force civilian and dependent cases	558	638	761

Compiled from the *Department of Defense Statistics on the Exercise of Criminal Jurisdiction by Foreign Tribunals over United States Personnel*, prepared by the Office of The Judge Advocate General of the Army in accord with AFR 110-12, paragraph 4-4.

2. DOD Directive 5525.1 dated 20 January 1966 and changes 1 and 2; AFR 110-12 dated 5 September 1974, paragraph 1-2(c) and (d).

3. See generally, for example, Agreement between the Parties to the North Atlantic Treaty Regarding the Status of Forces (4 UST 1792; TIAS 2846; 19 UNTS 67), referred to hereafter as the NATO SOFA. Reprinted in AFR 110-20 at 4-1.

4. The full text of the Resolution is reprinted in Appendix A, AFR 110-12. "Although the Senate Resolution applies only in countries in which the NATO Status of Forces Agreement is currently in effect, the same procedure for safeguarding the interests of US personnel subject to foreign jurisdiction will be applied, insofar as practicable, in all overseas areas." AFR 110-12, paragraph 1-1.

5. 10 USC 805.

6. The phrase "primary right" is standard terminology in all SOFAs. Note, for example, Article VII, paragraph 3(a), NATO SOFA. See also, *Atkinson v. Whitley*, 43 *Revue Critique de Droit International Privé* 602 (1954).

7. Article 38, Statute of the International Court of Justice.

8. *The Schooner Exchange v. McFaddon*, 11 US 116 (1812).

9. There are those scholars who believe that customary international law exempts "official duty" cases from foreign-host government jurisdiction. See Vincent A. Jordan, "Creation of Customary International Law

by Way of Treaty," *USAF JAG Law Review*, vol. 9 (September-October 1967), p. 38.

10. See dictum in *Reid v. Covert*, 354 US 1, 77 S Ct 1222; 1 L Ed 2d 1148 (1957); *Kinsella v. Kruger*, 354 US 1, 77 S Ct 1222; 1 L Ed 2d 1148 (1957); and *Wilson v. Girard*, 354 US 1, 77 S Ct 1409; 1 L Ed 2d 1544 (1957).

11. Thailand, not colonized by any country, has a very long history of independence. As such, Thailand is extremely sensitive about her national sovereignty. Since a Status of Forces Agreement would require, in effect, a yielding of sovereignty, Thailand has not been willing to enter into such an arrangement. However, as a result of informal *ad hoc* procedures that have evolved between the United States and Thailand, a virtual allocation of jurisdiction has been accomplished.

12. The NATO SOFA formula for allocation of jurisdiction is set forth in Article VII of that agreement.

13. See paragraph 1, Resolution of Ratification, with Reservation, as Agreed to by the Senate on July 15, 1953 (respecting the NATO SOFA), as reprinted in Appendix A, AFR 110-12.

14. Article VII, paragraph 2(a), NATO SOFA.

15. Article VII, paragraph 2(b), NATO SOFA.

16. Article VII, paragraph 3, NATO SOFA.

17. Article VII, paragraph 3(a), NATO SOFA.

18. Article I, paragraph 1(b), read in conjunction with Article VII, paragraph 3(a), NATO SOFA.

19. Article VII, paragraph 3(a), NATO SOFA.

20. The facts in this example are essentially the same as those in *Wilson v. Girard*, *supra*, note 10.

21. See Will H. Carroll, "Official Duty Cases under Status of Forces Agreements: Modest Guidelines toward a Definition," *USAF JAG Law Review*, vol. 12 (Fall 1970), pp. 284-89.

22. AFR 110-12, paragraph 1-4(a).

23. AFR 110-12, paragraph 1-4(a)1.

24. AFR 110-12, paragraph 1-4(b)1.

25. Article VII, paragraph 3(c), NATO SOFA.

26. Report of the Committee on Armed Forces of the United States Senate, "Operation of Article VII, NATO Status of Forces Treaty," 93rd Congress, 1st Session (March 27, 1973), Report No. 93-90.

27. Article XIX, Agreement between the Parties to the NATO SOFA and Germany of 3 August 1959, 14 UST 531; TIAS 5351; 481 UNTS 262.

28. *Kinsella v. Singleton*, 361 US 234; 80 S Ct 297; 4 L Ed 2d 268 (1960).

29. AFR 110-12, paragraph 1-4(c).

30. AFR 110-25.

31. AFR 110-25, paragraph 4.

32. 10 USC 1037.

33. AFR 110-12, paragraph 3-1.

34. AFR 110-12, paragraph 3-4.

35. AFR 110-12, paragraph 3-5.

36. Article VII, paragraph 9, NATO SOFA.

37. AFR 110-12, Appendix C.

38. 10 USC 1037.

39. AFR 110-12, paragraph 2-9(a).

40. 10 USC 1037.

41. AFR 110-12, paragraph 1-5(a).

42. AFR 110-12, paragraph 1-5(b).

43. AFR 110-12, paragraph 1-5(d).

44. Report of the Task Force, vol. 1, p. 126.

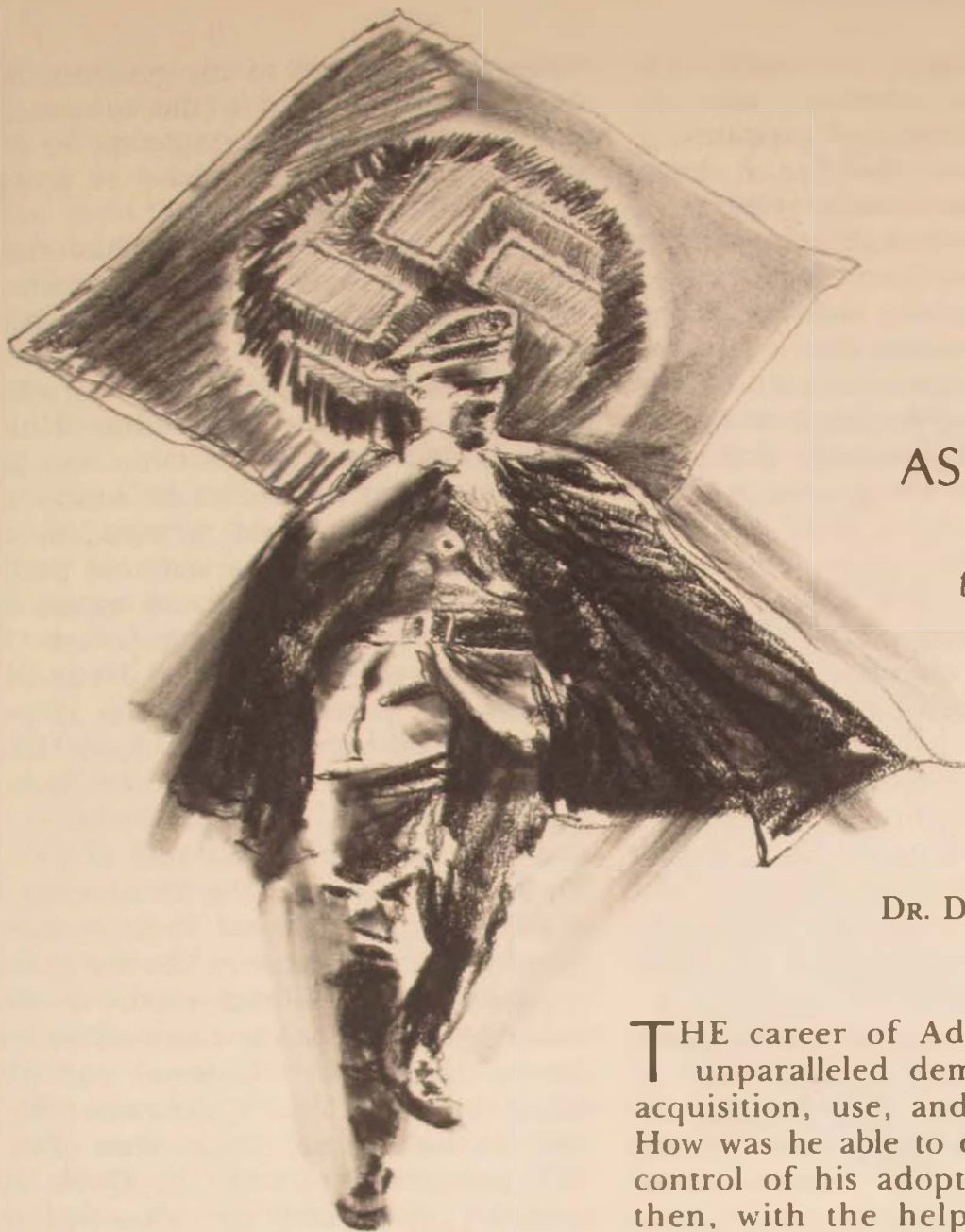
45. AFR 110-12, paragraph 1-6, and *TIG Brief*, no. 8 (1973), p. 16.

46. AFR 110-12, paragraph 1-6.

47. 10 USC 1037.

48. AFM 112-1 dated 1 December 1972, chapters 8 and 9; Article VII, NATO SOFA.

49. Article VII, paragraph 6, NATO SOFA.



HITLER AS WARLORD

*the Fuehrer and
his generals*

DR. DONALD S. DETWILER

THE career of Adolf Hitler was an unparalleled demonstration of the acquisition, use, and abuse of power. How was he able to develop totalitarian control of his adopted homeland and then, with the help of his generals, extend his sway from the Pyrenees to the Crimea? What role did the traditionally conservative Prussian military professionals play under the revolutionary Austrian dilettante to whom they had sworn personal allegiance in 1934? What did the leaders of the caste-conscious military hierarchy really think about their supreme commander? How was he able to bring them to accept his ever more rigid control over their once all but autonomous state within the state? Just what manner of man was he, finally, and what

Books and Ideas

sort of military leader? The three books under consideration here deal with several aspects of these central questions.

In *Hitler's Generals*, the British writer Richard Humble has briefly reviewed the course of the Second World War in Europe and North Africa from the perspective of the German military leadership.† His book is not free of factual error, nor does it offer the specialist new information or insight. But it is not addressed to the specialist in the first place. Intended rather for the general public, it is a fast-paced series of brief essays on the major campaigns of the war, introducing the various field commanders in turn. By compressing his 25 reasonably well-informed and objective sketches into a readable narrative of some 150 pages, Mr. Humble has produced a concise introduction to the more prominent of Hitler's generals, who they were and what they did. It is a useful book, though certainly not, as proclaimed by the publisher on the flyleaf, "an in-depth study of Hitler's relationship with the high command."

That description does apply, however, to the work of Harold C. Deutsch.†† A professor emeritus of history from the University of Minnesota and now at the Army War College, Dr. Deutsch served as Chief of the Research and Analysis Branch of the Office of Strategic Services (OSS) in Paris and then in Germany in 1944-45 and also as a member of the U.S. State Department Special Interrogation Mission in 1945. The broader significance of his contribution to our knowledge of the Third Reich, particularly of

Hitler's relationship to his generals, becomes apparent only in the context of the German dictator's systematic extension of his institutional base of power from 1933 to 1938.

Hitler's appointment to the chancellorship on 30 January 1933 was retrospectively transformed by National Socialist propaganda into a full-blown seizure of power (*Machtergreifung*). That was a legend. No one knew better than Hitler himself that the chancellorship was just the first step. Even before he was sworn into office, he had set to work on the second: electing a new national parliament (Reichstag) that would assure his minority coalition sweeping powers. In the election of 5 March 1933, he and his conservative partners barely won 52 percent, but that narrow margin gave Hitler the leverage he needed: on the 23d of the same month, the representatives of the German people, by a vote of 441 to 94, formally abdicated by transferring to the Hitler government their constitutional legislative authority. By the end of the year all the political parties in Germany had been either dissolved or outlawed except the National Socialist, which by the law of 1 December 1933 was "insolubly tied" to the state. But it was not absorbed into it. Quite the contrary, the party was accorded the status of a public corporation under its leader (Fuehrer), who alone determined its statutes; its disciplinary courts were recognized as having special jurisdiction; and cabinet rank was bestowed on Hitler's party deputy, Rudolf Hess, and on Ernst Roehm, chief of staff of the SA

† Richard Humble, *Hitler's Generals* (Garden City, New York: Doubleday & Co., 1974, \$5.95), viii and 167 pages.

†† Harold C. Deutsch, *Hitler and His Generals: The Hidden Crisis, January-June 1938* (Minneapolis: University of Minnesota Press, and London: Oxford University Press, 1974, \$15.00), xxv and 452 pages.

(*Sturmabteilungen*), the party militia of brownshirted paramilitary storm troopers. The sanction of law was thereby given to a German party-state dualism analogous to the dualism in Russia of the Communist party and the Soviet state.

The implications of this were keenly appreciated by the leaders of the German armed forces (the Reichswehr), for they were the custodians of the German tradition of a very different sort of dualism: a dualism approaching parity between the civilian and military authorities, permitting the latter to remain aloof from party politics and maintain the military establishment on a semi-independent basis. Their privileged status had hardly been challenged by the twenty fragile coalitions of the Weimar Republic from 1918 to 1933, especially not after the election to the presidency of Field Marshal Paul von Hindenburg in 1925. But close Russo-German military ties during the twenties had made the leaders of the Reichswehr quite familiar with what it meant for a professional officer corps to be subjected to the authority of a totalitarian party and its secret police—such as the *Cheka*. Concern about the danger of such a system's arising in Germany had been an important factor in Hitler's rise to power. He was militantly anti-Communist. Whatever shortcomings he might otherwise have had, the military-industrial-landowning establishment generally felt he could be depended upon to stop Bolshevism and, presumably, the threats it implied.

The elevation on 1 December 1933 of SA Chief of Staff Roehm to cabinet rank on a par with the war minister, General Werner von Blomberg, came as a shock. It did not challenge the privileged position of the Reichswehr in the same way establishment of a cabinet-level secret police authority would. But it was seri-

ous, nonetheless, because of the danger that the professional military establishment might be engulfed by the plebeian horde of party storm troopers. In February 1934, *Reichsminister* Roehm proposed to the cabinet that the SA be used as the basis for swift expansion of the army and that this expansion program be carried out under the aegis of a single minister (obviously himself), who would be in charge of the regular armed forces as well as the paramilitary and veterans organizations.



General
Wilhelm Keitel

Limited by the Treaty of Versailles to 100,000 men, including a maximum of 4000 officers, the German army was a professional elite force that would have lost its character, identity, and effectiveness in an amalgamation with Roehm's militia of millions. The SA proposal was immediately sidetracked, not only because of an emphatic Reichswehr protest

directly to Hindenburg, the supreme commander, but also because Hitler himself fully grasped its implications. Roehm's brownshirts had been indispensable during the years he was storming the gates, but now he had no need for brutal street fighters. His future plans called for as sophisticated a striking force as the professional competence of the general staff, modern military technology, and the economic and human resources of the nation could provide. While Roehm continued to agitate for the "Second Revolution" on into the spring and summer of 1934, Hitler became increasingly sensitive to the mounting concern of the German military hierarchy, whose failing 86-year-old protector, President Hindenburg, could not be expected to live more than a few months. Hitler intended to succeed him as head of state and supreme commander of the Reichswehr, but he knew this would not be possible without at least the acquiescence of the tightly knit military hierarchy. With his uncanny instinct for power, Hitler well knew the difference between titles of office and real control—and also understood the peril of underestimating this difference.

Machiavelli once observed that one does not maintain power with the same following used to gain it. A month before Hindenburg's death, Hitler gave a ruthless demonstration of this axiom by ordering Roehm and scores of his associates shot in a series of actions retroactively proclaimed, by a special law, to have been "legal as acts of self-defense by the state."

Allegedly Roehm and his "accomplices" had been caught red-handed in the process of staging a *coup d'état*. This was untrue. While Roehm and many of his supporters were dissatisfied with the government, they were not trying to over-

throw it but rather to gain greater influence within it. Scores of others who obviously had nothing to do with the fictional "Roehm revolt" were simultaneously murdered in a nationwide settling of old accounts that took perhaps two hundred lives, possibly many more. Among the victims were Father Bernhard Stempfle, a former editorial reader of Hitler's *Mein Kampf*, Undersecretary of Transportation Erich Klausener, the head of Catholic Action, and Hitler's predecessor as chancellor, General Kurt von Schleicher, together with his wife, as well as one of his close associates, General Kurt von Bredow.

Not Roehm but Hitler was guilty of a *coup d'état* in the summer of 1934. The Roehm purge was the first step in a triple *coup* by which Hitler made himself Germany's highest judge, head of state, and supreme commander of the armed forces on an extraordinary basis.

The dictator's usurpation of ultimate judicial authority was already implicit in the law by which the cabinet on 3 July 1934 retroactively condemned to death as traitors the victims of the purge. But in his Reichstag speech ten days later, Hitler went on to proclaim explicitly that he had acted as "the supreme judge of the German people." The legislative branch had forfeited its authority by passing the Enabling Act sixteen months earlier; now Hitler placed himself above the judiciary as well. (This was not just a matter of exercising the power of pardon, a traditional and constitutional prerogative of the head of state, an office Hitler in any case did not yet hold. What he claimed, after having blatantly exercised it, was unbridled authority to order executions without due process of law or even the most peremptory of formal convictions.)

On the death of President Hindenburg

at the beginning of August 1934, Hitler succeeded him as head of state and supreme commander. Despite the explicit inviolability of the presidency under the Enabling Act, that office was combined with the chancellorship in Adolf Hitler as Fuehrer and Reich Chancellor by a law decreed by the cabinet on 1 August and endorsed by some 85 percent of the voters in the plebiscite of 19 August. On the 2d, meanwhile, War Minister Blomberg had ordered a sacred oath of personal obedience administered to all members of the armed forces. Earlier forms of the Reichswehr oath, previously required only of new personnel, had been solemn avowals of loyalty and obedience to the constitution and the fatherland, but the new oath, sprung without warning on all, was a commitment, under God, ". . . to render unconditional obedience to the Fuehrer of the German Reich and people, Adolf Hitler. . . ."

Unsanctioned by law or precedent, this vow subordinated those who took it to the status of personal subjects if not vassals of Hitler. Yet it was accepted, despite strong misgivings on the part of many, because Hitler, for his part, had freed the Reichswehr of the threat of the SA with one stunning blow and had categorically pledged, in his Reichstag speech of 13 July, that just as the National Socialist party would be the sole bearer of the political will of the nation, the Reichswehr would be the sole bearer of arms.

THE apparent triumph of the professional military establishment over the party militia was a Pyrrhic victory. The killings had largely been carried out by Heinrich Himmler's SS (*Schutzstaffeln*, defense echelons) and Gestapo (*Geheime*

Staatspolizei, secret state police). On 20 July 1934, exactly one week after his unequivocal pledge to the Reichswehr, Hitler rewarded the SS for its "great services" in connection with the "Roehm revolt" by severing its affiliation with the SA, of which it had been a subdivision initially charged with the personal protection of the Fuehrer. Henceforth reporting directly to him, *Reichsfuehrer-SS* and Gestapo Chief Himmler would be in a position to develop a combined palace guard and secret police incomparably more dangerous to the army and other established interests in Germany than Roehm's SA could ever have become. This did not happen without early warning. One could hardly have contrived a more resounding challenge to the caste-like solidarity and rigid code of honor of the officer corps, particularly unyielding among the army generals, than the cold-blooded murder of Bredow and the Schleichers. The commander in chief of the army, Baron Werner von Fritsch, did turn to Hermann Goering, asking him as a fellow general to arrange with Hitler for a thorough investigation and prosecution of those responsible for the murders. But Fritsch did not follow through, while Hitler, for his part, assuaged the consciences of the more scrupulous by passing the word down through the grapevine that he had been shocked by the murder of the two generals and had seen to it that those responsible were summarily shot. This lie served its purpose. For the time being, the military leadership corps was prepared to accept the leadership of War Minister von Blomberg, who observed that the Prussian officer's honor had consisted in being stringently proper but that from now on the German officer's honor had to consist in being cunning.

For over three years Blomberg's ap-

proach seemed to pay off. The German military establishment prospered, as never before in its history, under leadership of the war minister, one of very few senior members of the officer corps who had become a dedicated National Socialist. In 1935 Hitler introduced universal military training, achieved British recognition of German rearmament in the Anglo-German Naval Agreement, and reorganized the Reichswehr of the Weimar Republic, consisting of the army and navy, into the Wehrmacht of the Third Reich, which now included an independent third service branch, the air force (Luftwaffe) under Goering. In 1936 Blomberg was promoted to field marshal. By late 1937 serious problems had begun to arise in the allocation of raw materials. Shortages had been brought about by the precipitate rearmament program. Goering ruthlessly exploited his position as General Plenipotentiary for the Four Year Plan (for economic mobilization) to the advantage of the air force at the expense of the other service branches. After postponing a showdown as long as he could, Blomberg asked Hitler for a joint conference with himself and the three service chiefs, not seriously hoping to bridle Goering but possibly to establish more equitable guidelines he could be expected to honor. Hitler consented to the meeting, setting it up for the afternoon of 5 November 1937. To Blomberg's surprise, Hitler summoned the Foreign Minister, Baron Konstantin von Neurath, in addition to Goering, Fritsch, and the head of the navy, Admiral Erich Raeder. To the war minister's greater surprise, Hitler used the topic of raw materials merely as a launching pad for an extended explanation of his plans for increasing Germany's living space (*Lebensraum*). First Austria and Czechoslovakia would be taken; then, with the flanks of

the Reich secured, France could be dealt with as the major enemy. Goering already had an idea of what was coming and was in tune with Hitler to begin with. Admiral Raeder was reserved, not only because of his habitual reticence regarding matters outside his immediate area of professional responsibility, sea



Colonel General
Walther von Brauchitsch

warfare, but also because he tended to underestimate the seriousness of what he regarded as mere rhetorical excursions on Hitler's part. Blomberg, Fritsch, and Neurath were astounded but far from speechless; they challenged Hitler's judgment on the spot, and the latter two followed up with subsequent individual conferences. Hitler refused to reconsider his plans, and all three of the dissenters were removed from office. Three

months later to the day, on 5 February 1938, it was announced that Joachim von Ribbentrop had been named foreign minister and General Walther von Brauchitsch commander in chief of the army. The ministry of war had been abolished, Field Marshal von Blomberg relieved, and General Wilhelm Keitel named chief of a newly established supreme staff directly under Hitler.

Blomberg had no direct successor because the functions of his office, much like those of the presidency in 1934, were taken over by Hitler himself. He did this by converting the ministry of war into the "High Command of the Armed Forces" (*Oberkommando der Wehrmacht* or okw). Through the okw, which took precedence over the general staff organizations of the individual service branches, Hitler personally pre-empted the direct command previously exercised by the war minister. General Keitel, whom the dictator inherited as administrator of his new supreme staff, had been virtually assured the post by Blomberg's remark to Hitler that Keitel had merely served as his "*chef de bureau*" (office manager) in the war ministry.

The general background of the events leading to the fall of Blomberg and Fritsch has long been familiar. As a sixty-year-old widower, Field Marshal Werner von Blomberg blundered into a *mésalliance* with a former prostitute and nude model with a police record, including at least one conviction. When this became known, his position was absolutely untenable—not only because of the embarrassment to Hitler, who had joined Goering as a witness at the wedding, but even more because of the rigid code of honor of the officer corps, which could never have tolerated such a breach of caste ethics on the part of a general officer, least of all the first soldier of the Reich.

Meanwhile Fritsch was falsely charged with homosexuality, and although he was proven innocent in the end, the allegations served as a pretext to remove him simultaneously with Blomberg. Hitler thereupon reorganized the war ministry as the high command of the Wehrmacht under Keitel, Blomberg's former deputy, and replaced Fritsch with Brauchitsch. "With one blow, without a jot of opposition, Hitler had thus eliminated the last power factor of any significance," wrote Joachim C. Fest in his recent biography of Hitler. "He had put across, as it were, a 'bloodless June 30.' Contemptuously, he declared that all generals were cowardly." (*Hitler*, New York, 1974, p. 543)

There is some truth in Fest's observation, for the blow that fell on the army in the Blomberg-Fritsch crisis can be compared to that suffered by the SA in the Roehm purge; in each case intractable organizational leadership, undermining Hitler's totalitarian control and thwarting his plans, was ruthlessly supplanted by compliant instruments of his will. But in writing that Hitler broke the hierarchy of the army in 1938 "without a jot of opposition," Fest uncritically accepted the totalitarian dissimulator's denigration of the "cowardly" senior officers of the army and his trivialization of what was in fact a watershed crisis of the National Socialist regime. Hitler had good reason to trivialize it. It was essential to conceal at home and abroad how narrow had been the margin by which he succeeded in the last major *coup d'état* of that long series that finally brought him unchecked power and freed his hands for the mad career of conquest that ultimately led to the destruction of the German Reich and his own suicide in the bunker beneath the ruins of his Berlin chancellery.

Hitler may have thought, or at least hoped, that he had achieved full power over the armed forces with the oath of unconditional personal obedience in August 1934. If so, he realized the contrary after the historic November conference in 1937 at which his authority was categorically challenged by none other than the war minister, who had ordered administration of that oath, and the commander in chief of the army, who had dissuaded his chief of staff, General Ludwig Beck, from resigning in protest against it.

The point of stressing Fest's failure to appreciate the gravity of the 1938 Wehrmacht crisis, to which he devotes only three of his book's 850 pages, is not to suggest incompetence. Despite specialists' reservations regarding his treatment of this and several other matters, this biography of Hitler is widely considered the best now available.

THE Fest flaw serves to dramatize, by contrast, the research and synthesis reported by Harold C. Deutsch in *Hitler and His Generals: The Hidden Crisis, January-June 1938*. In his 475-page volume, Professor Deutsch has come remarkably close to reconstructing as bizarre and improbable, yet meticulously documented a day-by-day, hour-by-hour account of the Blomberg-Fritsch crisis as tapes and testimony made possible in the Watergate affair. Much of the tale has long been known—in part as a result of Deutsch's own postwar interrogations of General Alfred Jodl, Field Marshal Wilhelm Keitel, and others. But by years of tireless investigation, correspondence, and conversation he has gone on to develop the most intimate professional rapport with previously often unidenti-

fied principals, witnesses, and their widows. By tracking down the most deviously concealed connections, he has unearthed an intricate labyrinth beneath the shabby construction that so long passed for all there was to the Blomberg-Fritsch affair. In his historical tunneling, moreover, he has also thoroughly explored the passage that leads directly from the military opposition during the 1938 Wehrmacht crisis—the opposition of which Fest was unaware—to outright conspiracy.

As Deutsch explained in a previously published work, *The Conspiracy against Hitler in the Twilight War* (Minneapolis, 1968, p. 6), there were four rounds in the military conspiracy against Hitler. The first, centering in the high command of the army, culminated in preparations for a *coup* against Hitler in September 1938 as soon as he would give the order for war against Czechoslovakia over the Sudetenland. Though well apprised of these preparations, the British and French opted for appeasement, not only forestalling Hitler's overthrow but vindicating his aggressive policy. Round II, from September 1939 to May 1940, centering in the intelligence division of the high command of the armed forces, sought to prevent the continuation of the war after the fall of Poland. The third round took place in 1942 and 1943; operating from the Eastern front, its protagonists proved unable to kill Hitler, once merely because of the failure of a detonator. Round IV, operating from the staff of the reserve army command in Berlin, climaxed in the detonation of a bomb in Hitler's headquarters on 20 July 1944; but although several persons close to Hitler were killed, he was only slightly injured. A number of works, such as Eberhard Zeller's *The Flame of Freedom: The German Struggle*



Nuremberg rally—1935
Blomberg, Goering, Fritsch,
and Hitler

against Hitler (University of Miami, 1969), have recounted the story of the German resistance with particular emphasis on the third and fourth rounds. In his 1968 book Professor Deutsch reconstructed the story of the second round, including the role of the Vatican, which had not previously been elucidated. His present book, *Hitler and His Generals*, clearly shows how it was that—to cite the subtitle—“The Hidden Crisis, January-June 1938” so shocked and outraged the military leadership corps that, by its end, they were ready to make the plans to deal with Hitler that will be fully described in Deutsch’s forthcoming volume covering the period from June 1938 to the beginning of the war.

The removal of Blomberg and Fritsch as such did not provoke shock and outrage. As supreme commander, Hitler had the prerogative of asking for their

resignations at any time. Had he wished to do so, he might have found it more difficult to keep Blomberg than to let him go, for the indignation concerning the field marshal’s *mésalliance* among the strait-laced military hierarchs was so intense that, after his fall, with the blessing of Admiral Raeder and travel funds provided by Hitler’s personal adjutant, he was followed to Rome by his former naval adjutant, Baron von Wangenheim, who gave him what was probably the most complete account he had yet heard of his wife’s past and urged him, as a matter of honor, to seek an annulment. When Blomberg indignantly refused, Wangenheim slammed down on the table a pistol for the disgraced officer to use in taking his own life, which he even more indignantly refused to do.

Once Blomberg had married the former Eva Gruhn (who had never been his

secretary, as stated by Richard Humble), his fate was sealed. Once he fell, his almost inevitable successor as war minister would have been the highly esteemed commander in chief of the senior service branch, Baron Werner von Fritsch. But the commander in chief of the air force, Hermann Goering, wanted to become war minister and thereby gain control of the Wehrmacht himself. To that end, not only had he encouraged Blomberg, who naïvely confided in him, to marry Eva Gruhn; he had even, on the distraught war minister's appeal, arranged for an inconvenient rival to be given a lucrative position in Argentina. Before accepting this by no means optional turn of fortune, Blomberg's departing rival had the decency to call on Goering with a message, to be conveyed as tactfully as possible to Blomberg, that in view of the lady's lurid history he might be well advised to reconsider his marital intentions. Far from warning Blomberg of his peril, Goering had turned forthwith to Himmler, and after early December 1937 not only Blomberg's future wife but also Fritsch, his most likely successor, were under secret Gestapo surveillance.

The dossier on the future wife of the war minister was easily enough put together, but assembling the kind of charges Goering required to discredit Fritsch was another matter, for the conservative, reticent bachelor was personally no less than professionally above reproach. There being no legitimate case against Fritsch, Himmler's minions built one around perjured allegations of homosexuality by a confessed extortionist and police informer. Fritsch was proved innocent before the court-martial when his defense demonstrated that the false witness had never blackmailed him but rather a retired cavalry captain with a similar name, Frisch.

Professor Deutsch, through two-thirds of his gripping book, traces the Byzantine scenario in all its complex mendacity, beginning on 25 January 1938 with Hitler's revelation to his Wehrmacht adjutant of the double-barreled charges aimed at the two highest officers of the army and ending with Fritsch's complete exoneration by the court-martial almost eight weeks later. Goering was behind the army's agony, assiduously helping Blomberg into his marital trap rather than warning him, while shamelessly conspiring with Himmler to discredit Fritsch, in order to gain control of the Wehrmacht. He lost this prize, for it was snatched, through Keitel, by Hitler, who meanwhile agreed to the demand of the army's outraged senior officers for a full investigation and court-martial. In exchange, however, he not only extracted their acquiescence in his establishment of the new Wehrmacht high command with the professionally acceptable but personally weak Keitel as his staff chief but also elicited their agreement to the immediate appointment of a new commander in chief of the army. The leaders of the embattled military hierarchy went along with this in part because they were able to prevail upon Hitler to name Walther von Brauchitsch to the post rather than his professed favorite, General Walther von Reichenau, earlier and more strongly National Socialist than even Blomberg had been.

Little did they dream that, by the time Hitler appointed the man of their choice, he had been gravely compromised by Hitler's support in his divorce settlement. Deeply enamored of a paramour of earlier years, he had long been separated from his wife, but she refused to release him in a private settlement except on the basis of a lump sum payment (in lieu of

alimony) that was entirely beyond his means. As he saw no alternative but to accept the scandal of divorce for adultery in public court proceedings, which would immediately end his career, he considered himself completely unsuitable for the position and explained this to Hitler. Instantly the dictator knew he finally had found his man. For understandable ideological reasons, he told Brauchitsch, he personally preferred Reichenau, just as he would have preferred him as war minister back in 1933, but the army leaders were no less against him now than then. So, as supreme commander of the Wehrmacht, he now turned to Brauchitsch, knowing that the army leaders and the German people could depend upon him not to shrink before the tasks that lay ahead. The perplexed soldier did indeed shrink at first, but after several days of negotiations with Goering and Keitel as well as Hitler, he became convinced that his personal circumstances must not be permitted to stand in the way of national interest or the good of the service. To solve his delicate marital problem, Hitler promised that whatever would be necessary to effect the private lump sum settlement would be provided from his own personal funds. (These funds would have been adequate to buy off a harem, in view of his income from such sources as tax-free book royalties—*Mein Kampf* was "required reading" everywhere—and payments from the postal service for the use of his picture on German stamps, "a type of emolument," Deutsch observes, "that certainly would never have occurred to previous German heads of state.") The capital sum required in the end, 80,000 marks, was not actually provided until after months of legal negotiations and proceedings leading to the divorce, critical months during which

Brauchitsch was on tenterhooks.

But even after consummation of the sad transaction, he remained personally so beholden to Hitler that he was probably more compliant than the strong-willed Reichenau would have been. Hitler's ultimate concern was neither ideological orthodoxy nor critical loyalty (the only true kind), but the power to impose his will. This he achieved by the army's consent to the spineless Keitel and the vulnerable Brauchitsch.

With their appointments, Hitler had all but won his game. Yet he was not in a position to rewrite the rules and declare that it had ended with his final victory, for the verdict on the Fritsch case was still outstanding. The conclusive demonstration of Fritsch's innocence would have meant a severe setback for the Hitler regime, particularly for the emerging ss-Gestapo state within the state, which had compromised itself by the seizure and torture of the key defense witness and by a thinly veiled threat to the life of Fritsch himself. However, the fiasco of this sordid affair was completely overshadowed by an event that interrupted the court-martial proceedings for a full week: the annexation of Austria, a German triumph unequalled since the Franco-Prussian war.

The Fritsch investigation and court-martial, unique in the annals of military justice, resulted in far more than the exoneration of the viciously defamed general. It had also been a trial of the officer corps. Many of its members failed to perceive this. Others succumbed to the blandishments or threats of the regime. But some of them drew together, united in the realization that in a land where even loyal opposition was prosecuted as crime, those seriously opposing a criminal regime had no alternative but conspiracy.

In *Hitler and His Generals*, Harold C. Deutsch has shown precisely how, in the Wehrmacht crisis of January through June 1938, Hitler succeeded in wresting institutional control of the German armed forces from the tightly knit German military leadership corps—but how, in so doing, he forced a number of its most discerning members, including several of his close associates, into an extensive conspiracy involving influential representatives of “the decent Germany” from all walks of life. This book, its forthcoming sequel, and Professor Deutsch’s already published third volume, *The Conspiracy against Hitler in the Twilight War*, together will represent the first adequate historical recognition of one of the most tragic chapters in German history.

RICHARD HUMBLE’S survey and Deutsch’s masterpiece repeatedly raise questions that are directly addressed from a unique perspective in the third book under consideration here, Percy Ernst Schramm’s *Hitler: The Man and the Military Leader*.† Assigned to German supreme headquarters at the beginning of 1943, Schramm, the late Goettingen historian, kept the official war diary of the high command of the Wehrmacht until the end of the war. In the 1960s he published it in four massive volumes, which he introduced with an essay on Hitler as a warlord. He appended to it a study he had prepared in 1945 for U.S. Army historians on Hitler’s bitter conflict with his generals over the Battle of the Bulge, together with a remarkable memorandum on Hitler’s military leadership dictated at Nuremberg by General Alfred Jodl, former

chief of Wehrmacht operations. The present volume couples these three pieces with the detailed analysis of Hitler’s personality, cultural background, ideology, philosophy of life, and physical condition that Schramm had published as an introduction to his definitive edition of Hitler’s table conversations. Consequently *Hitler: The Man and the Military Leader* (which, as a former Goettingen student of Schramm’s, this reviewer translated, edited, and annotated in consultation with him before his death in 1970) is not the English edition of a book that appeared in Germany but is an original presentation of the interpretation of Hitler by the man internationally recognized as the Nestor of German World War II historians.

Scion of a patrician Hamburg family (his father was mayor), a brilliant medievalist (elected corresponding member of the Medieval Academy of America), and chancellor of the Order *Pour le Mérite* for the Sciences and Arts (the only German order of knighthood to have survived both World Wars), Schramm probed the records of secret conversations and conferences for clues to help account for the man who “for twelve years determined the fate of Germany, and for five brought the world to tremble.” Schramm did not claim to have given final answers to the questions posed by “the most devious and baleful man in German history,” but the sensitivity and authority with which he perceived and defined them make his work invaluable for readers seriously interested in the history of Germany, the Second World War, or military leadership in an age of ideological warfare.

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† Percy E. Schramm, *Hitler: The Man and the Military Leader*, translated and edited with an introduction by Donald S. Detwiler (Chicago: Quadrangle Books, 1971; London: Allen Lane, Penguin Press, 1972; New York: Franklin Watts, New Viewpoints, 1973, cloth, \$10.00; paper, \$2.95), x and 214 pages.

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AWARD

The Air University Review Awards Committee has selected "Counterforce in an Era of Essential Equivalence" by Captain D. J. Alberts, USAF, as the outstanding article in the March-April 1975 issue of *Air University Review*.

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