AIR UNIVERSITY REVIEW

DEEP FURROW airdrop

ARMS CONTROL AND DISARMAMENT . . . EXERCISE DEEP FURROW . . . JCS AND DEFENSE POLICY FORMULATION

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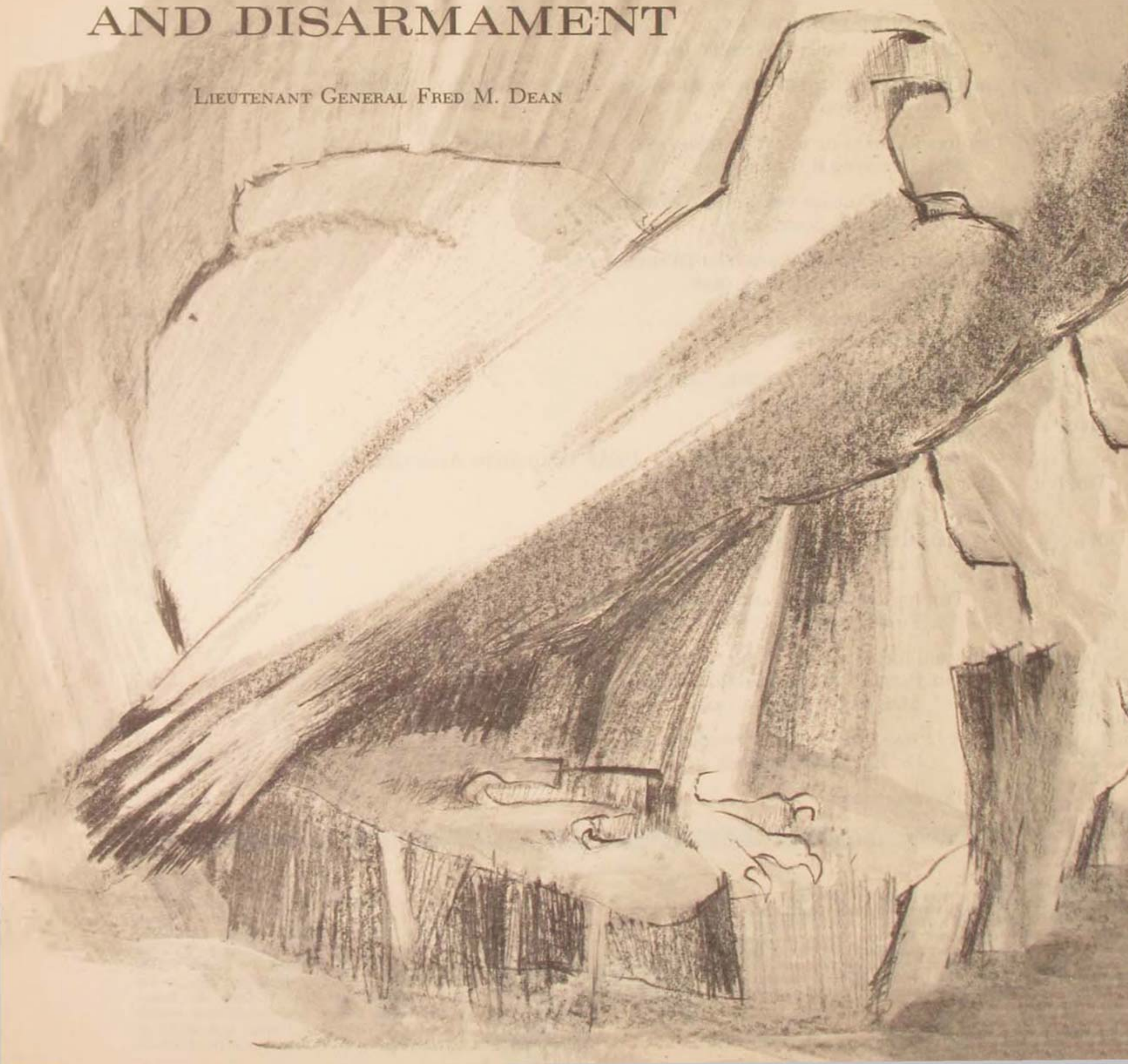
the cover

In September 1965 personnel of all four U.S. military services joined Greek and Turkish forces in NATO's Exercise DEEP FURROW 65. Lieutenant General Benjamin J. Webster, who as Commander, Allied Air Forces Southern Europe, played a significant role in the joint exercise, describes it from its inception through the air and amphibious assault phases in Turkey and Greece and offers an estimate of overall exercise effectiveness.

THE BIRD'S-EYE VIEW OF ARMS CONTROL AND DISARMAMENT

Lieutenant General Fred M. Dean



IN MATTERS of defense and foreign affairs, it has become popular to describe policy proposals and recommendations as being polarized around two general outlooks. The proponents of these two outlooks have come to be described as "hawks" and "doves." But, like most collective terms that attempt to generalize or oversimplify, these sobriquets are subject to inaccurate if not misleading definition. At one extreme, the hawks are depicted as soaring boldly in the updrafts from the brink of war, crying stridently for forceful, positive actions or responses, wings poised for the plunge. On the other hand, the doves are usually conceived of as fluttering along a timid path through a thicket of abstract ideas, such as the U.S. image, world opinion, and international legalities, while uttering gentle cooing calls for delicacy of approach, negotiation, and conciliation—and occasionally resting on a moral perch.

These are, of course, extreme portrayals, for the most part greatly overdrawn as well as unflattering and sometimes unfair to the sincerity and motives of those to whom the labels may be attached. But these appellations do serve as useful devices with which to isolate pros and cons and to identify competing voices, both in and out of the government, that seek to influence the course of events.

This hyperbole of the birds is also apposite in matters of arms control and disarmament, because such matters impinge upon both defense and foreign policy concerns. This impingement has resulted in the emergence of a third kind of bird among the hawks and the doves. This one is best described as the "eagle." And this is a peculiarly American species of eagle, for seized in its talons are both the olive branch of peace and the arrows of armed strength. In general terms, the eagles turn out to be much less bellicose than the hawks and far tougher than the doves.

general outlooks

Before taking up the United States arms control and disarmament goals and objectives, I shall survey briefly what seem to be the general outlooks of the birds on this subject, as I have come to understand them.

Generally, the hawks call for "peace through strength." They are convinced that military power is the only common, meaningful language of international relations and that overwhelming superiority of such power is the only thing that keeps Communist aggression in check. They hold that war is a historic social institution rising from clashes of national self-interests among contending nation-states; as such, war cannot be abolished, so the best to be hoped for is to deter it.

They point with concern to the historic failure of previous U.S. and international disarmament efforts and the inadequacy of the League of Nations and United Nations to deal successfully with security problems, especially when the interests of the major powers were involved.

In sum, the hawk outlook is that the prospects for any serious measures on arms control and disarmament are of very low probability for the foreseeable future. Even limited measures may, in fact, be quite dangerous to our national security.

What of the doves? Their main premise is that the very existence of armaments, particularly the nuclear arsenals, creates fear and international tensions which keep the world on the knife-edge of the "balance of terror." They contend that fear causes war and that the causes of fear must be sharply reduced before a meaningful solution to international differences can materialize. The doves' approach to alleviation of such causes favors experimentation.

At the outer reaches of the dovecote can even be heard calls for world government as the only way of resolving conflict between nation-states, with all military power centralized under supranational control to police a rapidly disarmed world. The more thoughtful and serious-minded doves, however, do not press this far but do urge deliberate speed for changes in the world system to eliminate war and reliance upon military power as the arbiter in international relations.

To summarize, the doves hold that, under the urgencies of modern conditions brought on by the collapse of time and space and the vast destructiveness of weapons created by technology, nations and peoples can and must change. They argue that the "unthinkable" consequences of war at thermonuclear levels are so exigent that a bold international program, led by the United States, must be launched to dismantle the modern instruments of war. Otherwise, they mournfully conclude, time may run out and, through fear, insecurity, and miscalculation by nuclear-armed nations, the world may end in radioactive ruins.

Thus, it would appear that the outlooks of the hawks and the doves are as divergent with respect to the approach to arms control and disarmament as they are in regard to other defense and foreign policy questions. Let us, then, consider the eagles' views.

Collectively, the eagles agree on and emphasize the need to work for alternatives to huge arsenals of weapons which, if used, could bring the world down. They also consider it important that we not overbuild our defensive-offensive capabilities to the detriment of other components of our national strength, i.e., economic, social, and political. But they also have serious reservations concerning Communist motives and intentions. With all this, there is the conviction that balanced, adequate U.S. strength is indispensable as a basis for any hopeful prospects of arms control negotiations with the Communist states. At the same time, the eagles are willing for the United States to negotiate arms control and disarmament possibilities whenever our adversaries are willing to talk meaningfully on a rational, *quid pro quo* basis.

In essence, the eagles believe that a continuing dialogue should be sustained by the U.S. with its adversaries. The purpose would be both to determine the nature of their motives and intent and to convey to them, as well as to friendly and neutral nations, the United States' conviction and sincerity of purpose in working for a lessening of tensions and for a slowing down of the arms race through balanced, verifiable agreements.

From the discussion thus far, it should be clear that the eagles represent the collective views and actions of the U.S. Government. Yet the reader should not be misled into thinking that during the formulation of policy and recommendations the eagles are therefore a monolithic body of opinion and judgments, speaking with one voice. It cannot be overlooked that within the span of the government there are those individuals specifically charged with responsibility for the size and number of arrows the eagle carries, whereas others are much more involved in the cultivation and application of the olive branch.

Thus, the differences of views expressed by the various eagles stem from their differing responsibilities and their perspectives on the *how* and the *when* of arms control and disarmament, rather than the *what* and the *why*. This is as it should be; otherwise the President would be denied the range of alternatives and choice of options which he needs to formulate sound decisions on arms control and disarmament policy.

Once these executive decisions are made, of course, the views of all those who advise the President tend to merge in support of a single position: that of the official eagle of the United States, poised in balance between the olive branch and the sheaf of arrows.

The foregoing notwithstanding, the American tradition of debating public policy remains a very active one. The urgent cries of the hawks and the insistent cooings of the doves continue. They swoop and flutter about the U.S. eagle, the one tugging to loose his arrows, the other pressing him to lift higher the olive branch. Small wonder that the old bird gets a little ruffled from time to time in maintaining his balanced perch on arms control and disarmament matters!

Moving now from the general to the specific, we shall first state the structure of national goals and supporting objectives which shape the United States efforts in arms control and disarmament, then examine the respective bird's-eye views on the major issues relative to these goals and objectives. I hope in this way to provide the reader with a framework of understanding and a selection of perspectives which will contribute to the formulation of his own position and personal views on this controversial but vital and contemporary subject.

national goals, policy, and objectives

The first type of question one might logically ask when initially considering arms control and disarmament is: "What is the United States trying to achieve and what is the fundamental policy which guides its efforts in arms control and disarmament?"

The answer can be found in the law of the land, specifically Public Law 87-297, "The Arms Control and Disarmament Act," which states, in substance, that an ultimate goal of the United States is a world which is free from the scourge of war and the danger and burdens of armaments, in which the use of force has been subordinated to the rule of law, and in which international adjustments to a changing world are achieved peacefully. In seeking to achieve this ultimate goal, arms control and disarmament policy, as an important aspect of foreign policy, must be consistent with national security policy as a whole.

In pursuance of this ultimate goal and in accordance with the above policy, the United States seeks to achieve the following arms control and disarmament objectives:

- A stable international environment conducive to arms control and disarmament
- Nonproliferation among nations of weapons of mass destruction, delivery vehicles, and conventional weapons
- No outbreak of hostilities; if hostilities occur, reduction of their destructiveness, and containment and termination of them
- Limitation and reduction of armed forces, armaments, and military expenditures.

Additionally, in striving for these objectives, the United States must plan for the economic consequences of reduced defense spending, both in the United States and abroad, resulting from arms control and disarmament measures, and for the constructive use of the resources thus released.

the bird's-eye views on major issues

The significant major issues in arms control and disarmament take shape when the general outlooks of the hawks, doves, and eagles are focused specifically on the U.S. arms control and disarmament objectives. The pulling and hauling relative to these objectives devolve from the differing views held as to their priorities and how best to go about attaining them.

To a considerable extent, the question of priority of objectives conditions the views of each group with respect to the major issues. For example, the hawk conviction is that until the objective of a stable international environment (as they understand it) is achieved, efforts toward obtaining the other objectives do not make much sense, or may be damaging to U.S. national security. The doves, on the other hand, place overriding priority on the objective of limiting and reducing armaments as the indispensable key to progress on the other objectives stated. But the eagles do not accept either of these rigid priorities. They hold that the United States should pursue parallel lines of action, advancing toward all four objectives on a broad front, retaining the flexibility to adjust priorities among them to exploit opportunities or to respond to the exigencies of the world situation.

THESE respective attitudes toward priorities should be kept in mind in the following discussion of major issues, set within the context of the U.S. arms control and disarmament objectives.

"a stable environment conducive to arms control . . ."

The major issues related to this objective revolve around two questions. First, are meaningful arms control and disarmament negotiations and international agreements possible without participation of Communist China? And, second, in view of current and foreseeable world conditions is it possible for the United States to enter into significant agreements with the Soviet Union without detriment to our national security?

The view of the hawks is that Red China should continue to be isolated politically and contained militarily as a bandit nation. They are concerned about the Chinese Communists' primitive nuclear capability but feel that a strategic threat to the United States is still well off into the future. The hawks do consider, however, that should this threat develop more rapidly than anticipated and if Red China continues its present belligerent course toward the U.S., we would then be justified in destroying her nuclear and industrial capabilities. In hawk idiom, this has been described as "returning Communist China to the Stone Age."

Meanwhile, according to the hawks, the major threat to the U.S., Europe, and the rest of the free world continues to be the Soviet Union. They voice strong doubts, if not downright disbelief, of any serious intentions on the part of the latter toward arms control and disarmament. Some hawks will argue that the Soviets view arms control and disarmament purely as a propaganda ploy to keep the U.S. off balance and to cast us in the role of imperialist warmongers in the eyes of the so-called unaligned nations or lesser developed countries, especially those that are likely Communist targets for subversion and "just wars of national liberation." The hawk-like conclusion is that, since we are on top in the strategic picture, our best hope for a stable international environment is to convince the U.S.S.R. we intend to stay there. Thus, any arms control agreement which the U.S. might undertake must have as its basic premise the maintenance of this superior position while reducing the Soviet threat to the United States and Europe.

The doves, to the contrary, urge that we must open a dialogue on arms control and disarmament with Communist China now, else all prospects of international stability will wither. They maintain that bringing the Chinese Communists into such a dialogue, with the status of a recognized member of the international community, would have a civilizing effect on their bellicose attitudes toward the U.S. and China's neighbor nations. The doves insist that, at the very least, such a dialogue would give insight into Red China's intentions and clarify problems, thus soothing its frustrations and security fears to the point where it might be possible to bring the Red Chinese nuclear effort under control.

With regard to the U.S.S.R., the doves advance the view that significant changes have been and are occurring in that country's outlook. As a result the Soviet Union is no longer seriously oriented toward world revolution and ultimate Communist domination or toward inevitable war. Rather, she is far more concerned about her relationships with Red China and the other Communist states and with serious internal problems in economics, industry, and agriculture. Deeply worried about her security, she is apprehensive of United States strategic capabilities and intentions and the dangers of nuclear war. From this, the doves conclude that the U.S.S.R. is no longer the major active threat to the U.S. and our allies, providing that we do not destabilize the international environment or upset the military balance by developing and deploying additional new and advanced weaponry.

The doves put forth that, as the most powerful nation, the United States should consider and accommodate the changed outlooks and fears of the Soviets as a first step in improving the international environment. From our position of great power, we should not insist on arms control measures which are obviously to the U.S. advantage and which serve only to heighten the Soviets' sense of strategic inferiority and give rise to their fears. Moreover, say the doves, a positive U.S. gesture in this direction would signal the beginnings of a real détente between the super powers, making possible the first real turn downward in the arms race. Some doves seem to think it might even be possible that the U.S.S.R. would see the advantages of working with the U.S. to tame Red China into peaceful ways and to dampen outbreaks of violence such as the India-Pakistan clash.

The eagles' attitude is one of guarded watchfulness, strongly conditioned by the United States commitment in Vietnam. The outcome of Red China's attitudes and actions there and elsewhere will be the key factor in any change in the current U.S. views of Communist China, one way or the other. Meanwhile, the eagles do not see any evidence that the Chinese Communists are interested in improving the international situation or joining the community of nations except under conditions to the marked disadvantage of the United States and the free world. The eagles also feel that the Chinese discomfiture over their recent setbacks in the lesser developed countries and in the India-Pakistan confrontation, coupled with their worsening philippic with the U.S.S.R., indicates a very low probability of any interest on their part in participating in an arms control and disarmament dialogue. In fact, recent statements by high Communist Chinese leaders are to the effect that U.S. arms control and disarmament proposals are simply an imperialist aggressor plot to disarm poor but honest Communist China and divide the world into American and Soviet spheres of control.

The eagles are not convinced that the U.S.S.R. has been transformed in its outlooks and policies to the extent held by the doves, but they are willing to agree that the Soviets do have their problems, mostly of their own creation. The eagles consider that these problems, taken in conjunction with U.S. determination and obvious capability to act at the time of the Cuban crisis, led to the limited détente wherein we were able to make some progress on arms control with the U.S.S.R. Now the eagles are concerned that this détente is deteriorating into a new chill in U.S.–U.S.S.R. relations, which the latter blames on the U.S. actions in Vietnam. The eagles, however, sense that the real source of this new freeze is Soviet frustration at not being able to influence the situation in Vietnam in the face of American power and determination and Communist China's obstreperousness. Meanwhile, the eagles are firm in their view that the United States should continue the arms control and disarmament dialogue with the U.S.S.R., both to determine if there are indeed any prospects for a serious change in her outlooks and intentions and to convince the Soviets that our intentions toward them are not aggressive.

The eagles do not consider that the U.S. should attempt to tell the U.S.S.R. how to solve her problems, even if she would listen.

At the same time, through the continuing dialogue, the eagles sense that even the Soviets might eventually be able to see the advantages that would accrue to them in stabilizing the international environment and leveling off, then turning down the arms race.

"nonproliferation of weapons . . ."

The significant major issue at present related to the U.S. arms control objective of preventing proliferation of weapons of mass destruction is how the U.S. should deal with the uncompromising Soviet attitude toward a nuclear nonproliferation treaty.

The hawk view of this issue is based on the premise that nuclear hardware sharing in Europe, such as a Multilateral Nuclear Force/Atlantic Nuclear Force (MLF/ANF) type of arrangement, is an overriding political and military necessity. The hawks point out that, without such an arrangement, the Federal

Republic of Germany could become dissociated from the NATO alliance and seek to develop her own nuclear capabilities. The hawks urge that the U.S.S.R. must be brought to accept that nuclear hardware sharing can be arranged so that it does not constitute nuclear spread but in fact is the best way of attaining nonproliferation in Europe. In any event, conclude the hawks, NATO must have an MLF/ANF type of arrangement in face of the menacing Soviet nuclear posture of hundreds of MRBM's based in the western U.S.S.R. and targeted on West Germany.

As for the doves' views on the question of Soviet attitudes toward a nonproliferation treaty, they emphasize that the U.S.S.R. has very genuine apprehensions concerning the Federal Republic of Germany's gaining any form of access to nuclear weapons. They point out that the Soviet polemics about West German "revanchism" are not just propaganda but indeed represent deep-seated Soviet anxieties as to future German intentions, which the U.S. should treat more empathically.

The doves argue that U.S. policy should urge the F.R.G. to accept something much less than the MLF/ANF (which they note other European nations do not like either) in order to remove the major obstacle to attaining a nonproliferation treaty with the U.S.S.R. now, before the nuclear dam breaks. Since it is American power which guarantees European and German security in any event, they feel that revision of the West German position on NATO nuclear sharing arrangements is a *must* if we are to see any modification of the unbending Soviet attitude.

In countering the importunities of both hawks and doves concerning the Soviet stand on a nonproliferation treaty, the eagles advance two main points.

First, the United States does not hold that the MLF is the only solution to NATO nuclear arrangements. To the contrary, the idea was first introduced by the U.S. in order to stimulate European thinking on this problem. The U.K. proposal for an Atlantic Nuclear Force was the only substantial response in this respect.

Next, as long as the Soviet MRBM threat to Western Europe exists and grows, some form of adequate arrangements for the planning, targeting, and coordinated control of nuclear weapons is indispensable to the defense of our NATO partners, including the F.R.G. The U.S. finds it unacceptable that the Soviets should dictate what these arrangements may or may not be. In fact, the eagles point out that the U.S. and NATO would be greatly interested in knowing what arrangements the U.S.S.R. has instituted in the Warsaw Pact military structure for the control of nuclear weapons. With the background of recent delivery of tactical nuclear systems to Warsaw Pact forces, the Soviet reply to this question has been one of dead silence.

The eagles take a global view of both the dangers of nuclear proliferation and the urgency of preventing it, as compared with the seemingly exclusive Soviet focus on West Germany. Therefore, the eagles believe that the major task ahead for the United States is to persuade the Soviets of the importance of the global problem and to convince them that, within this context, NATO nuclear control arrangements will contribute to reducing the worldwide proliferation possibilities posed by such nations as India, Sweden, Israel, and Japan.

"prevention, containment, termination of hostilities . . ."

The major issues at controversy among the hawks, doves, and eagles concerning the U.S. objective of preventing, containing, and terminating hostilities stem from the differing views on the East-West confrontation and the U.S. role in relation to the lesser developed, emerging nations in the world.

The hawks contend that the overriding needs of the emerging nations are stable government and the arms and forces to defend themselves against Communist subversion and the related "just wars of national liberation." Instability among the lesser developed countries can directly affect U.S. security interests in key world areas, according to the hawks. Therefore, the proper course for the United States is to help build the shield of military strength within these countries and back it with U.S. power while assisting them with their political and economic difficulties.

The hawks tend to stress the relative ineffectualness of the United Nations as a peace-keeping or conflict-resolving agency when the differing interests of the major powers are engaged. Hence, they insist, if Communist-inspired or -directed hostilities break out in the lesser developed countries and are to be contained and terminated to the advantage of U.S. and free world security, the United States had better be ready to do the job, quickly and well.

On the problems of the lesser developed countries, the doves tend to be quite critical. They complain that U.S. policy is dominated by military considerations which contribute to instability and to the outbreak of hostilities in these areas, rather than prevent them. They urge that the best way to prevent these conflicts would be for the United States to support efforts to tackle, as the first priority, the political and economic difficulties of these countries on a regional basis. These efforts should be institutionalized through international organization and participation, to minimize the conditions which lead to friction and the outbreak of war in these areas. With this, the doves exhort the U.S. to seek ways and means to achieve agreement among the major powers to stem the flow of arms into the lesser developed countries, concluding that, if the tools of war are denied, the dangers of conflict are proportionately diminished.

Finally, the doves plead for much more attention and support for the United Nations as the best hope for peace-keeping in troubled areas. They urge that the U.S. take the lead in obtaining agreements on setting up a permanent U.N. force, as visualized in the U.N. Charter, and such other U.N. organizations as a Peace Observer Corps.

These latter views relate to the doves' apparent conviction that the unilateral exercise of U.S. military power is essentially provocative and may lead to a direct confrontation with the U.S.S.R. or Communist China, with the attendant danger of a rapid escalation into nuclear disaster.

The eagles aver that balanced military, political, and socioeconomic assistance is the surest way to attain and maintain the stability necessary to national independence and viability in the lesser developed countries. But this balance can be maintained only if the country concerned is not subjected to the disruption of Communist-inspired and -directed violence. The eagles consider that such threats endanger not just the nation and region so attacked but the ultimate security of the United States and the rest of the free world. Thus, although the eagles look hopefully for assistance from U.S. allies that have interests in the endangered area, military support by the United States may be the only means of preventing, containing, or terminating hostilities brought on by Soviet or Chinese Communist cat's-paws clawing at the vitals of an emerging nation. As in Vietnam, the scope and pervasiveness of the armed struggle against Communist aggression can cause the military aspects of U.S. support to overshadow the other kinds of assistance in response to a developing nation's needs. But, the eagles insist, these other needs would become completely academic if the United States did not provide the necessary military aid to bolster a smaller nation's efforts to excise the Communist enemy.

While desiring that the United States do all it can to work through and strengthen the United Nations and the efficacy of international law, the eagles somberly view the perspective of the past twenty years. What they see tells them that the rule of law among the nations of the world has not prevailed. While continuing to strive toward that hoped-for goal through the United Nations, the eagles maintain that the United States must reserve the prerogative of employing its power in the protection of its smaller allies and its own security interests. Meanwhile, with his olive branch held forward, the eagle invites all nations to join with the United States in searching for peaceful ways of preventing, containing, or terminating hostilities, wherever they may occur.

"limitation and reduction of armed forces and armaments . . ."

The salient issue which stems from the differing views on these arms control and disarmament objectives relates to the matter of a freeze on the numbers and characteristics of strategic nuclear delivery vehicles (SNDV) and an ultimate reduction in their numbers.

The hawks seem to think that the idea of a freeze and reduction of SNDV's borders on the absurd. They stress that it is patently illogical for a nation like the U.S.S.R. to negotiate and agree to a condition of present and future inferiority in strategic capabilities. The hawks contend further that, even should the Soviets make such an agreement, they would only do so for the purpose of evading it while they worked to close the strategic gap, as they are probably doing even now. Moreover, it is the hawk view that verification of such an agreement with any acceptable degree of reliability would probably be impossible. A hard-pressed hawk argument is that with a growing war on its hands in Vietnam the United States needs all the strategic nuclear capabilities available, both to sustain the deterrence of nuclear war and to deal with Communist China, if necessary. So, the hawks conclude, the best thing for the U.S. to do is to keep building and improving upon our SNDV capabilities, to convince the Soviets that they are in a losing game.

The doves plead that there are so many SNDV's available to both sides that they make the present danger of nuclear war intolerably high. From this they postulate that an immediate freeze at current levels, followed by early reductions of significant numbers of SNDV's, would not detract from the essential security needs of either side. As a result, the doves claim, a marked reduction in East-West tensions could be expected, laying the foundation for a true détente and contributing to the possibility of real political solutions to other questions.

The doves foresee no great problems in verification of an agreement on SNDV freeze and reduction, through a combination of unilateral means and the witnessing of weapons destroyed rather than those remaining. And, they conclude, even with significant reductions, the United States would still have more than enough capacity to handle any threat from Red China in the foreseeable future.

On the SNDV question, the eagles acknowledge that no advantage accrues to the United States from overbuilding these weapons beyond its essential security needs of deterrence and damage limitation. Although the gap between U.S. and U.S.S.R. SNDV capabilities has narrowed slightly, the present and planned U.S. deployments provide a significant strategic superiority. However, the eagles believe that a freeze and reduction of SNDV's which would not disturb the relative strategic balance could be worthwhile as a stabilizing element. They do see some problems with the verification aspects of any possible agreement, but they consider that verification could be accomplished with adequate reliability.

On the other hand, the eagles point out that the greatest obstacle to discussing or negotiating an SNDV freeze and reduction agreement remains the fact that the U.S.S.R. simply shows no interest in doing so.

IN AN ARTICLE of this length it is impossible to do more than touch selectively upon the highlights and the most outstanding issues stemming from the many viewpoints on the complex field of arms control and disarmament. As any well-informed citizen or student of defense and foreign affairs will be quick to see, there are many other related or subordinate issues which have not even been touched upon here. (In fact, there are sufficient other major issues and related differing viewpoints which have not been discussed here to provide the basis for another treatise as long as this one!) To mention but a few of these omitted matters, there is first the issue of a comprehensive nuclear test ban versus the so-called "threshold" test ban proposal, or the question of whether the U.S. should even venture to extend the present limited nuclear test ban with its built-in safeguards. Next, there is the question of the deployment of anti-ballistic-missile (ABM) defenses relative to our arms control and disarmament objectives and whether this deployment would or would not be a destabilizing influence on the international environment. Then there is the matter of what can be done in the arms control and disarmament field to ease the East-West confrontation in Europe. And, to conclude this sample listing, there is the issue which centers on the impact that the nuclear nonproliferation and test ban efforts might have on the future peaceful uses of nuclear explosions; for instance, nuclear excavation of a sea-level Isthmian canal. I think that the reader can be assured that the competing views and voices of the various avian protagonists are just as animated and diverse on these issues as on those which I have discussed here.

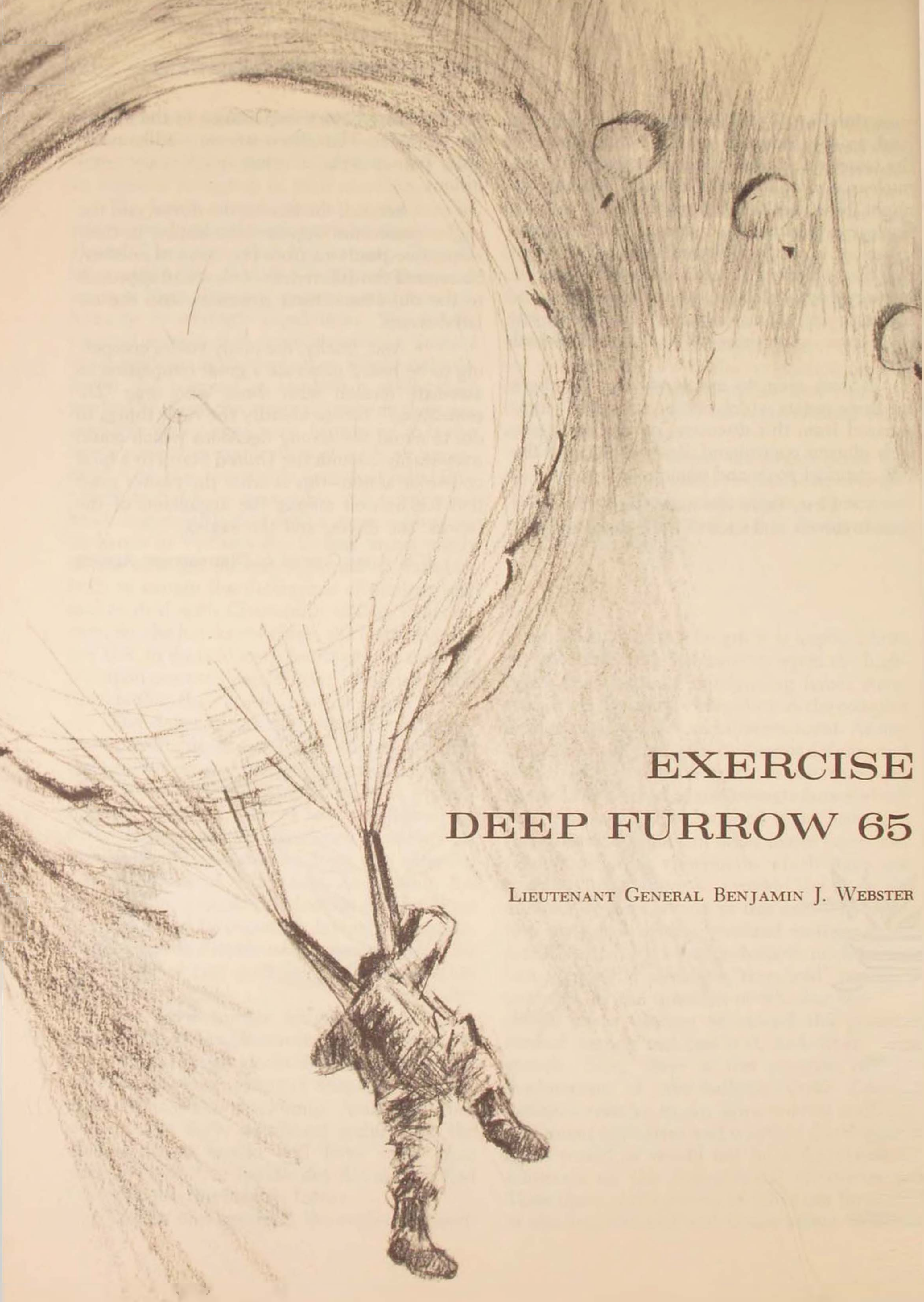
It does seem to me, however, that there are three points which can be fairly well summarized from this discourse on the bird's-eye view of arms control and disarmament and the U.S. national goals and objectives therein.

• First, there are many facets to every issue involved, and each of these assumes varying or contradictory importance in the eye of the beholder. Thus, there are no readily available, pat answers offering quick, easy resolutions.

• Second, the hawks, the doves, and the eagles sometimes appear inconsistent in their respective positions from one issue to another, because of the differences of view and approach to the objectives, their priorities, and the related issues.

• And, finally, the many voices competing to be heard generate a great temptation to associate oneself with those who urge "*Do something!*" Yet, to identify the *right* things to do, to avoid the *wrong* decisions which could irrevocably commit the United States to a fatal course of action—this is what the reader must find for himself among the arguments of the hawks, the doves, and the eagles.

U.S. Arms Control & Disarmament Agency



EXERCISE DEEP FURROW 65

Lieutenant General Benjamin J. Webster

EXERCISE DEEP FURROW 65 was several hours under way when the long caravan of staff cars and buses swung into a grassy parking area near the provincial Turkish city of Adapazari. In the still early dawn, NATO military and civilian observers converged on the tented observation post overlooking a wide valley.

From there they would witness the start of the ground phase; however, it was soon apparent that it was going to be other than routine because the flags of NATO's 15 nations were hanging limply on the standards fronting the reviewing stands. The rising sun confirmed the worst fears of the directing staff—fog. Already airborne were over 2000 United States and Turkish paratroopers and their equipment. This fog-blanketed valley was their drop zone (DZ).

After nearly a year of planning, a large-scale NATO exercise was once again being conducted in the Southern Region. The observers were there to witness the joint U.S.–Turkish airborne assault, the kick-off of the live-play portion. High overhead a Tactical Air Command C-130 transport orbited, serving as an airborne command post. Expected momentarily was the first C-130 troop carrier aircraft with a pathfinding U.S. Strike Command Combat Control Team and its protector, an Army Assault Team.

A one-hour delay was announced because of the fog.

In the meantime, 250 miles to the west in the Aegean Sea, naval task forces from the U.S. Sixth Fleet and the Royal Hellenic Navy were deploying and forming for amphibious assault maneuvers that would immediately follow the Turkish phase. In all, nearly 60,000 soldiers, sailors, marines, and airmen were poised. Over 50 naval vessels were participating, and 400 jet aircraft were airborne or alerted on Turkish and Hellenic airfields and carriers at sea for the exercise.

The fullness of dawn revealed the static display and observation area where the Supreme Allied Commander, Europe (SACEUR), General Lyman L. Lemnitzer, USA, had joined

the Commander in Chief, Allied Forces, Southern Europe (CINCSOUTH), Admiral Charles D. Griffin, USN, civilian dignitaries, and other military leaders to witness the airdrop. Admiral Griffin was the overall commander for DEEP FURROW 65. With him were Lieutenant General John H. Michaelis, USA, Commander of NATO land forces in Greece and Turkey, and myself, Commander of NATO air forces in Italy, Greece, and Turkey. Also on hand was Major General Clyde Box, USAF, Commander of the Sixth Allied Tactical Air Force, which is composed of Royal Hellenic Air Force, Turkish Air Force, Royal Air Force, and United States Air Force contributions to the NATO defense of Greece and Turkey and surrounding seas.

Thick ground fog is an ankle-buster and unloved by airborne troops. In peacetime training exercises it is treated with even greater respect for safety reasons. Of course the exercise plans allowed for delays such as this, but we were anxious to get under way. Fortunately, in 30 minutes the solid blanket of fog began to break, and 70 miles to the southeast the lead C-130 departed its holding pattern and closed in on the DZ.

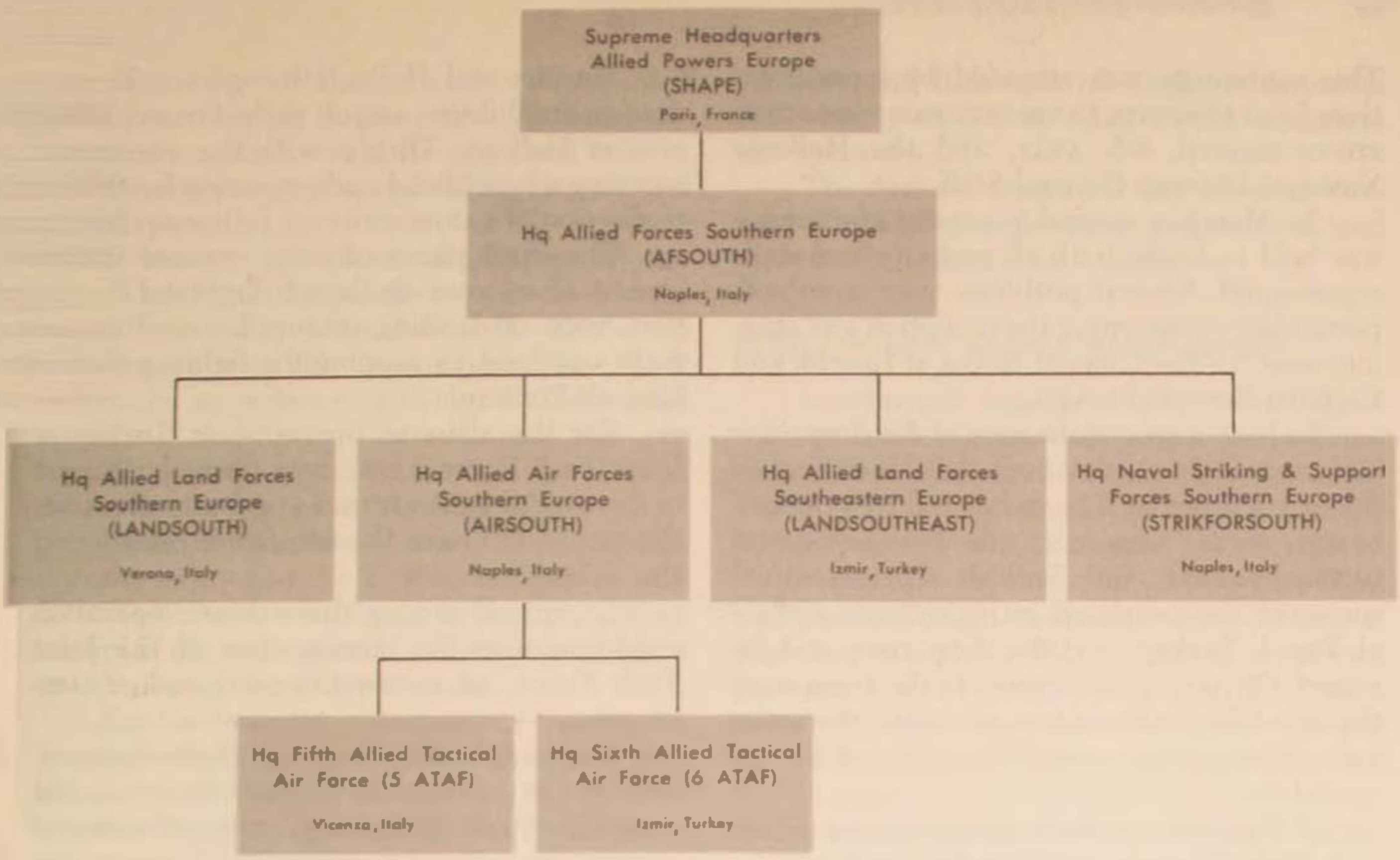
planning

The pattern of events had been forming for more than a year.

A Southern Region command post exercise was scheduled for the period 14–18 September, involving those forces of Greece, Italy, Turkey, the United Kingdom, and the United States earmarked for NATO's wartime use. Associated with this command post exercise (CPX), called DENSE CROP 65, were two follow-on training exercises: DIAMOND BLUE, a combination CPX-FTX (field training exercise), to be conducted in northern Italy by Southern Region land, sea, and air forces; and DEEP FURROW, an FTX, to be conducted in and around Greece and Turkey by the combined land, air, and sea forces of NATO plus external forces from the United States Strike Command and the United States Atlantic Fleet.

The basic scenario for these three exercises

Allied Forces, Southern Europe



provided for a situation where an aggressor, the Orange bloc, began hostilities against the Southern Region countries: Greece, Italy, and Turkey. This offensive stalled, and the enemy initiated general nuclear war, which resulted in a massive nuclear exchange between Orange forces and NATO forces, known as BLUE. After the aggressor recovered from NATO nuclear retaliation, Orange forces launched a large-scale ground attack in Hellenic and Turkish Thrace, coupled with an amphibious and airborne invasion of the Kocaeli Peninsula of Turkey. Blue forces mounted delaying and defensive actions, which blunted the enemy thrusts. By about D+20, external forces consisting of an airborne task force and an amphibious task force had arrived in the Southern Region and were made available to CINCSOUTH. With the addition of these forces the situation was considered favorable for a Blue counteroffensive. The stage was set for DEEP FURROW.

The overall objective was for Southern Region NATO forces, supported by external airborne and amphibious forces, to counterattack and defeat the enemy forces remaining in Greece and Turkey. The training aims were to provide NATO and external forces live practice in large-scale joint and combined operations while testing Southern Region defense plans and procedures.

Detailed planning for DEEP FURROW began with a conference at Headquarters Allied Land Forces Southeastern Europe (LANDSOUTHEAST) in Izmir, Turkey, during January 1965. The conference was attended by representatives from all interested Southern Region national and NATO staffs as well as the external commands of STRICOM, MATS, and USAFE. The scenario was presented, and basic agreement was reached on participating units and the concepts for deployment, employment, and redeployment of forces.

In February a combination planning conference and reconnaissance was held in Thessalonike, Greece, for the purpose of determining the exact location for the amphibious landings and airdrop zone, as well as the scenario and methods for exercise play in Greece.

This conference was attended by representatives from AFSOUTH, LANDSOUTHEAST, AIRSOUTH, STRIKFORSOUTH, 6th ATAF, and the Hellenic National Defense General Staff.

In March a second planning conference was held in Izmir, with all participating staffs represented. Several problems were resolved, particularly concerning the reception and staging areas for the STRICOM forces at Incirlik and Cigli Air Bases in Turkey.

In June a reconnaissance of the drop zone and proposed redeployment airfields in Turkey was carried out by a team headed by STRICOM. USAFE, MATS, AIRSOUTH, 6th ATAF, USAREUR, LANDSOUTHEAST, and Turkish representatives surveyed the proposed redeployment airfield at Topel, Turkey, and the drop zone at Adapazari. Of particular concern to the team were the suitability of these two areas and the external support which would be required for the operation.

A final DEEP FURROW planning conference was held in Izmir during the last week of July. At this time detailed plans were coordinated, and all major unresolved problems were settled.

concept of operations

In CINCSOUTH's Exercise Operation Order DEEP FURROW, three simultaneous live phases were planned in the time frame of 21–26 days after the beginning of general war:

Phase I—Defense against a seaborne and an airborne landing on Turkey's Kocaeli Peninsula

Phase II—Defense against the enemy thrust in Hellenic Thrace

Phase III—Movement of supplies across the beaches in western Turkey.

In Phase I the concept for employment called for a force of U.S. and Turkish airborne troops to land at the base of the Kocaeli Peninsula with the mission of sealing off the peninsula, assisting the movements of other Turkish ground forces into the area, and then fighting as part of the Turkish First Army until relieved.

In Phase II an amphibious task force composed of U.S. and Hellenic naval units, plus U.S. Marines and Hellenic troops, would conduct an amphibious assault in the Struma River area of Hellenic Thrace, with the mission of securing a beachhead and preparing for the introduction of LANDSOUTHEAST follow-up forces.

The third phase of DEEP FURROW would consist of an over-the-beach logistical operation, with off-landing of supplies and movement overland to support the fighting on the Kocaeli Peninsula.

For the airborne operation in Turkey, a Joint Task Force (JTF) was formed. As part of the overall LANDSOUTHEAST counteroffensive, the JTF would have the mission of conducting the airborne assault.

Command during the airborne operation would involve the commanders of the Joint Task Force, of LANDSOUTHEAST, and of AIRSOUTH.

National authorities were made responsible for the movement of their forces to the reception bases in Turkey. CINCSOUTH would assume operational command of the forces at the reception bases for the duration of the exercise. Upon completion of the exercise, operational command of the forces would revert to national authorities.

CINCSOUTH directed COMLANDSOUTHEAST to coordinate the planning and execution of the airborne operation. This entailed conducting operations to support the land phases of the operation and, upon termination of the airborne operations, assuming operational control of the Army element of the Joint Task Force.

Hq AIRSOUTH was directed to coordinate the air operations of the Joint Task Force during airborne assault operations and to provide air support as requested by the Commander, Joint Task Force, through the Commander, 6th ATAF, whose headquarters at Sirinyer, Turkey, is adjacent to Izmir and the Joint Command Operations Center (JCOC).

The Commander, Joint Task Force, was designated as the overall commander within the airborne objective area. He would exercise operational control over forces not a part of the Joint Task Force, except air defense forces, when such forces were operating within the airhead. This control would be assumed at 0300Z prior to take-off of the airlift forces assigned to the airborne assault. When such forces were merely passing through the objective area, control would be exercised only to the extent of preventing and minimizing mutual interference.

Other air operations in support of the Joint Task Force, to include air operations conducted over the objective area, would be coordinated with the Commander, Joint Task Force, in accordance with established joint command and control procedures. The JTF would maintain representation in the JCOC to insure continuous close coordination.

Upon termination of the airborne operation the Army and Air Forces elements of the Joint Task Force would pass to the operational control of the NATO ground and air commanders until released for redeployment.

For the live-play operations in Greece, an Amphibious Task Force was to be formed and become a part of the overall LANDSOUTHEAST counteroffensive. This task force would have the mission of conducting the amphibious assault. Counteroffensive operations would involve three commanders: Commander STRIKFORSOUTH, Vice Admiral W. E. Ellis, COMLANDSOUTHEAST, and COMAIRSOUTH.

COMLANDSOUTHEAST would have operational control of the Hellenic First Army and airborne forces operating in conjunction with the amphibious forces, but not within the amphibious objective area (AOA).

The Commander, Amphibious Task Force, would exercise control of all forces operating within the AOA beginning on the day prior to the initial amphibious landing. The concept was for an amphibious task force, consisting of a U.S. Marine division wing team and a Hellenic landing force, to assault and secure a beachhead.

This landing would be in conjunction with a battalion-size Hellenic airborne operation in the vicinity of Serrai, 20 miles northwest of the selected beaches, and a Hellenic First Army attack from the west, both of which were outside the AOA. Tactical fighters of 6th ATAF would provide air support to LANDSOUTHEAST forces outside the AOA.

Once the beachhead was secure, a LANDSOUTHEAST follow-up force would land administratively and link up with Hellenic forces in the vicinity of Serrai. This would terminate the operation.

The date selected as D-day for DEEP FURROW was 21 September, but preparations and movements began much earlier.

STRICOM force deployment and support

USSTRICOM's deployed force consisted of the JTF headquarters staff plus a Strike Communications Support Element and the Army Forces, Strike Command (ARSTRIKE) and Air Force Forces, Strike Command (AFSTRIKE).

STRIKEJTF was commanded by Major General Jamie Gough, USAF, Director of Plans at Hq STRICOM and also commander of one of two permanent Strike Joint Task Force Headquarters staffs. His deputy was Brigadier General Richard G. Ciccolella, USA, STRICOM's Director of Personnel.

ARSTRIKE, JTF DEEP FURROW Army forces, consisted of one airborne brigade composed of two infantry battalions and one artillery battery from the 82d Airborne Division, Fort Bragg North Carolina, commanded by Brigadier General Edward P. Smith, Assistant Commander of the 82d.

AFSTRIKE, JTF DEEP FURROW Air Force forces, were commanded by Brigadier General Robert L. Delashaw, Deputy Commander, Nineteenth Air Force. They included the C-130 airlift force from the 314th Troop Carrier Wing, Sewart AFB, Tennessee, and the 464th Troop Carrier Wing, Pope AFB, North Carolina, plus the 613th Tactical Fighter Squadron of 18 F-100's from England AFB, Louisiana, which were refueled en route by KC-135 tankers of the Strategic Air Command. Communications support came from the 507th Combat Control Group, Shaw AFB, South Carolina.

During the deployment/redeployment, 45 MATS aircraft (19 C-124 Globemasters, 25 C-130 Hercules, one C-135) and 70 Tactical Air Command C-130's provided airlift for the STRICOM forces, composed of over 3000 Army and Air Force personnel and 250 tons of cargo. The first MATS C-130 load of airborne troopers departed Pope AFB on 15 September.

The main body of the Joint Task Force

headquarters established itself at Sirinyer in close proximity to Hq LANDSOUTHEAST and 6th ATAF. With it was the jointly manned Air Force/Army Communications Support Element (CSE), which consisted of two field units and a support element. Capable of providing the necessary communications for Hq Joint Task Force to operate independently throughout the area, the CSE packaged part of its equipment aboard a C-130 aircraft to provide voice and wireless communication for airborne command post operations.

During the deployment / establishment period, an advance echelon of the STRICOM JTF staff set up operations at the Incirlik staging base. This JTF, headed by the Deputy Commander, Brigadier General Ciccolella, would parachute into the DZ with the first of the airborne forces on the morning of the assault.

Activities at Incirlik Air Base near Adana, Turkey, increased rapidly with the arrival of Hq ARSTRIKE. All the paratroopers were at Incirlik by 20 September. Personnel at this southern Turkey base were billeted in a tent city located north of the airfield, while the C-130's were parked in dispersed hardstands around the perimeter of the field.

Responsibility for providing support for the JTF fell primarily on USAFE. USAFE's area support organization, the United States Logistics Group in Turkey (TUSLOG) was given a stringent test with the requirement for billeting, messing, and other support for an influx of over 3000 personnel.

In addition to the logistical support provided at Incirlik, extensive support was provided by USAFE at Topel, the redeployment airfield. Topel is a "bare base," i.e., without permanent-party personnel or facilities. USAFE provided communications, weather, and navigational facilities, including a mobile tower, TACAN, weather interceptor van, and beacon. Communications were also provided between Izmir, Incirlik, and Cigli Air Base. A Casualty Staging Flight, with attached Aeromedical Evacuation Control Team, was established at Topel to furnish medical facilities for the operation.

USAFE was also active in the airlift role. Flying over 120 C-130 and C-124 sorties to preposition and deposition support equipment from bases in Central Europe and North Africa to exercise bases in Turkey, the 322d Air Division (USAFE) also added 25 C-130 sorties for the training and airdropping of the Turkish Presidential Airborne Battalion, an element of the Presidential Airborne Brigade. Twenty C-130 sorties were flown by the 322d Air Division for the training and airdropping of a Hellenic parachutist battalion in Greece. Two TAC Rotational Squadrons from Evreux Air Base, France, and the MATS Rotational Squadron from Rhein-Main Air Base, Germany, supplied the aircraft for the USAFE airlift. Nearly 3,300,000 pounds of equipment and supplies were moved by USAFE airlift.

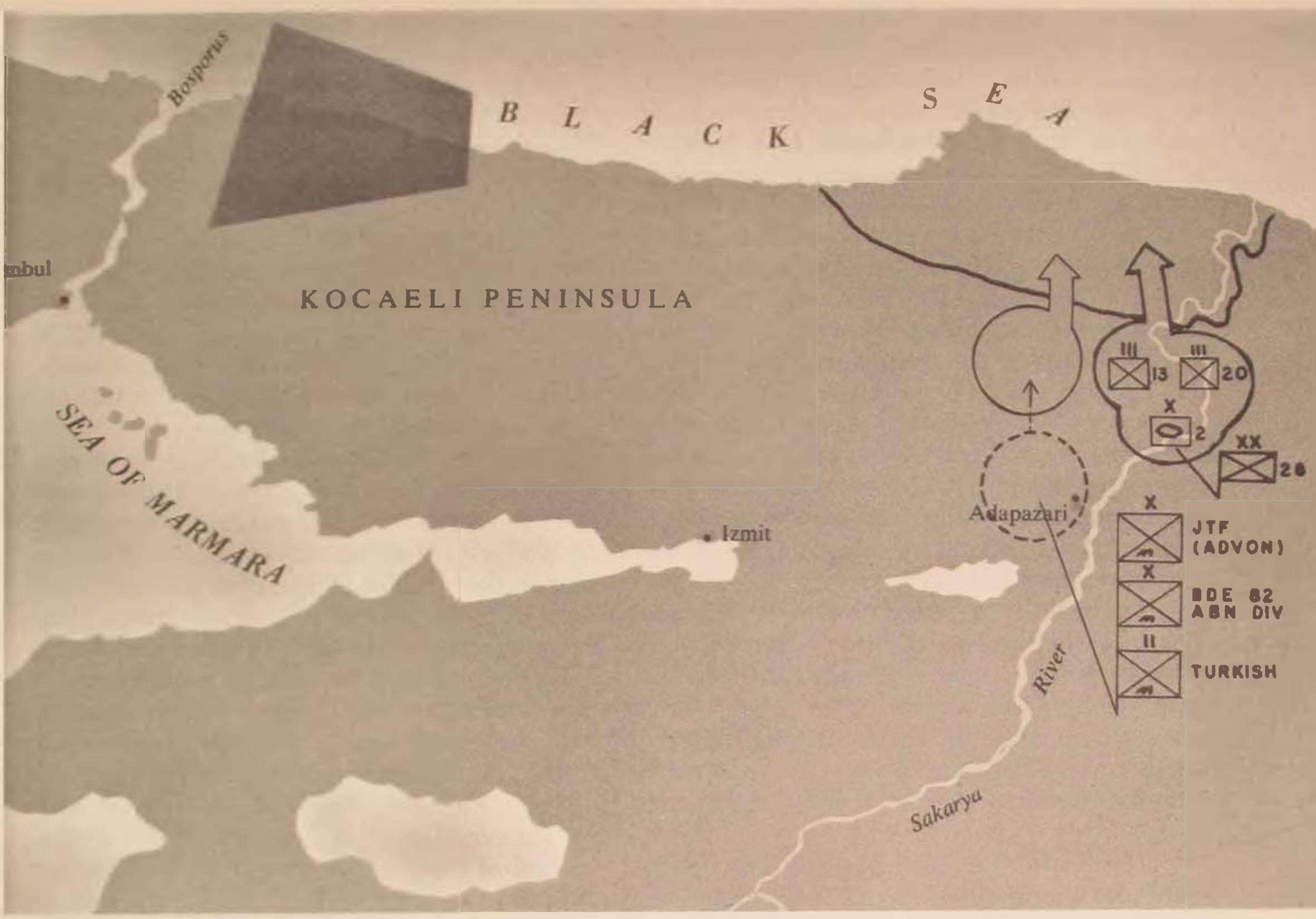
operations in Turkey

By 20 September (D+20) the Orange forces, by their attack in Turkish Thrace, were endangering the strategic Dardanelles. The Bosporus, splitting Istanbul and Europe from Asia, was an obvious objective. The Orange bloc force on the Kocaeli Peninsula, some 60 miles east of Istanbul, thus posed a serious threat to NATO defending forces.

Some 30 miles southwest of the Kocaeli area are the Gulf of Izmit and the Sea of Marmara. Capture of this strategic area would isolate Istanbul from the rest of Turkey. The loss of the Bosporus and the Dardanelles would open the Mediterranean to Orange naval forces in the Black Sea.

CINCSOUTH directed that airborne reinforcements join a Turkish First Army force rushing to meet the invaders. A valley 15 miles northwest of Adapazari was selected for the DZ. Plans called for the airborne force of 1600 U.S. and 500 Turkish paratroopers, plus heavy equipment, to drop at dawn on 21 September and link up with the Turkish First Army. Under LANDSOUTHEAST command, the combined force would push forward and drive the invaders into the sea.

Weather naturally was a key factor. A frontal system pushing towards Turkey from Europe threatened to delay the drop by 24 hours, but the front slowed its movement



Kocaeli Peninsula region, Turkey—site of the airborne counteroffensive

enough for a "Go" decision to be made at midnight, 20 September.

The objective area was a dry lake bed, covered by recently harvested fields. At 0630Z on D-day, 21 September, AFSTRIKE F-100's commenced simulated fighter strikes in the objective area, to soften it up as a prelude to the airborne assault.

During this assault all close-air-support and troop-carrier-escort missions called for were successfully completed by the 613th Tactical Fighter Squadron operating from Cigli Air Base. Above 20,000 feet in the drop area, Turkish Air Force jets provided air defense. In addition to this support, 6th ATAF jets would fly over 250 close-support sorties during the exercise.

Before dawn at Incirlik, all the AFSTRIKE C-130's, loaded with 82d Airborne Division paratroopers and equipment, taxied out to the runway on schedule. The first C-130 took off at 0425 local, carrying the Combat Control Team (CCT) and Airborne Assault Team (AAT).

Take-off was on schedule, and VFR conditions were excellent over the entire route of flight except for the local fog condition in the drop zone.

The stream of 68 AFSTRIKE C-130's en route to the drop zone flew at low level at 250 knots, to avoid radar detection as long as possible.

Rendezvous with the Turkish airborne force took place at Ankara. Staging out of Murted Air Base near Ankara, a flight of nine C-130's joined up at the end of the stream, completing the entire JTF DEEP FURROW Airborne Assault Force in one of the critical maneuvers of the exercise. Six of these nine C-130's were from USAFE (one of them was rigged for equipment drop), and three were from the Turkish Air Force.

At 0750, the first C-130 executed the "pop-up" maneuver, climbing swiftly from 200 feet to 1250 feet over the drop zone, then slowing down to 125 knots before disgorging the Combat Control Team and Army Assault Team. The assault team rapidly deployed while the control team quickly set up its navigational equipment and radios, marked the drop zone with smoke, and prepared to guide the main airborne assault force into the target area.

The main force, which had been directed into a holding pattern at Bolu, 70 miles east of the drop zone, received orders to proceed. The orders to hold and proceed were issued by the JTF Combat Control Team. At 0805, after a one-hour-and-five-minute delay, the main force flew over the drop zone in offset in-trail formation.

The first 43 aircraft dropped heavy equipment and supplies into the partially foggy valley. They were followed by 34 C-130's dropping the 82d Airborne Division and Turkish Presidential Battalion paratroopers. Within 24 minutes all drops had been completed.

Aboard the C-130 airborne command post orbiting high over the objective area, JTF Commander General Gough monitored and controlled the entire operation.

To insure complete coordination during this joint and combined operation, liaison officers had been positioned at the Turkish First Army Air Support Operations Center, the Turkish First Tactical Air Force Operations Center, and the JTF Direct Air Support Center. Positive radar control was maintained over all flights by the Combat Reporting Center at Izmit and/or by joint Turkish/U.S. Air Control Teams. A mobile TACAN had been positioned at Adapazari to provide a further positive fix in the objective area.

All observers considered the airborne operation professionally executed. Only six minor and no major injuries were reported out of 2037 troops jumping into an unfamiliar DZ. Only three of the 102 vehicles dropped were damaged as a result of aerial delivery malfunctions.

After completion of the airborne assault, the AFSTRIKE C-130's returned to Incirlik. Twenty-two of these aircraft were then recycled, and they airlifted 49 vehicles and 24 trailers to Topel Air Base. After being airlanded, the vehicles joined the Army forces of Strike Command that afternoon.

Link-up with the Turkish First Army elements on the right was attained at 0920, and all airhead objectives were aggressively seized. At 1243, all conditions established as prerequisites to the transfer of operational control had been met: the airhead was secure; link-up had been effected with the Turkish First Army; liaison officers and forward air controllers had been exchanged; and effective communications had been established with the Turkish XV Corps. At 1500, operational control of the Strike JTF's Army forces passed to COMLANDSOUTHEAST, and simultaneously operational control of the JTF's Air Force units passed to the 6th ATAF commander.

Blue forces initiated a counterattack toward the Orange invaders at 0700Z on 23 September, and Turkish 1st Corps troops captured two bridges over the Sakarya River. With all objectives achieved by 1000Z, the JTF forces were returned to operational control of the JTF Commander at 1027, 23 September, and preparation for redeployment was initiated by all forces.

The focus of interest shifted now to Hellenic Thrace and the threat by Orange forces to split the NATO forces of Greece and Turkey by a thrust to the Aegean Sea.

Over 2000 U.S. and Turkish Blues jumped to attack Orange forces near Adapazari, Turkey, on 21 September, and NATO Exercise DEEP FURROW 65 was under way.

Turkish Air Force pilots in F-100D Super Sabres prepare to take off on a ground support mission. . . . General Irfan Tansel, Chief, Turkish Air Force, and Major General Clyde Box, Commander, Sixth Allied Tactical Air Force, discuss NATO defense exercise.

Camouflaged paratroops of the 82d Airborne Division man a jeep-mounted 106-mm recoilless rifle.

A gun crew of the 82d removes a 105-mm howitzer that was palletized and airdropped battle-ready.

A squad leader issues orders to recently landed paratroopers of the 82d Airborne, part of Strike Command Joint Task Forces airlifted from ConUS for the exercise.

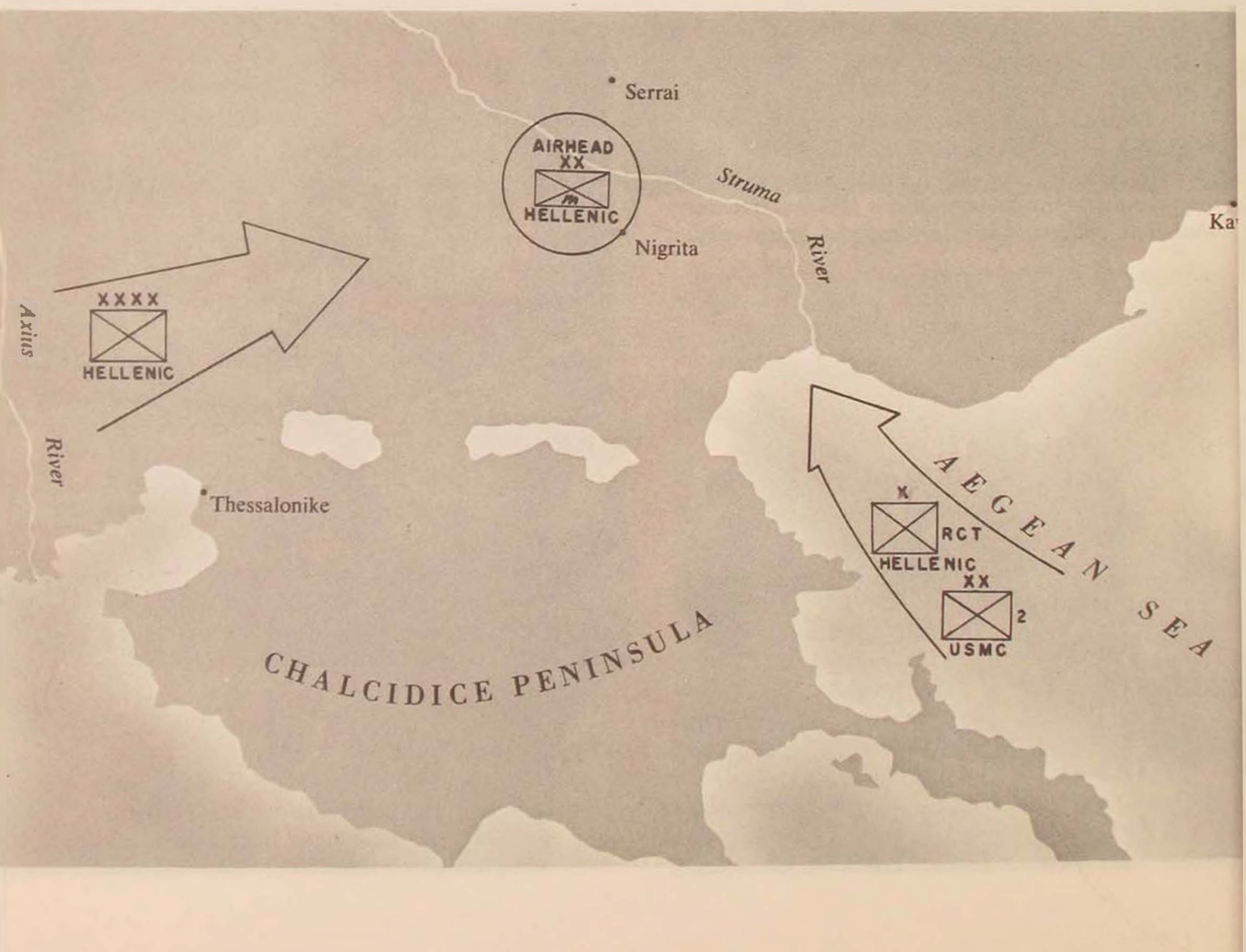
operations in Greece

While the airborne assault was taking place in Turkey, a U.S. Navy Amphibious Task Force, which departed Malta on 17 September, was nearing its objective area. On 19 September it had rendezvoused with a Royal Hellenic Navy destroyer task group east of Cape Malea, the southern tip of Peloponnesus. The following day the task group rendezvoused with RHN LST's east of Skyros Island. An Attack Carrier Task Group departed Rhodes in the morning of 22 September and steamed to the scheduled rendezvous with the Amphibious Task Force, making passage between Kasos Island and Crete. Also joining the rapidly building naval force was a force of Hellenic minesweepers.

Participating forces consisted of an Attack Carrier Striking Group composed of one attack carrier (USS *F. D. Roosevelt*) supported by escorting destroyers. This group would be commanded by RADM F. G. Bennett, USN.

The Amphibious Task Force, commanded by Captain N. Almgren, USN, consisted of attack transports, a cargo transport, landing ships dock (LSD), and a landing ship tank (LST), plus escorting destroyers, minesweepers, and other vessels. The Amphibious Task Force would be augmented by Royal Hellenic naval units. The U.S. Landing Force, simulated by a Marine Expeditionary Unit, would consist of a U.S. Marine Expeditionary Headquarters, a Provi-

Chalcidice Peninsula region, Greece—site of the amphibious landing



sional Marine Air Group, a Marine Attack Squadron, a helicopter detachment, and a Battalion Landing Team. The Hellenic Landing Force would consist of a Regimental Combat Team plus a raiding force of one infantry battalion.

On 21 September advance force operations began with the landing of a Hellenic raiding force on the Chalcidice Peninsula. The next day the Hellenic XX Armored Division moved to a position on the west flank of the Axius River. By 23 September the carrier aircraft, the Marine Squadron deployed ashore at Larissa Air Base, and 6th ATAF air units had isolated the landing beaches. The Royal Hellenic Amphibious Group rendezvoused with the Amphibious Task Force during this activity.

Thus on L-day, 24 September, the stage was set for the amphibious assault operation. The Hellenic XX Division during the night of 23 September and morning of the 24th crossed the Axius River, secured critical terrain, and established contact with the main enemy force west of the Struma River. The Hellenic Amphibious Raiding Battalion during this period moved inland and struck enemy positions and installations in the strategic Redina Pass.

The umbrella of power was opened for the classic beach assault operation by coordinated land, sea, and air power. Assured of control of the air through the efforts of U.S. Navy and Marine and Royal Hellenic tactical air power, the Commander of the Amphibious Task Force activated the Amphibious Objective Area. Control of all air power in the sector was through the Task Force Tactical Air Control Centers (TACC) on the cruisers USS *Albany* and USS *Springfield*, flagship of COMSTRIKFORSOUTH, who directed the overall assault. At 0500Z 24 September nearly 3000 Hellenic troops were landed on the beaches to the west of the Struma River, followed 2½ hours later by the 1900-man U.S. Marine assault force, which landed to the east of the Struma River. These troops established the beachhead and blockaded avenues of approach to the Thessalonike-Kavalla area. At 0500Z of the next morning a Hellenic parachute battalion, airlifted from Elefsis Air Base, dropped from five C-130's of the USAFE's 322d Air Division into an area north of the AOA to seize the vital Nigrita bridge across the Struma River.

At 0900Z the 9000-man Hellenic X Infantry Division initiated its attack to smash the enemy front and link up with the airhead. Carrier aircraft and land-based Royal Hellenic Air Force and U.S. Marine tactical air contributed close-support sorties into this objective area. The smooth-working international force quickly attained its objectives, and by 1500Z the AOA was declared secure and responsibility for air defense operations in the AOA was returned to Commander, 6th ATAF. The attack aircraft carrier (CVA) force continued close air support for the beachhead during the transition.

At 1000Z 26 September, the advancing Blue forces linked up with the airhead in the Nigrita area, and COMLANDSOUTHEAST issued termination instructions.

In the midst of redeployment and backloading of troops, the final live phase of Exercise DEEP FURROW 65 was taking place on a western Turkish beach.

over-the-beach operation

On 19 September at 0800Z the British LST *Empire Fulmar* had arrived in Izmir, ready to load cargo. By 0400Z 22 September loading operations had been completed, and at 0800Z the ship sailed for the Sea of Marmara, to rendezvous with an Allied Forces, Mediterranean (AFMED) task force on 23 September.

They anchored off Kusadasi at 0600Z on the 25th, and successful unloading operations were conducted and the ship was returned to British control at 1600Z 27 September. This signaled the termination of live play for DEEP FURROW 65.

WITH THE conclusion of the exercise in Hellenic Thrace, DEEP FURROW 65 rapidly became a matter of history. Even while the amphibious operations were under way in the Struma River area, across the Sea of Marmara at Topel Air Base the massive deployment of STRICOM forces was reversing itself, and AFSTRIKE C-130's and MATS C-130's and C-124's were airlifting the JTF Army forces back to Fort Bragg.

A landing ship tank (LST) of the Royal Hellenic Navy offloads a Hellenic Army M-48 tank.

SACEUR General Lyman L. Lemnitzer, USA, (center) confers with General George Antonakos, Chief of Staff of the Royal Hellenic Air Force, (left) and Admiral Spyros Avgeris of the Royal Hellenic Navy.

Ground forces get close air support by RHAF F-84.

Amphibious craft converge on Struma River beaches.

U.S. Marines charge onto the beach to join Greek comrades in counterattacking the aggressor forces.

Airdrop by AFSTRIKE C-130 assists the ground operation.

Other participating forces and support units were flown back to their home bases from Incirlik and Cigli. By 30 September the STRICOM force had closed in the ConUS, and the U.S. Sixth Fleet units returned to normal training operations in the Mediterranean.

Both sides, the Communist Orange and the NATO Blue, began evaluating and computing the results. This assessment will go on for months. But already refinements are being made in procedures, and tactics are being refined under certain conditions. These are the everyday, tangible results accruing from such a massive exercise, but they are of necessity classified.

An obvious answer was forthcoming with regard to STRICOM's capability to provide augmentation forces to reinforce the Southern Region. It could and did perform its mission as planned. Further, the participation by STRICOM was visible proof of the intention of the United States to provide forces when and where needed by its NATO allies.

The STRICOM forces were able to answer another question with confidence when it showed that it could operate on the ground and in the air with Turkish forces. The operations were marked by high professional ability on the part of both the U.S. and Turkish forces. They worked closely and harmoniously and measured up to the highest standards.

DEEP FURROW 65 was a proving ground as well as training ground in conducting joint and combined operations. The exercise was of great value in evaluating joint task force operational procedures under field conditions, which are of course the most valid measure of adequacy. While language problems were of some importance, the exercise clearly proved that language was not a limiting factor. The exchange of forward air controllers, for example, showed conclusively that NATO forces can act in concert without losing stride.

The exercise was a long-awaited opportunity to test support facilities and the ability of commands in Europe to provide for a large influx of U.S. augmentation forces to the Southern Region and to determine through actual use the adequacy of logistical and other support.

Operationally, the air forces involved performed as well as or better than expected. The capability of the Turkish and Hellenic Air Forces, already known to us in the Southern Region, was clearly demonstrated to the augmentation forces. The hard and diligent work

Redeployment—Paratroops of the 82d Airborne Division's 3d Brigade Task Force board a MATS C-130 aircraft at Topel Air Base, Turkey, for return stateside.

on standardization that has consumed so much effort in the past paid enormous dividends in the live-play phase. A typical example was the flawless rendezvous of the mixed Turkish–USAF force of transports with the main body of airlift forces over Ankara and the subsequent pop-up maneuver by all the forces.

Admiral Griffin, CINCSOUTH, in his general comments to SACEUR, stated that DEEP FURROW 65 was considered the most profitable and meaningful field training exercise conducted to date in the Southern Region. "Valuable training was achieved in planning the exercise. In particular the problems and preparations involved in introducing external forces into the region have again been clearly defined and in most cases solutions and procedures further developed. . . . the readiness posture of the Southern Region has been considerably enhanced."

To the press, Admiral Griffin summed up the general consensus: "The test of our defenses in Greece and Turkey showed an increased capability to combine allied forces in the defense of this crucial Southern Region of NATO. Field tests show we're not perfect, but we deliver the goods when necessary."

The final conclusion: Exercise DEEP FURROW 65—all objectives attained.

Hq Allied Air Forces Southern Europe

THE CHALLENGE OF THE PERFORMANCE SPECTRUM FOR MILITARY AIRCRAFT

Hans Multhopp

DEVELOPMENT of the aircraft was probably the greatest step in the long history of transportation technology. The ability to fly above any kind of terrain or over small and large bodies of water has led to a degree of mobility of which past generations of mankind could only dream. Moreover, the speeds of the modern aircraft are one or two orders of magnitude above those of other means of transportation.

The military significance of the capabilities of the aircraft was soon enough realized, and the pace of its development has been very high, thanks to this appreciation by the military. In particular, the speed of airplanes has increased in a very impressive and continuous fashion, so much indeed that speed, more than every other capability of the aircraft, has been the main yardstick for progress in aviation.

However, nothing continues to grow forever. We have reached nowadays the point that any speed is technically feasible that can be achieved and sustained in the earth's atmosphere, up to and beyond orbital speed. This brings about the inconvenience that the old yardstick for progress is no longer automatically applicable. With regard to speed it means that we have a choice, and we have to decide, therefore, what the best speed for a specific class of airplane really is. For there are reasons now why speed is not the only aspect to be considered; there are others, like cost effectiveness and operational convenience, which enter the picture. This achievement is basically a sign of maturity and should be appreciated properly. It means also that, in the future, aircraft development is losing much of its glamour; it becomes a business like many others.

basic value of speed

The first and foremost value of the speed of any vehicle is the ability to reach a desired place in the shortest possible time. Time spent in transit is usually lost time. This is evident in commercial transportation. Von Karman and Gabrielli in a paper published 15 years ago showed that different systems of transportation can compete with one another if their price per ton-mile is approximately proportional to their speed; i.e., the faster mode of transportation can charge a considerably higher price.

In military operations the value of speed is frequently even greater than in commercial affairs. Gaining the initiative in a conflict or reacting quickly to a threatening buildup has often prevented the growth of a local disturbance into a major war. Once a war is on, the faster, more mobile side can usually choose the time and site of battle and gain local superiority in force strength or firepower. "To git thar fustest with the mostest" has been one of the most important stratagems of all times. Therefore, the desire of the military to increase the speed of their fastest vehicles (namely, their airplanes) is quite understandable.

There are, however, a few finer points which should not be overlooked. What is wanted is short action or reaction time. This means not only the time spent in flight; the time needed in preparation of the flight, including the command decision process, counts just as much. Frequently, higher speed is bought with longer fueling time, more time for preflight checkout or for rearming, etc. Quite often the higher speed is achieved with longer take-off and with landing distances that require operating bases farther away from the combat area. A field unit in need of air support might get help sooner from helicopters based 30 miles away than from supersonic fighter-bombers several hundred miles away.

Cost effectiveness, which must also be considered, does not automatically favor the fastest airplane available for a specific task. If unit cost differences are not too large, the faster airplane can accomplish more missions in a given time period and is, therefore, an easy choice. If, however, the faster airplane is considerably more expensive, a given budget will buy considerably more airplanes of the slower kind. There is then a greater probability that these will be closer to the place where action is needed simply because of their larger number and also more easily assigned on request because of their greater availability.

speed and range or endurance

Usually the purpose of a flight is to get from one place to another rather quickly. Since time spent in transit is lost time, ideally one would want to fly faster, the farther he intends to go. Unfortunately, this desire is not too compatible with today's technical capabilities. At present, and probably for a long future, the best range is attainable at speeds slightly below the speed of sound in the mach number region from .75 to about .9, provided the airplane and its power plant are properly chosen for these speeds. At slower speeds we can obtain almost the same range for a comparable weight effort, but there is nothing to be gained in doing so, since the utilization of the airplane and the crew suffers with decreasing speed.

As is well known, the range of an aircraft is determined by the propulsion efficiency expressed by the ratio of velocity to specific fuel consumption, the ratio of lift to drag, and the fuel-weight fraction. It is worth noting that almost all progress in long-range airplanes in the past 15 years has been made in the propulsion system; development of the airframe has been rather stagnant for no good reason. Sailplanes have long ago reached lift-drag ratios between 30 and 40, without boundary layer control, by the use of higher aspect-ratio wings. In view of the improvements in structural materials in recent years, it seems reasonable to expect that the next generation of long-range aircraft will have lift-drag ratios near 30, which would make possible large transport airplanes with radii of 6000 to 8000 nautical miles. The race for global supremacy between the Western and the Communist worlds in the next decade may well depend on the capability to reach quickly and with an adequate force the many unstable, underdeveloped countries, which unfortunately are mostly far away from the U.S.A.

Long-range capabilities in the supersonic speed regime are rather limited in spite of the improving friction-drag situation and the increase in overall engine efficiency. The main handicap against efficient flying at supersonic speeds is the enormously high induced drag at these speeds in comparison to subsonic induced drag. Even if all possibilities of minimizing the induced drag are carefully exploited, the range of high-density configurations (bomber, tanker) in the mach-2 to -3 region will hardly reach half what is possible at high subsonic speeds. With transport aircraft the wave drag due to the larger volumetric requirements cuts range capabilities down even more.

More promising again is the outlook for long range in the hypersonic speed regime. Although the lift-to-drag ratio continued to go down with increasing mach numbers, less aerodynamic lift is needed because more and more weight is balanced by centrifugal forces.

The performance possibilities of hypersonic air-breathing power plants are still not sufficiently clear, and much research work in this area is still needed before we can count on them. But even without air-breathing power it is definitely feasible to reach any place on our globe with boost-glide vehicles, and it is not unlikely that this technique will remain in the lead as far as the hypersonic speed regime is concerned. The main elements in this technique—the rocket for the acceleration and climb phase and the ablative heat shield, preferably, for the glide phase—are really quite simple and could become fairly economical if sufficient numbers were produced. What the modern rocket may lack in specific fuel consumption, compared to air-breathing power plants with supersonic combustion, is at least partly compensated for by their very good mass fraction and the avoidance of aerodynamic heating on the way up. The faster we go, the greater is the distance flown while accelerating or in the ballistic or glide descent, and the less important is the constant-speed portion of the flight.

It is well within the present state of the art to design and produce hypersonic transport aircraft with excellent landing capabilities which can reach any place on earth within about an hour from take-off. Such transports would be a valuable addition to the heavy transonic long-range transports of the C-5 or subsequent class, to be used in emergencies or in such assignments as to secure airfields for big transports or to suppress hostile uprisings before they really get under way.

If endurance rather than range is the prime performance objective, as it is in surveillance and in early-warning and antisubmarine missions, speeds should be either very low or near orbital; nothing in between is of much use. At the low-speed end we have the best endurance possibilities with propeller-driven aircraft having straight, modestly loaded wings of high aspect ratio. To provide such airplanes with a high-speed dash performance for immediate kills does not seem very promising. Missiles or parasite fighter airplanes for this purpose are much more practical.

speed and maneuverability

What makes an aircraft differ from a missile on a preset course is the pilot's ability to change its flight path in adaption to changing conditions related to the flight objective. The ability to change the flight direction (i.e., the maneuverability of the airplane) is very much a function of speed; generally, maneuverability suffers badly at the higher speeds. This was not always so; in the earlier days of aviation, maneuverability was limited by maximum lift, a modest amount of excess power, and the lagging response of the airplane due to its inertia and damping characteristics. The faster and more powerful aircraft was, therefore, usually more responsive to the pilot's steering efforts.

Today the radius of the tightest turn is mostly limited by the acceleration normal to the flight path or load factor that either the airframe or the pilot can sustain. In general, the turning radius of a fixed-wing aircraft in a horizontal turn is described by a curve like that in Figure 1. At low speeds, the limitation comes from the maximum lift that can be generated, which is measured by the coefficient $C_{L\,max}$ of the airplane (usually with the flaps up):

$$r \geq \frac{1}{g\sqrt{\frac{1}{V^4_{min}} - \frac{1}{V^4}}}$$

with $V_{min} = \sqrt{\dfrac{2W}{\rho S C_{L\,max}}}$ being the stall speed (flaps up). At higher speeds the maximum acceptable load factor n_{max} sets the limit

$$r \geq \frac{V^2}{g\sqrt{n^2_{max} - 1}}$$

The absolutely smallest turning radius occurs when these two unit curves intersect at $V_1 = V_{min}\sqrt{n_{max}}$; the turning radius then is

$$r_{min} = \frac{V^2_{min}}{g}\frac{n_{max}}{\sqrt{n^2_{max} - 1}}$$

$$= \frac{2W}{\rho g C_{L\,max} S}\frac{n_{max}}{\sqrt{n^2_{max} - 1}}$$

which is only slightly more than $\dfrac{V^2_{min}}{g}$. With n_{max} values usually in the range between 3 and 6, V_1 is mostly between 1.7 and 2.5 times the stall speed, which is, at lower altitudes at least, much below the cruise or combat speeds of modern aircraft. We are, therefore, mostly concerned with the limit set by the load factor.

What is the military significance of the turning radius? For noncombat airplanes like transports it means very little unless they try to fly close to the ground to avoid detection. The best contour following is usually done at $V = \sqrt{3}\,V_{min}$ because negative load factors beyond -1 are not tolerated for long. At greater speeds, the contour flying over wavy terrain becomes more and more an enveloping course over the peaks along the way; the height

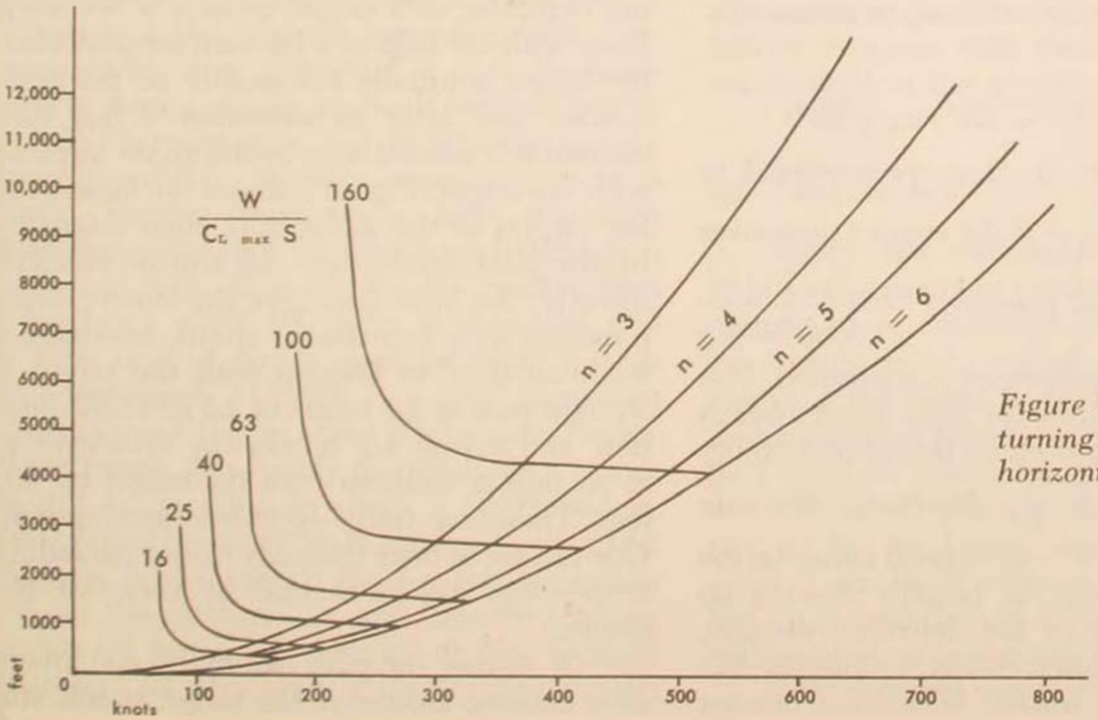


Figure 1. Relation between turning radius and speed, in horizontal plane at sea level

drop into the valley betwen two subsequent peaks which are the distance L apart is limited to

$$\Delta h \cong \left(\frac{2L}{V}\right)^2$$

For example, an airplane flying at mach 1.2 on the deck (a popular number in today's requirements) over terrain with a "wave length" of about half a mile can dip down about 15 feet between peaks. Since the airplane usually clears these peaks by more than that, it remains practically always within radar sight, whereas at 300 knots it could dip over 100 feet into the valleys.

For combat aircraft, especially in the tactical field, maneuverability is very often the key to success or failure. In dive attacks the pullout radius alone determines the release distance for almost all weapons. The hit probability against a small target is thus essentially proportional to $\frac{1}{r^2}$ and, therefore, to $\frac{1}{V^4}$, down to the speed at which the pullout maneuver is flown at the maximum lift coefficient.

In very shallow or essentially low-level attacks the situation is not much better. The limit distance for weapons release is mostly determined by the safety distance $h°$ by which one wants to clear either the target itself or the ground. The minimum weapon release distance is then

$$L_{R\ \min} = \sqrt{h°(r + 2h°)} \cong \sqrt{2h°r}$$

The hit probability is, thus, proportional to $\frac{1}{h°r}$ with $r = \frac{V^2}{(n-1)g}$ if the evasive maneuver is made in a vertical plane or $r = \frac{V^2}{\sqrt{n^2-1}\,g}$ if a lateral evasive maneuver is attempted. This looks somewhat better for high-speed aircraft than the dive attack because the hit probability decreases only with $\frac{1}{V^2}$. However, the safe clearance distance $h°$ can depend either on the danger presented by the target's blowing up or on the lethality of the delivered weapon. The first case applies mostly to targets like tanks and supply trucks. Whenever heavier weapons are used to make up for lower hit probabilities, $h°$ has to grow roughly with the square root of the weapon yield; or if the delivery inaccuracy dictates the safety distance $h°$, we are back to the situation in a dive attack, i.e., the hit probability is roughly proportional to $\frac{1}{V^4}$.

In modern tactical air warfare another problem arises from the difficulty of detecting targets. Practically everybody has learned by now that exposure to attack from the air is not too healthy. Hiding, using all the possibilities a terrain can offer plus plenty of camouflage, dispersing by splitting up forces into very small units, hardening either by digging in or by the use of vehicle armor—these tactics have become much more fashionable than they were in World War II. In addition, active defense with ground-to-air weapons, automatic small- and medium-caliber guns, modest-caliber (30- to 57-mm) antiair artillery, and surface-to-air missiles has increased by more than an order of magnitude in all major armed forces. Very few rewarding interdiction targets have been left because nobody wants to make the use of tactical nuclear weapons too attractive.

As a result, targets for air-to-ground weapons are hard to find, often fleeting or very small, so that fast action and high accuracy following detection of a target become a necessity. Even with the help of a forward air controller, the target is usually not exactly on the flight course, and after its detection a fast turn maneuver is needed so as to line up the airplane with the target. Figure 2 shows the location of the targets at the moment of their discovery by the pilot, while they can still be attacked directly; the limit lines give the closest target positions as a function of speed, assuming a 4-g maneuver to line up with the target, a straight pass at the target of 2.5 seconds' duration, and a final 4-g breakaway maneuver so as to miss a collision with the target by 200 feet. These are fairly optimistic assumptions. One can see at once that only truly outstanding targets can still be tackled by very fast airplanes.

Of course, the pilot can fly by and attack after turning around if the target stands still

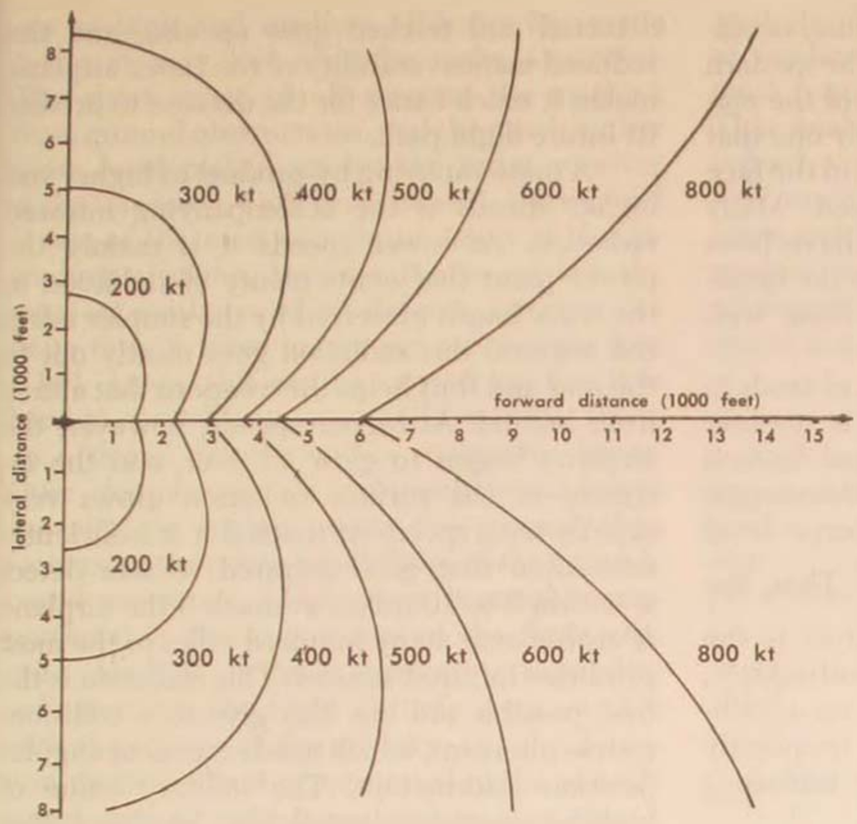


Figure 2. Location of targets that can be directly attacked after they have been detected: position limits vs. speed in 4-g maneuvers at sea level

in the meantime. Chances are that he loses it again at least temporarily while turning and that he faces all the antiaircraft fire around the target that the enemy can pour out, whereas in the first pass one frequently has the surprise factor. When we add up all these factors concerning the aircraft maneuverability, we see quickly how important it is to fly fairly slowly during attacks on small tactical targets.

With supersonic and hypersonic speeds, maneuverability becomes more and more a farce. Turning times are so large that high load factors cannot be maintained through a complete turn. At mach 3 a 45° banked turn describes a circle 100 miles in diameter, and a good deal of power must be spent just on this maneuver. At mach 10 a 180° turnabout costs as much fuel as about 2000 nautical miles' flight range; it is highly questionable whether it still makes sense to attack a target and fly back rather than to go on to another landing site. At near orbital speeds the 1-g turning radius equals the earth radius, and impulse requirements for just a few degrees' change in flight direction are very high. If the orbiting aircraft has a high lift-to-drag ratio, it pays to dip into the atmosphere in order to save some power; the fuel requirements for a specific turn go down by a factor $\frac{1}{\sqrt{1 + (L/D)^2}}$. But even so, it is a joke to compare the maneuvering capabilities in space with those to which we are accustomed in the aviation field.

speed and survival

Every new weapon that ever amounted to more than a minor nuisance led to the development of counterweapons. As long as these are lacking or very imperfect, the new weapon enjoys a dominant position. Progress in the development of antiweapons may eliminate the new weapon altogether or establish for it a more balanced position, rendering it still important but no longer decisive. Even at this point it can be of considerable value, since it ties up a good deal of the enemy's strength in maintaining antiweapons.

The military aircraft has been on this

course for quite a while. It is, therefore, necessary to analyze its chances against the modern antiaircraft weapons carefully. One of the major factors, but definitely not the only one that concerns the survival of the airplane in the face of antiaircraft weapons, is its speed. Many specific performance requirements have been largely dictated by a strong belief in the invulnerability of the faster airplane. How well justified is this belief?

In general there is a good deal of truth in it, particularly if the antiweapon is another aircraft that operates in the classical fashion of a pursuit fighter. It takes the interceptor some time to build up to the energy level $\left(\frac{V^2}{2g} + h\right)$ of the intruder aircraft. Thus, the higher this energy level is, the lower is the chance of its being intercepted. Unfortunately, interceptors attack more and more on a collision course, which can be flown frequently without matching or exceeding the intruder's speed.

The significant speed of the intruding aircraft is that during and before the encounter, which might not be the same as its advertised top speed. Not too seldom this high-speed capability exists only for the "clean" aircraft without its military load. A popular concept for many aircraft missions is the subsonic-cruise/supersonic-dash flight profile, which is an attempt to "have a cake and eat it too." Whatever advantage is achieved with the high speed of the dash phase exists only for a rather small fraction of the flight time, and only if the opponent was not alerted already during the preceding cruise phase.

Ground-based antiaircraft weapons have become a much more formidable threat to military aircraft than the interceptor, which nowadays serves more in a secondary role than as the primary air defense weapon. Because of the state of the art in detection and tracking techniques and the high degree of readiness of modern air-to-surface missiles, speed and altitude are no longer much of a protection. Survival against these weapons depends largely on bypassing the sensing devices. Since the best usable altitude regime goes up with speed, the distance at which an incoming airplane can be detected and tracked goes up also, and the reduced maneuverability of the faster airplane makes it much easier for the defense to predict its future flight path.

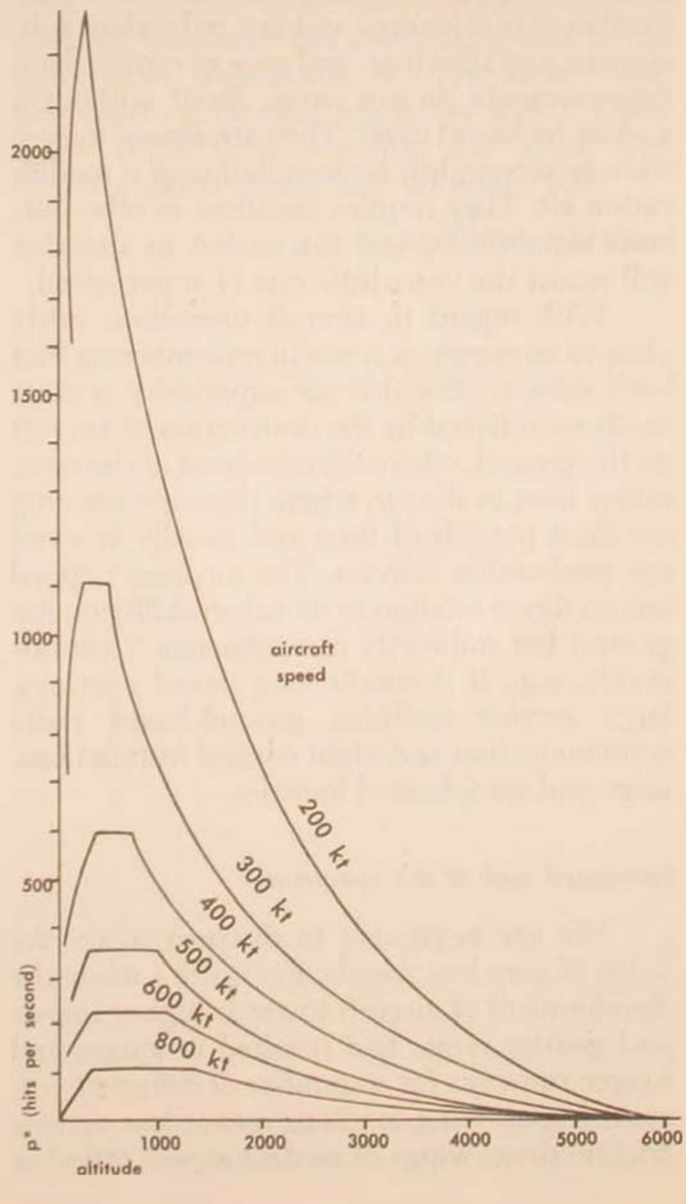
A most annoying by-product of higher and higher speeds is the accompanying infrared radiation. At lower speeds it is mainly the power plant that emits plenty of radiation in the wave bands preferred by the simpler infrared sensors; this radiation goes mostly out to the rear and thus helps the weapons that attack from behind. At higher speeds, however, the airplane begins to glow all over, and the intensity of the surface radiation grows very rapidly with speed. At mach 2 it is sufficiently noticeable that good infrared sensors detect it within 5 to 10 miles; at mach 3 the airplane is visible over many hundred miles to the most primitive infrared sensors. This radiation is the best possible aid one can give to a collision-course intercept, which needs excellent angular position information. The military value of higher supersonic speeds for airplanes that have to penetrate deeply into the territory of a well-equipped enemy is, therefore, open to considerable doubt. Rather heavy use of electronic countermeasures, saturation of the local defense, and the gradual destruction of the air defense installations appear more promising.

Equally questionable is the value of the "supersonic dash" of an airplane that normally flies subsonic. The power plants for such subsonic-cruise/supersonic-dash missions have to use afterburning quite heavily for the supersonic portion of their flight, which is just what the infrared guided missile needs. We would be better off with power plants optimized for supersonic cruise, because, in addition to better fuel economy, they can have a fairly cool exhaust and do not have to pour out much infrared radiation. Of course these engines are not overly efficient at subsonic flying. In spite of all the ingenuity that is presently spent on multipurpose airplanes, it is hard to see what the military merits of a limited supersonic-dash capability are; if we cannot afford to go supersonic all the way out and most of the way back, we had better improve the survival chance elsewhere.

The present strength of antiaircraft weapons at high and medium altitudes has made flying at very low altitudes quite attractive. The short range of all sensors, the masking from ground obstructions, and the much higher noise level picked up by the radar receiver make the defense job very difficult. Here speed is one of the most significant assets of the intruding airplane, because it can exploit the greatest weakness of all defense systems: the finite time it takes to convert a detection into a kill. Again, this can be carried too far; it is hard to see why anyone would want to shake up a sleepy defense with a supersonic boom. Over irregular terrain too much speed forces the airplane higher above the ground, thus increasing the range capabilities of the ground-based weaponry. (This range is roughly proportional to the square root of the flight altitude. Analysis of the maneuvering capability indicates that the flight altitude goes roughly with the square of the velocity; i.e., the detection range is about proportional to the aircraft speed, and no gain is realized in alert time.) The faster aircraft still has the possible advantage of outpacing slower defense missiles, in particular, if it does not cooperate with their homing techniques. A reasonable natural speed limit is the transonic drag rise; the power requirements increase considerably if we try to push temporarily supersonic speeds on the deck, and this is hard to do without very significant increases in infrared radiation. The protective value of flying low is also considerably weakened if the high speed leads to continuous use of terrain-clearance and Doppler navigation radar or other active electronic systems. Where the enemy is alert and has the technical capability, the use of such devices should be restricted to bad weather situations if and when other means of navigation fail.

In tactical warfare, i.e., wherever the aircraft has to fight against hostile ground forces, we have to consider very seriously the threat from small-arms ground fire, which is no longer just a nuisance. Since the days of World War II and the Korean conflict, most major ground forces have increased the number of antiaircraft machine guns by an order of magnitude and have devoted considerable training to their proper use. Figure 3 shows the results of an analysis of the hit probability per unit time of randomly distributed ground fire from the most frequently used 14.5-mm machine gun. This analysis establishes that ground fire is indeed a very serious challenge to the battlefield use of aircraft. It is orders of magnitude more serious than the threat from enemy interceptors, and it will remain so even if absolute air superiority is an accomplished fact. Aircraft speed is quite a strong survival factor against

Figure 3. Unit hit probability from random ground fire (14.5-mm antiaircraft machine gun). Target in aircraft = one square foot. Fire density = one round per square foot per second. Hits per second = p^*.



ground fire, and it should be utilized fully whenever possible. Altitudes above 5000 feet or so are relatively safe from ground fire but ideal for antiaircraft artillery and missiles; therefore these altitudes are usable only after such systems have been mostly destroyed. Unfortunately it is hard to accomplish much against the relatively small, dispersed, and camouflaged targets in modern war threats unless the aircraft slows down to speeds at which the pilot can detect and destroy them effectively. The ratio of target kills to airplane losses from ground fire still is best at the speeds at which the airplane is most maneuverable. It is therefore most advisable to seek a reduction of the aircraft vulnerability to small-arms fire by other means than speed alone; for instance, by armor protection for the most vital parts, prevention of fuel leakage and fire, redundant subsystems and structure, and ease of repair. Such improvements do not come about without a serious technical effort. They are almost impossible to accomplish by installation of a modification kit. They require sacrifices in other aircraft capabilities, and the easiest to abandon still seems the unrealistic one of super speed.

With regard to aircraft operations fairly close to an enemy, it is worth remembering that both sides realize that air superiority is most easily established by the destruction of aircraft on the ground, where they are most of the time, rather than in the air, where they operate only for short periods of time and usually in a not too predictable fashion. The airplane's speed has no direct relation to its vulnerability on the ground but indirectly can influence it considerably, e.g., if it entails long paved runways, large service facilities, ground-based radio communication and flight control installations, large and complicated logistics.

low-speed end of the spectrum

We are beginning to discover again the value of very low speeds. For quite a while the development of aircraft towards higher speeds and greater range had resulted in longer and longer runways for a number of different reasons: higher wing loadings meant less surface friction drag; wings of modest aspect ratio but with considerable sweep were required for supersonic performance; earlier the jet engines had rather modest thrusts at lower speeds compared to the propeller engines, which used to develop thrust in an inverse relation to the speed. However, since those early days of jet propulsion, engine weight has been reduced considerably. So we jump from one extreme to another, from two-mile runways to vertical take-offs and landings (VTOL). Surely the technical means of producing lift out of power become more and more available; the best one, namely the rotary wing of the helicopter, has been with us for several decades, but unfortunately it lacked high-speed capabilities.

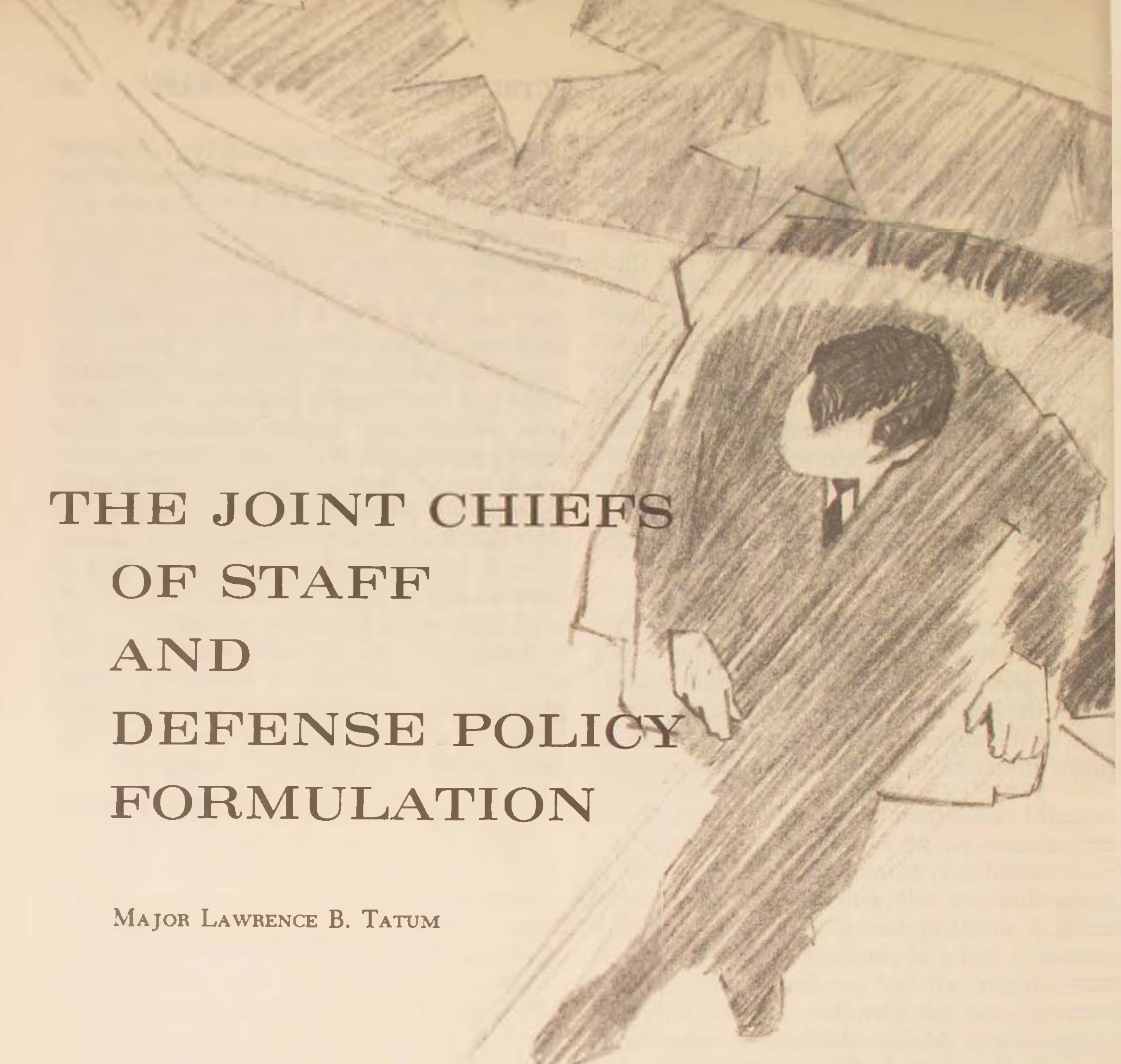
The wide variety of lift engines allows many arrangements of the propulsion system so that speeds much above those of the helicopters can be attained, with a tolerable weight effort suitable for all but the most ambitious aircraft missions. Undesirable are the effect of the high-energy exhaust on the ground environment and the rather long transition zone between hovering on engine thrust and the minimum speed for fully aerodynamic lift.

It might be useful to point out occasionally that there are considerable possibilities between the two extremes—the two-mile-plus runway and the VTOL launch platform. A look at existing airfield facilities in a few areas of the world for which we had the information available showed uniformly the same trend: the number of available airfields was roughly inversely proportional to their length. It was not possible to extend this statistic to runways below 2000 feet because such short ones were hardly ever under consideration as airfields, since there are too few aircraft around that could use them. For example, there exist in most parts of the world, outside the U.S.A., soccer fields near every medium-sized village, many of which could serve between games as about 500-foot runways.

In the general rush to attain pure VTOL performance we overlook too easily the possibilities of generating unusually high aerodynamic lift forces by a more intimate marriage of the wing and the propulsion system. With the high power level needed and available in modern aircraft, lift coefficients of an order of magnitude can be reached which were considered quite fantastic not too many years ago—say 5 to 10 or more. These lift forces involve such devices as blown or jet-augmented flaps, high degrees of propeller or ducted fan slipstream deflection, tilted powered wings, etc. If we do similar things to the tail and other control surfaces, we can have a single continuous control system down to the lowest flight speed and avoid most of the difficulties and hazards of the wide transition regime between hovering and wing-supported flight. If absolutely no forward speed is permitted, all aerodynamic effort is in vain. At zero speed, even a lift coefficient of 10 or 100 still means zero lift.

WE ARE TODAY technically in a position where we can develop airplanes for any speed between zero and orbital. The optimum usable speed depends now mostly on the desired function of the aircraft, and we should cultivate a more utilitarian attitude toward speed requirements. Where speed is essential for fast action or reaction, we should go to extremes; and in such applications we should aim towards hypersonic rather than supersonic speeds, i.e., depending on range requirements, the speed regime from about mach 10 to over 20, rather than mach 2 to 3 or 4. On the other hand, a short-time high-speed capability is just an expensive embellishment; it adds little of military value and may actually reduce it. A multipurpose aircraft may appear impressive in its paper performance; if we realize that its quoted speed, range, payload, etc., are not present together but attainable only one at a time, we shall soon find that it will be hopelessly inferior in each specific class to an airplane that is built for one or two of these tasks only. If we need high speed in military aircraft, we need it during the cruise out much more than in the action area. Supersonic or hypersonic cruise plus subsonic combat capability makes much better sense than anything the other way around—and is technically an easier task.

Baltimore, Maryland



THE JOINT CHIEFS OF STAFF AND DEFENSE POLICY FORMULATION

Major Lawrence B. Tatum

Many prominent writers on military affairs are gravely disturbed about "the excessive influence of civilians" in the field of defense policy-making. The following statements are illustrative.

> . . . the Secretary [Secretary of Defense McNamara] has penetrated deep into fields once reserved for the military. He has barked shins throughout the country's polity and economy. A stream of complaints has flowed from the Armed Services and their friends and clients. Carl Vinson, the powerful chairman of the House Armed Services committee, has semipublicly "warned" the Secretary against abridging the independence of the Services and their Secretaries. Virtually the whole press has joined in criticizing McNamara for what the *Washington Post* has called "The Closed Door Policy of the Defense Department." Blue suits and brown alike have charged that, as the *Army, Navy, Air Force Journal* put it, "the professional military leadership of the nation is being short-circuited in the current decision-making process at the Pentagon."[1]

> In structural terms, the military establishment may be one of the tripods of a "power elite," but in sociological fact the military officers feel dispossessed. . . . Since the end of World War II, the military has been involved in a number of battles to defend its elite position, beginning in 1945 with the young physicists and nuclear scientists, down to the present

action against the "technipols" (the military's decisive term for technicians and political theorists whom Secretary McNamara has brought into the Department of Defense).[2]

> In common with many other military men, active and retired, I am profoundly apprehensive of the pipe-smoking, tree-full-of-owls type of so-called professional defense intellectuals who have been brought into this Nation's Capital. I don't believe a lot of these over-confident, sometimes arrogant young professors, mathematicians and other theorists have sufficient worldliness or motivation to stand up to the kind of enemy we face. . . . it seems to me the old strengths still apply. In my opinion the two that count for most in the nuclear space age, regardless of academic cerebrations, are national determination and military forces designed to achieve victory, not tailored to obtain compromise. Professional military training teaches the philosophy of victory whereas politics is based on compromise.[3]

Do civilians have inordinate power in the strategy-making field? If they do, is it because of the energetic personality and management philosophy of our present Secretary of Defense?[4]

It is a thesis of this article that a variety of civilian groups have begun to play and—barring a large-scale war situation—will continue to play a major role in the determination of strategy and military policy.[5] Moreover, Secretary McNamara did not create the phenomenon of civilian influence.[6] At most, the Secretary's energetic implementation of an activist management philosophy has accelerated an existing trend—and exacerbated the debate over its desirability and consequences.

A subsequent and more important thesis of this article will be that civilian participation in defense policy formulation—while inevitable and to a large extent desirable—has, in recent years, tended to overwhelm the military input to strategy-making. This has happened, it will be argued, because the military, erroneously, has assumed that its advice will be ineffective unless all military suborganizations appear united behind specific policy proposals. This erroneous assumption has resulted in present Joint Chiefs of Staff organizational procedures which ensure that the military is poorly equipped to provide meaningful strategic advice. But these are matters to be dealt with later.

The Civilian's Role in Defense Policy Formulation

Prior to World War II, American attitudes toward war and peace were clear-cut. Normally, thought Americans, states were at peace with one another. Relations with other nations were conducted by the State Department, utilizing principally the instrument of diplomacy. War was thought to be an aberration, a temporary deviation from normality. Moreover, Americans thought war justified only when an immoral or insane aggressor compelled a state to use force in self-defense. When driven to take up arms, the total defeat of the aggressor became the only possible—and moral—objective of war.

Thus, according to American tradition, peace and war were entirely different phenomena. During peace, force or the threat of force was not a usable instrument of foreign policy; the formulation of defense policy could be of little or no concern to the nation as a whole. To whatever degree prewar planning and strategy-making were deemed essential—and that was certainly not to a great degree—they were the exclusive domain of a small group of military professionals. On the other hand, whenever war was thrust upon the United States, the goal had to be total victory. During war, military needs became paramount and "generals and admirals moved from political isolation into the seats of power."[7]

America's attitude in the era since World War II has become more sophisticated. The old traditions die hard, but slogans like "cold war," "neither war nor peace," "peaceful coexistence" have relegated more categorical descriptions of U.S. policy into the background. The principle of political primacy and its corollary, the economy of force, have become prevailing national concepts.[8] "Political primacy" asserts that the only legitimate purpose of military force is to serve the nation's political objectives. This principle declares that force or the threat of it can be of no practical use in itself. Attainable, concrete, specific political objectives must guide the threat or the use of military power to ensure a practical and discernible relationship between ends and means.

Political primacy as a principle is especially pertinent to an age when the principal protagonists hold nuclear weapons. In addition, strategy considerations must adhere to the principle of economy of force—the use of only that amount of military force absolutely necessary to accomplish a given political objective; the more force applied, the more difficult its control and, consequently, the maintenance of political primacy.

States which follow the principles of political primacy and economy of force do not regard peace and war as entirely separate orders of existence. Given proper circumstances, force or the threat of force becomes an acceptable foreign policy instrument, whereas diplomacy and political primacy are vitally necessary throughout an actual conflagration so that force may be limited and controlled.

Wherever the principles of political primacy and economy of force prevail, the argument that the politician sets goals and the military man decides means must be regarded as outmoded. Under these twin principles, *both* the politician and the military man ought to participate in setting goals and determining means because ends and means are intimately connected—indeed, frequently inseparable. The present international situation, in which great powers are, primarily, adversaries —but still believe they cannot resort to total war to settle differences—only reinforces the conclusion that civilians must be involved in the planning of force utilization.

Of all the reasons why defense policy is no longer the exclusive domain of the military, I judge the primary one to be that American strategists are guided—and will continue to be guided—by the principles of political primacy and economy of force.[9]

There are, however, many other reasons why defense policy formulation is no longer just the military's bailiwick. I will briefly discuss some of them without belaboring the obvious. Most, if not all, the reasons discussed are permanent rather than transitory characteristics. I make this statement because some observers, though astute enough to understand why the civilian has "invaded" the strategy domain, seem to believe the present civilian "occupation" may be temporary.[10]

One reason why there is now a furor over civilian dominance of strategy-making is that a comparison with the immediate past presents a remarkable contrast. As I have already indicated, World War II military leaders had an unusual amount of influence in policy formulation. When events in the postwar era made it clear that the United States could not again shirk international responsibilities, government agencies were unable to find sufficient numbers of competent civilians to man important national security posts. As a result, "military officers were appointed to key State Department offices, ambassadorial posts and positions in other foreign affairs agencies."[11] Thus, throughout the late Forties, military men occupied many of the prominent positions in both the foreign and defense branches of the national security policy structure.

It was inevitable that Administrations would change this situation as circumstances permitted. Under Presidents Eisenhower and Kennedy the overall participation of military officers in civil office declined until very few professional military officers have been appointed to top civil governmental positions during the 1961–65 Kennedy and Johnson Administrations.[12] Even in the defense policy area itself, each political party had, by the early Sixties, built up a reservoir of men knowledgeable and experienced in military affairs to man top positions in the Department of Defense.[13] The present *modus operandi* undoubtedly is more logical and relevant to the American political system than the practice followed in the immediate postwar era.

Therefore, the clamor against civilian strategists is in part due to fond memories of a yesteryear unusual in the degree of military occupancy of important national security positions. A far more significant factor, however, is that civilian influence *has* been introduced into heretofore sacrosanct military arenas.

As Professor S. P. Huntington says, three groups of civilians have "invaded" the strategy domain. The first group is composed of the "defense intellectuals."

> Most of the significant writings on strategy produced after World War II were produced by civilians. . . . Experts such as Brodie, Kaufman, Kissinger, Wohlstetter, Schelling, and Kahn took the lead in articulating theories of stabilized deterrence, limited war, tactical nuclear war, arms control and civil defense. . . . Traditionally, the professional military officer is supposed to be contemptuous of the ignorance of civilians on military problems and strategy. One striking aspect of the McNamara Pentagon, however, has been the allegation that the civilian "whiz kids" are unduly contemptuous of the military officers for *their* backwardness and ignorance.[14]

The second civilian group is comprised of the natural scientists.

> In the [defense policy] debates of the late 1950's and the early 1960's concerning technology, space activities, nuclear testing, arms control, disarmament and even weapons development, the role of the scientists was as important or more important than that of the soldiers.[15]

The Department of Defense civil servants make up a final civilian group which, quite unostentatiously, has gained power and influence. Military men normally rotate through top staff positions. Many top civil servants have been with DOD since 1947. Their experience, knowledge, contacts, and power permit them to restrict and control many defense policy matters.

These three groups are, I think, permanent occupiers of the strategy domain. Given the complexity of modern strategic planning, the cost of new weapon systems, and—most important—the absolutely crucial requirement that defense policy contribute maximally to national security, then the defense intellectual, the natural scientist, and the DOD civil servant are welcome additions to the strategy team.

Another important cause of the decline of the military's input into defense policy-making is the changing nature of the political process through which strategic decisions are made. The role of Congress in determining the military budget, force levels, weapons, and uses of the armed forces has been practically preempted by the executive branch. Reflection seems to indicate that this development was inevitable and is irrevocable. Congress is not organized to formulate the strategic decisions at the heart of force-structure determination. Still, diminution of congressional influence in military affairs has removed one of the military strategist's power sources. Congress may heed plaintive cries of service advocates and appropriate additional military funds—but almost without exception the President has effectively "vetoed" the legislative action by impounding the funds.[16]

Many of the traditional, heretofore mundane, problems of military affairs are no longer handled exclusively by military professionals. Here is another area of civilian invasion of the defense policy field. For instance, choices of modern weapon systems involve extremely long lead times in planning, testing, procurement, and production. With choices now involving billions of dollars, civilian participation has become routine, especially since "unnecessary" monies spent on defense may increase the national debt, intensify the balance of payments problem, decrease amounts spent on foreign aid, poverty programs, etc. Moreover, with political primacy demanding interrelated defense and foreign policies, civilians naturally are concerned with what types of weapon systems are being planned, produced, and made operational.

Finally, because of cost and other factors such as the increasing rate of technological obsolescence, only a few weapon systems now become operational. The ideal pattern seems to be a single, long-lasting weapon system for each combat function. For example, DOD wants the Navy and the Air Force to use the same aircraft throughout the 1970's to fill their tactical fighter needs.[17]

It is evident that civilians are entering the weapon systems decision-making process quite forcefully. The argument that "we must have this particular weapon system as soon as possible"—a contention which, if accepted, maximizes military control of weapon system decisions—will carry much less weight than it has in the past. Civilian DOD leaders feel that there *is* time to make a fully staffed study before making decisions on weapon system selection and management problems—and that their participation in these decisions is not only possible but essential. Consequently, if civilians are going to participate in decisions on weapon systems, they are normally going to be involved in the strategic analysis which usually precedes the production of armaments. Ordinarily, one asks what defense policy one wishes to adopt *before* asking what kinds of technically and financially possible weapon systems are desirable.

Changes in defense organization have greatly accentuated the trend toward civilian dominance of the strategy-making process. Much water has gone over the organizational dam since the National Security Act of 1947 created the office of Secretary of Defense and vaguely instructed the Secretary "to preside" over the National Military Establishment. Through various organizational acts, the Department of Defense has been given increasing power and control over the separate services and the military professionals. Unified and specified (i.e., operational) commands have been created. Today these are directly responsible to the President and the Secretary of Defense. In regard to forces assigned to unified and specified commands, military departments are accountable only for their training, support, and administration. Functional offices at the Assistant Secretary of Defense level have been expanded in both numbers and powers. For instance, since the office of the Director of Research and Engineering was created in 1958, the Director has supervised *all* military research and development. Defense-wide agencies have been established to unite common supply and service functions and to reduce service duplication.

These defense organizational trends have unmistakably led to increased centralization and functionalism and to decreased authority of the military professionals in strategy areas. As one commentator observed:

> As a result of the *expansion of the unified command concept*, the authority of the Service Chief as an individual has been supplanted by the corporate authority of the Joint Chiefs, while the authority of the Chiefs of Staff has been reduced through the creation of the elaborate superstructure for defense policy-making in Washington.[18]

Moreover, Secretary McNamara and his predecessors have acted fully within legislatively permitted limits,[19] though perhaps Congress did not intend for Defense Secretaries to *utilize* their powers as actively as they have.[20]

I have indicated why civilians now play a role in the defense policy-making process. Civilian participation in strategy-making is no transitory phenomenon. Years ago, French Premier Clemenceau said wars were too important to be left to generals. Now the same can be said for defense policy:

> War is no longer a question of victory or defeat on the field of battle. With the advent of nuclear weapons and strategic delivery systems, we have reached the stage where peacetime preparedness is likely to determine the outcome of a major nuclear war. Thus not only war but also peacetime defense becomes too serious a matter to be left to the generals.[21]

United States Air Force Academy

Notes

1. Joseph Kraft, "McNamara and His Enemies," *Harper's Magazine*, August 1961, p. 41.

2. Daniel Bell, "The Dispossessed—1962," *Columbia University Forum*, 5 (Fall 1962), p. 6.

3. General Thomas D. White, "Strategy and the Defense Intellectuals," *Saturday Evening Post*, 236 (4 May 1963), pp. 10–12.

4. Secretary McNamara has been quite explicit in stating his management philosophy:

> "When I became Secretary of Defense in 1961, I felt that either of two broad philosophies of management could be followed by the man at the head of this great establishment. He could play an essentially passive role—a judicial role. In this role the Secretary would make the decisions required of him by law by approving recommendations made to him. On the other hand, the Secretary of Defense could play an active role providing aggressive leadership—questioning, suggesting alternatives, proposing objectives and stimulating progress. This active role represents my own philosophy of management."—From Robert S. McNamara, "McNamara Defines His Job," *New York Times Magazine*, 26 April 1964, p. 13.

Contrast Secretary McNamara's approach with that of one of his predecessors, Secretary McElroy, as indicated by the following comment:

> "The conflicting pressures on him [McElroy] from the Army and the Air Force were so great that he finally threw up his hands and asked Congress to decide which of the two services' competing and almost identical missiles—Jupiter or Thor—should be put into production."—From Julius Duscha, "Arms and the Big Money Men," *Harper's Magazine*, March 1964, p. 41.

5. When I refer to civilians and/or military men having an input to defense policy- or strategy-making, I imply that the input—by whomever given—involves the considerations of ends as well as means. As explained later, I believe ends and means are practically inseparable. No one should tell a military strategist that he should analyze only means and leave consideration of ends to the civilian policy-maker.

6. As one prominent writer on military affairs says:

"Military leaders and military institutions were less powerful in the Truman administration than they were during World War II. They were less powerful under Eisenhower than they were under Truman. They are less powerful now under Kennedy than they were under Eisenhower. This constant decline in power and influence of the military profession is the single most important trend in civil-military relations during the past fifteen years."—From Samuel P. Huntington, "Power, Expertise and the Military Profession," *Daedalus*, Fall 1963, pp. 795-96.

7. World War II directly reflected American attitudes toward peace and war. During the war the President and the Joint Chiefs of Staff formulated strategy. The Secretaries of State, War, and Navy played marginal roles. In 1945 Admiral Leahy declared that the Joint Chiefs were "under no civilian control whatever."—Noted in Huntington, p. 795.

8. Robert E. Osgood, in his book *Limited War* (Chicago: University of Chicago Press, 1957), has brilliantly formulated these two principles and drawn what he considers to be the necessary consequences for U.S. foreign policy. The following discussion of these principles is centered on Osgood's presentation.

9. A necessary and most important concomitant idea is that the very nature of strategy is no longer—if it ever was—even primarily military. This is especially true in the absence of major war situations, as Walter Millis says:

"In the absence of major war, the problems of high command are much more organizational, technical, diplomatic—political in the larger sense of the word—than strategic. Even where 'little wars' are under way, as in Vietnam, it is coming to be realized that military strategy itself involves a much larger political factor than was once supposed."—From "Puzzle of the 'Military Mind,'" *New York Times Magazine*, 18 November 1962, p. 158.

10. For instance, Colonel Robert N. Ginsburgh, after outlining many of the reasons why civilians are making most of the present defense policy inputs, had this to say:

"The statesman needs sound military advice; the military professional needs firm policy guidance. Each must, of course, understand the problems of the other. The military man should be aware of the political, economic, social and other factors which affect national security, but it is not his business to evaluate them. He should limit himself to a consideration of military aspects which are within his area of competence. The civilian authorities, both executive and legislative, should assist him in exercising self-restraint by not requiring his comments on nonmilitary matters. Similarly, the statesman who is concerned with a political problem must recognize that it may have important military implications but he should refrain from making military analyses. He should use the results of the analysis of the military as one of the factors bearing on his total problem." —From "The Challenge to the Military," *Foreign Affairs*, January 1964, p. 266.

Unless otherwise cited, reasons for contemporary civilian input into military affairs subsequent to this footnote are drawn either from this article by Colonel Ginsburgh, pp. 255–68, or from Huntington, pp. 793–801.

11. Huntington, p. 797. For instance, General Marshall served alternately as Secretary of State and Secretary of Defense.

12. *Ibid.*

13. One author notes that, at the end of the Eisenhower Administration, "most civilian leaders in the Pentagon had spent periods of 4 to 8 years in defense work, if not in the same post." —From Gene M. Lyons, "The New Civil-Military Relations," *American Political Science Review*, 55 (March 1961), p. 57. The Kennedy and Johnson Administrations turned quite often to executives like Roswell L. Gilpatric, Deputy Secretary of Defense, 1961–64, who had held responsible DOD positions under Truman.

14. Huntington, p. 798.

15. *Ibid.*, p. 799.

16. One of the more recent of a growing series of "veto" instances is the Congress–Administration fight over the RS-70. At this writing, only two prototype RS-70's are contemplated, and even the Air Force has given up hope of getting the plane into operational production.

17. The TFX (F-111) fighter airplane is DOD's answer to the tactical fighter problem. The degree to which civilians now participate in weapon systems procurement is dramatically indicated in the history of the TFX. See Richard W. Smith, "The $7-Billion Contract that Changed the Rules," *Fortune*, March 1963, pp. 97–101, 182–88, and April 1963, pp. 110–11, 191–94, 199–200.

18. Ginsburgh, p. 257.

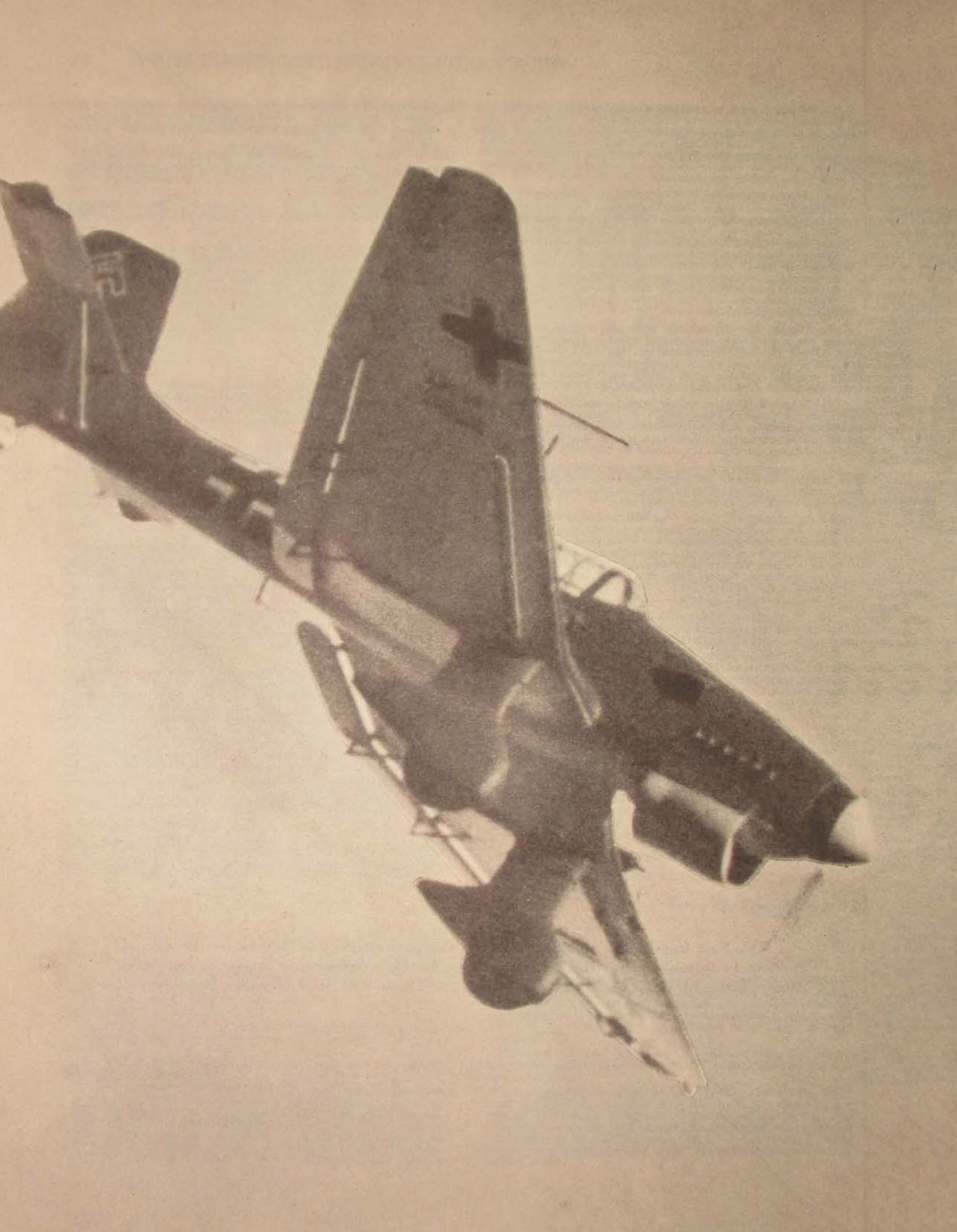
19. The following is typical of the conclusions of experts on the Defense Secretary's organizational and operating activities:

"Final approval of centralization and functionalism came in 1958—from Congress in the express words of the National Security Act amendments, not from the President or from DOD. And it came, moreover, at the behest of the Eisenhower, not of the Kennedy, Administration."—Captain Gerald Garvey, "The Changing Management Role of the Military Departments Reconsidered," *Air University Review*, XV, 3 (March-April 1964), 47.

20. A 1962 report of Representative Carl Vinson's Special Subcommittee on Defense Agencies argues that "Congress has lost control of the organization of the Defense Department" but even it does not argue that secretarial actions have been illegal.—*Report of Special Subcommittee on Defense Agencies*, Committee on Armed Services, House of Representatives, 87th Congress, 2d Session, 13 August 1963, p. 6635. The subcommittee merely wished to amend the National Security Act so that no *additional* agency consolidation could occur without specific congressional approval.

21. Ginsburgh, pp. 258–59.

This first installment of Major Tatum's two-part article has focused on the role of civilians in formulation of U.S. defense policy. In the installment to appear in our July-August issue, he will discuss the role of the Joint Chiefs of Staff in policy formulation.



THE RISE AND FALL OF THE STUKA DIVE BOMBER

A Warning for Today

Colonel William F. Scott

"DEFEAT," we are told by Admiral Alfred Thayer Mahan, "cries aloud for explanation, whereas success, like charity, covers a multitude of sins." The famed historian and strategist went on to state that "it is from the records of the beaten side that we are most surely able to draw instruction. . . . The naval practice of courtmartialing a defeated general or admiral has been most productive of the material which history, and the art of war, both require for their treatment."[1] The trials of the defeated German generals and admirals after World War II were not for the purpose of determining the mistakes in their military doctrine. Little interpretation or analysis of the reasons for Germany's defeat are available in the United States. On the other hand, the book market has been saturated by victorious generals and admirals writing to justify their own roles in the conflict. The "multitude of sins" that these success stories may cover is seldom touched upon, and the "records of the beaten side" are virtually ignored.

Of what value could a study and analysis of World War II German doctrine and weapon systems be to the military professional today? Have not the thermonuclear weapons, ballistic missiles, space, and 25 years of advancing technology made obsolete any lessons that might have been learned from the last world conflict? Fifteen years ago, in Korea, a limited war was fought—limited both in objectives and in the weapon systems used. In the mid-Sixties there is another type of war, a sublimited war, almost as different from Korea as that war was different from World War II. Aside from a purely historical or academic interest, are there any worthwhile lessons that can be gained from studying the defeated side in a war that began a quarter of a century ago?

A major difference between World War II and more recent wars, such as the limited and sublimited engagements of Korea and South Vietnam, has been the fight for air superiority. Since the European Theater D-Day of 5 June 1944, much of our military thinking has assumed that air free of enemy aircraft is the normal state of warfare. Current military planning appears to reflect that assumption. Since "it is from . . . the beaten side that we are most surely able to draw instruction," it might be well to analyze briefly an air weapon system and a concept that took for granted control of the air.

The Ju-87 aircraft, the famed Stuka dive bomber, was developed under such a concept. This aircraft made a tremendous impression upon the public mind during the German victories from 1939 to 1941 and influenced the planning of United States military leaders prior to and after Pearl Harbor. However, by the time of the invasion of the Continent by Allied ground forces, the Stuka was an extreme rarity. What caused its rapid rise to international fame, and why did it disappear from the battlefields of Europe? The study of this weapon system and of the thinking that led to its creation must start with the early days of the Luftwaffe.

Development of a Concept

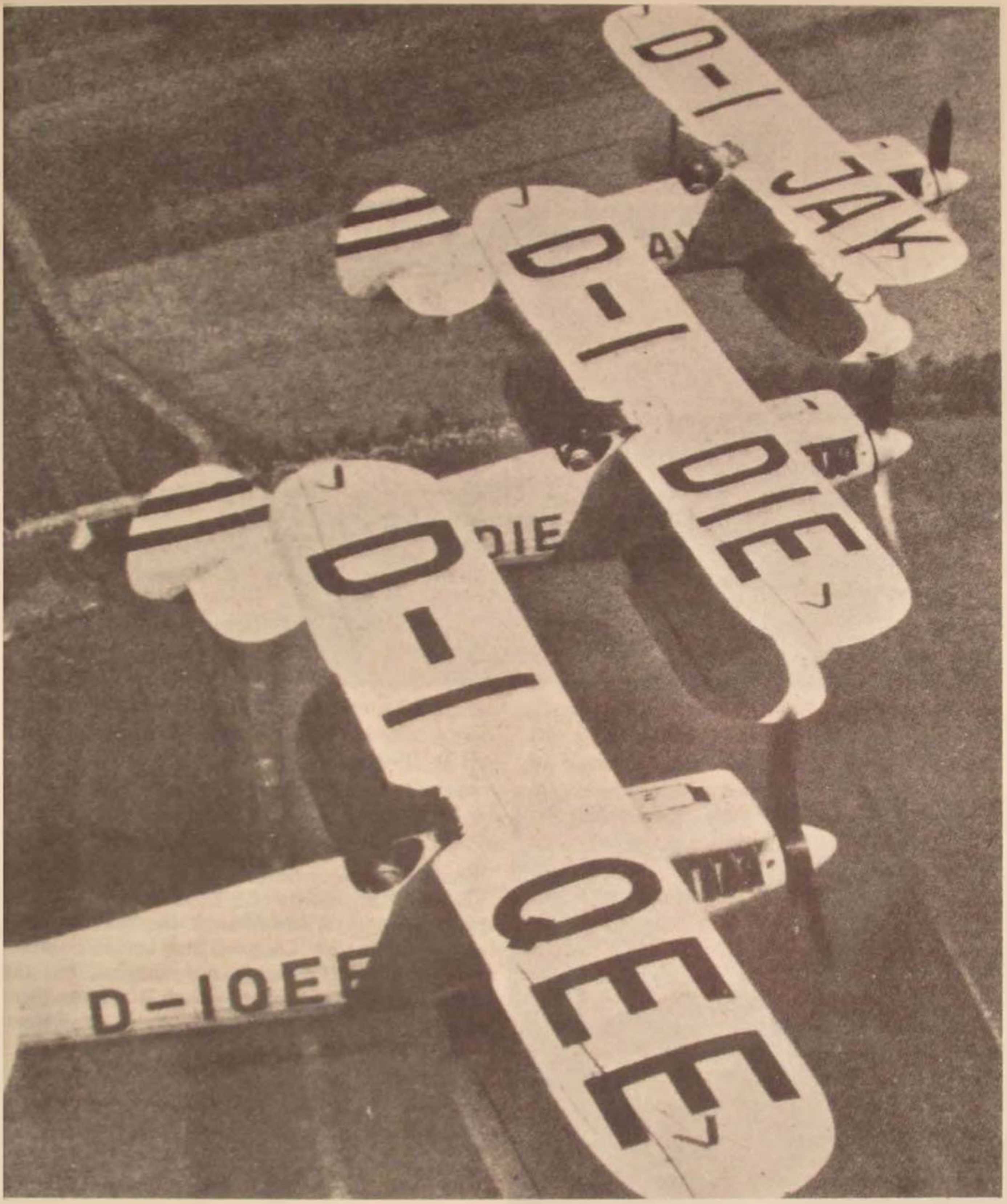
After World War I, the victorious powers attempted to ensure that Germany would remain militarily impotent. Clauses in the Treaty of Versailles were designed to preclude any resurrection of the German Flying Corps. Germany was required to surrender all her military aircraft and engines. In 1922 restrictions were placed on the size of civil aircraft that she could construct, but these restrictions were withdrawn entirely by the Paris Air Agreement of 1926. The French, with a firm belief in fixed ground defenses as a result of their experience in the war, were not overly concerned about the buildup of an aircraft industry in Germany. To keep Germany from becoming a military power, France concentrated her efforts on preventing the buildup of a German army and navy.

After the Paris Air Agreement, Germany built up her civil air line, Lufthansa, with its supporting facilities of airfields, aircraft industry, and schools for pilots. A military air force was developed concurrently with civil aviation, but in secret. Military pilots were trained in sections of commercial flying schools and in military schools for regular officers established in Russia. Aircraft manufacturing plants were established in friendly foreign nations. Insofar as potential air power was concerned, Germany had circumvented the provisions of Versailles, and until Hitler came to power, Britain and France rested secure in their belief in the supremacy of their surface forces.

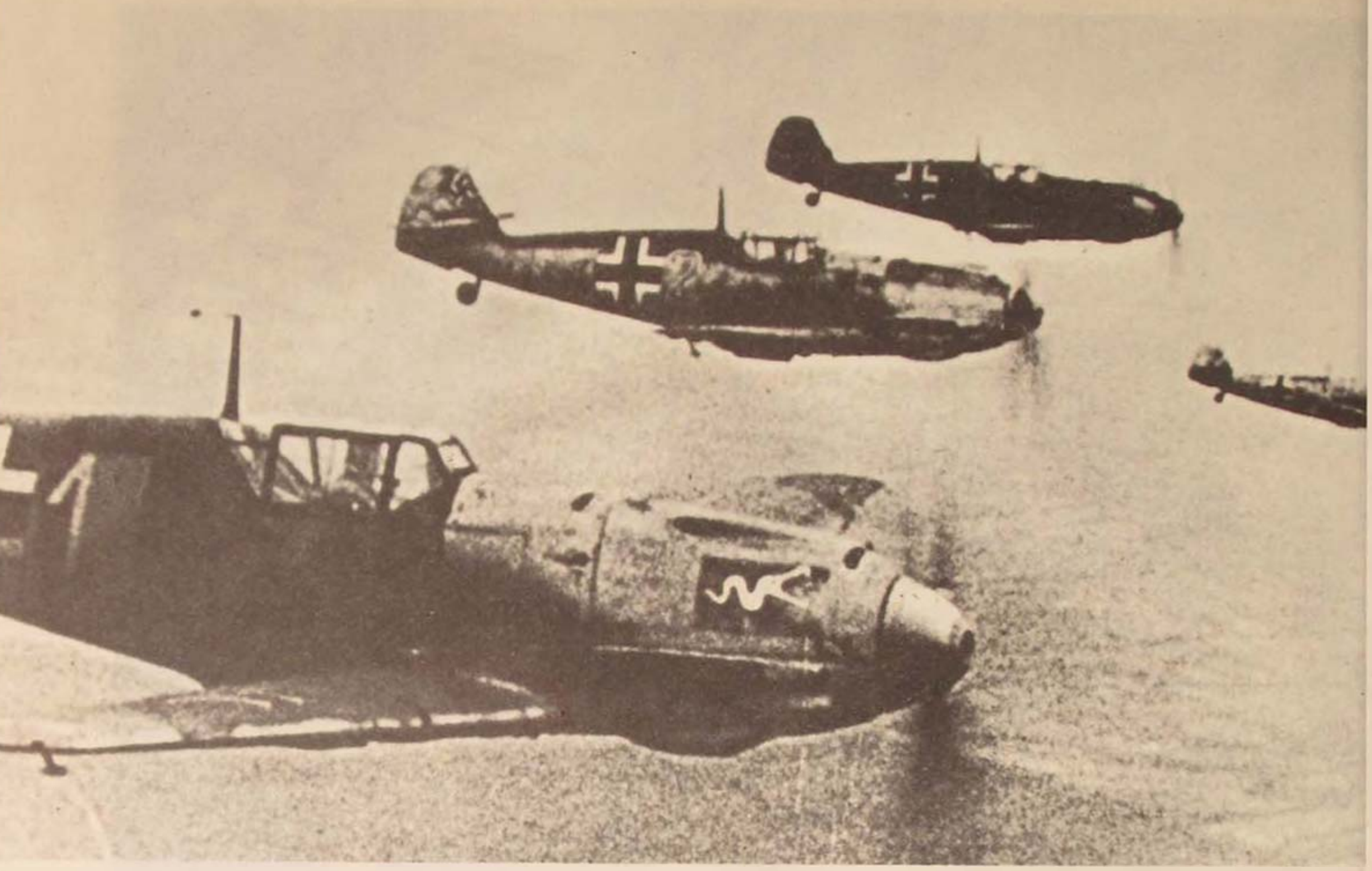
In 1935 the fact of German military air power was announced to the world. Hitler's strong supporter, Goering, became commander in chief of the new air force, an independent part of the German armed forces. An Air Staff College was established, and an antiaircraft force was begun, which was subordinate to the Luftwaffe. At this time, four years before the beginning of World War II, the strength of the Luftwaffe was approximately 1888 aircraft and 20,000 officers and men. By 1936 aircraft production averaged over 300 per month, making one year's production greater than the total number of aircraft then in the inventory of the United States Army Air Corps.[2]

With the formal creation of the German Air Force or Luftwaffe, its leaders held to a concept of strategic air power similar to the concepts of the leaders of the Royal Air Force and rebels in the United States Army Air Corps. The only significant difference was that at this time, 1935, when both the RAF and the U.S. Army Air Corps were asking for designs for a four-engine bomber, the Luftwaffe was still requesting two-engines. Still, the overall concepts for employment were basically the same.

Less than 18 months after the establishment of the Luftwaffe, a civil war in Spain became a testing area for air concepts and equipment. In August 1936, the first German force



In an early phase of the evolution of dive-bombing technique, the Heinkel 51 proved too slow as an escort fighter during the Spanish Civil War, but in low-level attacks on ground positions its success was considerable, establishing a pattern later followed in the German blitzkriegs of World War II.



The Me-109 was introduced in Spain and soon gained air superiority over Loyalist fighter opposition. Early in World War II the Me-109 (seen over the English Channel) was an able adversary of RAF Hurricanes and Spitfires, but the Luftwaffe did not have enough 109's for them to play a decisive role in the Battle of Britain.

for this limited war was dispatched to the aid of General Franco. The force was too small to be of any real value, and the He-51 escort fighter "was soon found to be inferior in performance to the Russian and American fighters being used by the Republican forces."[3]

In March 1937, the He-51 was involved in an experiment that was to have a significant effect on the future of the German Air Force and indirectly on the outcome of World War II. These aircraft proved to be too slow as escort fighters and so were equipped as fighter-bombers, each carrying six 22-pound bombs. They were used in low-level attacks against fortified ground positions, and the success achieved exceeded all expectations. "This attack marked the first close-support operations,"[4] and the pattern developed at the time was followed throughout the future German campaigns against Poland, Norway, France, and the Low Countries.

In watching the success of the He-51 as a dive bomber, the German air leaders did not neglect the requirement for air superiority. A new fighter, the Me-109, was dispatched to the "Legion Condor," as the force in Spain was called. This aircraft, considered at the time one of the world's best operational fighters, rapidly made obsolete the equipment of American and Russian design in the hands of the Loyalists. It gained air superiority in the summer of 1937, and with this mission completed the Legion Condor was free to accomplish other tasks. Franco's forces, lacking heavy artillery, were in need of a substitute for guns. In the land battle for Madrid, air bombardment demonstrated that an excellent substitute had been found. This success, together with the experience that had been gained in March, paved the way for the establishment of three squadrons of He-51 aircraft for close-support operations.

In the latter part of 1937 two specialized dive-bomber aircraft were sent to Spain for testing. These aircraft had been undergoing final trials in March 1936 and were new to operational squadrons. The first was the Ju-87, designed to carry 1100 pounds of bombs, armed with three machine guns, possessing a top speed of 210 miles per hour and having a total range of 370 miles. The second aircraft, the Hs-123, did not prove successful and was later dropped from production.

The Ju-87, or the "Stuka" as it was popularly called, was an instantaneous success. With a remarkable accuracy achieved in a dive angle exceeding 60 degrees, it was the infantryman's answer to long-range artillery. The pilot could put out a new device called dive brakes and control his rate of descent as desired. Attacking ground forces no longer had to await the arrival of slow and cumbersome artillery pieces. By the use of newly developed radio control, the dive bombers could work in close cooperation with the ground forces.

With the victory of General Franco, the Condor Legion had completed its task and returned to Germany in March 1939. The Spanish testing under conditions of limited warfare had made a lasting impression on both the Luftwaffe and Wehrmacht leaders. They abandoned the old concept of an air force as an independent strategic force. The operations conducted by the bombers in Spain had been largely limited to tactical support of the Army. The members of the Condor Legion went back to their units imbued with the possibilities of employing the Luftwaffe in direct support of ground forces, the dive bomber to play a leading role.

Of importance almost equal to the new tactical concept was the development of future air leaders in the Spanish Civil War. The first commander of the Condor Legion was Hugo Sperrle, who later rose to be the joint leader with Kesselring in the Battle of Britain. Another Condor Legion commander was Wolfram von Richthofen, who was to gain a reputation as the foremost exponent of intensive close-support operations. Richthofen, as a result of his Spanish Civil War experience, wanted to create "a separate tactical air force for participation in land battles; it was to be an adjunct to, and not a substitute for a strategic air force."[5] Despite his failure to obtain official sanction for his ideas, Richthofen created ground attack squadrons in the face of the opposition of the High Command. Richthofen's and Sperrle's ideas were shared by other officers who had been in the Spanish campaign, and since only the most promising officers had been sent to Spain, the results of the limited war were felt throughout the Luftwaffe.

Thus the German basic belief in air power as a supporting arm for the Army was largely the result of the limited-war test and the concurrent experience of the air leaders. But other factors had entered into the changing concept as well. The concept of the new weapon system, centered around the tank and the dive bomber, was further stimulated by visits of German air leaders to the United States. As a result of the visits, "instead of the commitment of major forces and area operations, small forces with pinpoint accuracy of fire became the slogan."[6] Apparently the distinguished German visitors were guests of ground leaders and took back with them copies of United States Army Field Manuals containing the viewpoint of the Army General Staff for the employment of air units. The Luftwaffe visitors did not realize that "control over the formulation and dissemination of combat doctrines [in the U.S.] was vested in a General Staff composed of ground officers and the air manuals had to be denatured to suit their taste."[7] In fact, "most of the manuals published before 1935 were actually antagonistic to the most advanced thought in the Air Corps."[8]

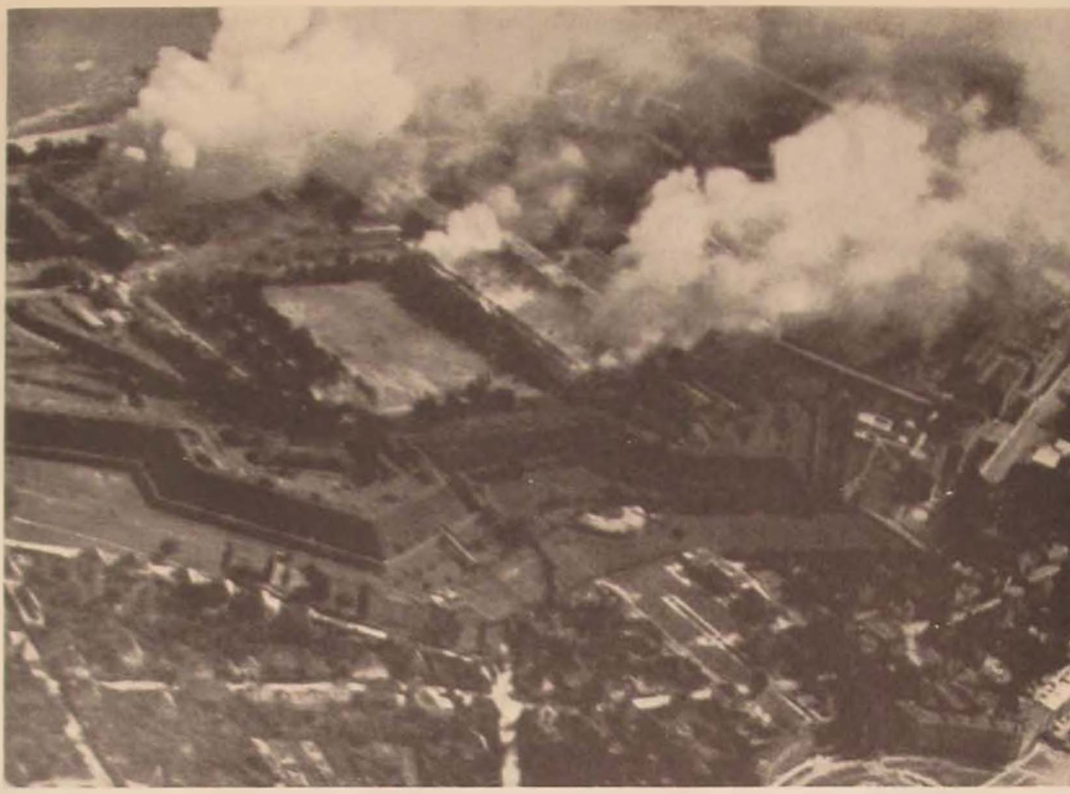
The effect of this changed German concept of air weapons and operations had its inevitable influence in aircraft programming. In 1935, Milch, the deputy to Goering, had planned for 51 dive bombers out of a total of 1863 operational aircraft, which came to 3.3 percent of the total number. By 1 August 1938, at the time of the Munich conference, dive bombers and ground support aircraft numbered 380, or approximately 13 percent of the total strength of 2928. Of equal importance, the bomber force of 1157 aircraft was thought of primarily as ground support weapon carriers. The ease with which air superiority had been gained in Spain, together with the relatively fast speed of the bombers in comparison to the fighter opposition, had resulted in decreased emphasis being placed on the battle for air superiority. Less than 25 percent of the total operational force consisted of fighter aircraft, and there were no four-engine bombers either in squadrons or in procurement.[9]

With this newly developed concept of ground support and with equipment strongly weighted in favor of such a concept, the Luftwaffe was assigned the task of carrying out the designs of Hitler. This force was paraded at Munich, where it won a great victory—"perhaps the greatest victory of its entire existence."[10] Britain and France were cowed, and only a few optimistic men on either side of the Atlantic thought that such a force could ever meet its match. By 1 September 1939 the total strength of the Luftwaffe had increased to 3750 aircraft. The percentage of dive bombers had shown a slight decrease and now stood at 8.9 percent of the total strength. However, the concept of employment as developed during and following the Spanish Civil War was unchanged. Would this "limited war" experience prove valid for the future?

Justification of a Concept

The first major test of the Luftwaffe started 1 September 1939, and within the space of 28 days Poland had been defeated. The leaders of the Allied powers then began to review their concepts of air power. Liddell Hart, the noted British exponent of tank warfare, saw his prewar theories, which had been scorned by his own nation, win success after success. The weapons were somewhat different from the concentration of tanks that Liddell Hart had anticipated, but the theory was the same: lightning thrusts of armored columns before enemy resistance could be stabilized. The determination of the Poles had availed little against the overwhelming power of the Luftwaffe and the Wehrmacht.

In this campaign, the Ju-87 Stuka stood out above any other type of aircraft employed. The entire German dive-bomber force had been used against Poland, with its initial attacks being against airfields. The Polish Air Force had consisted of approximately 900 first-



The burning barracks at the fortification of Modlin, Poland, are ample testimony to the accuracy of Nazi dive bombing.

line and 600 second-line aircraft, all of which were inferior to those of the Germans.[11] With both superior equipment and numbers, the Luftwaffe quickly gained air superiority. The Stuka delivered its attack almost without opposition, and the demoralizing effect of its bombing was a major factor in the rapid capitulation of the Polish Army. Of particular significance was the reaction of the civilian populace, which virtually panicked whenever the Stuka appeared.

After the "phony war" period of the winter of 1940, the next German objective was Norway. In this campaign, which started 9 April 1940, the Stuka played a lesser role. Only some 40 were employed, and their limited range did not permit them to take part in the first attacks. Little opposition was encountered, the small Norwegian Air Force having been taken by surprise and destroyed on the ground. Later, when the British attempted to re-establish a foothold in Norway, the Stukas did excellent service by bombing frozen lakes and other sites which the British attempted to use as airstrips.

Once Hitler had secured his right flank by holding both Denmark and Norway, he was ready for an attack against France. The German plan called for armored forces to make rapid advances and breakthroughs, spearheaded by a moving artillery barrage laid down by aircraft. Air support operations were conceived by Von Richthofen, who would put into further use the lessons learned in Spain and Poland. The Stuka dive bombers were to be employed in full strength, and at the time they numbered 380 of a total of 3530 German aircraft available.[12]

In France, from the very beginning of the battle, the work accomplished by the Stukas was out of proportion to their actual numbers. As many as nine sorties a day were flown by a single aircraft. A strong point or a resistance center, located either by air reconnaissance or by ground forces, was quickly overcome by concentrations of Stukas. A new chapter in the history of warfare was written. The millions spent on the Maginot Line, the centuries spent in developing a tradition—both were overshadowed by an investment of 380 aircraft dropping bombs from a 60-degree dive.

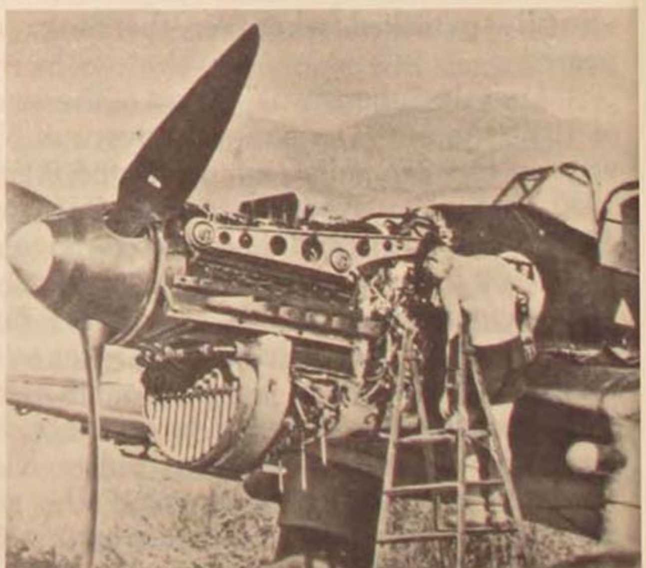
The Concept Tested

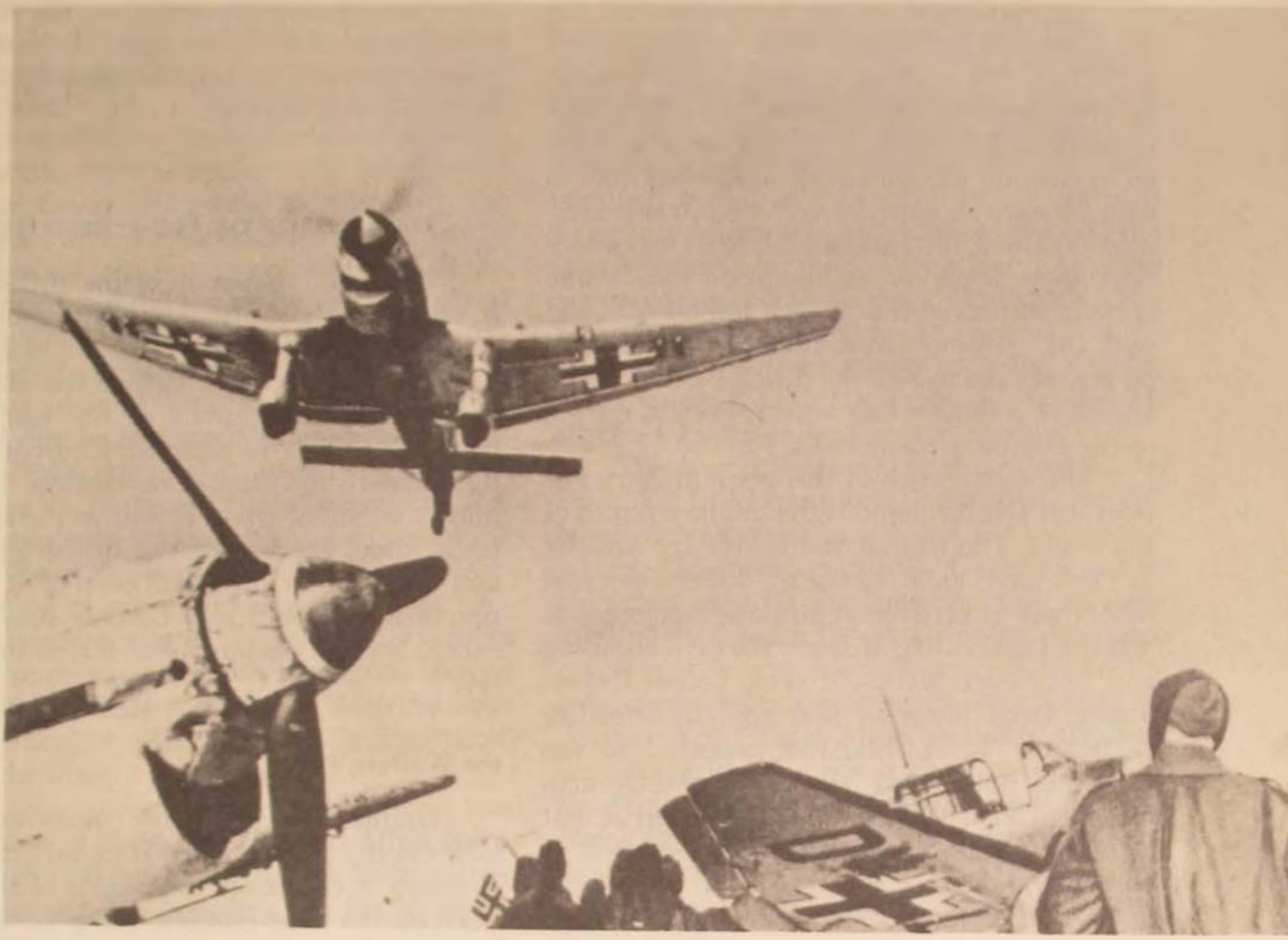
The Junkers 87 Stuka received first testing under battle conditions with the Legion Condor in Spain late in 1937 and performed brilliantly. But whether it could perform as well under other than "limited war" conditions remained for World War II to prove. One can all but hear its terrifying scream as it angles down and dive-bombs an isolated French tank.

The Stuka in flight . . .

in repose . . .

and grounded for engine repair.





A covey of Stukas when the bird was in its prime

A Stuka and Nazi tank clear the way for infantry.

A Polish train derailed by Stuka attack

Air opposition to the Luftwaffe was for the most part ineffectual. The French had not more than 600 modern aircraft, supplemented by approximately 160 bombers and 130 fighters from the Royal Air Force.[13] Against such limited opposition the Luftwaffe again was able to gain decisive air superiority. Once air superiority was gained, the Stuka added to its legendary reputation. It played an important role "in the demoralization of the French infantry,"[14] and with its extreme concentration of striking power, it "paralyzed the British and French armies to a degree that was a revelation even to the Germans themselves."[15]

The significance of this revolutionary aircraft was felt throughout the military forces of the world. The United States Military Attaché in Paris gave as a reason for France's defeat that "there is no French airplane designed, as was the Junkers 87, primarily for dive bombing and sea level tactics."[16] The noted United States Army historian and analyst Brigadier General S. L. A. Marshall reported to the American public that "the role of the German dive bomber had been roughly guessed at, but its accuracy and its efficiency as a destroyer of both morale and materials proved one of the great tactical surprises of the war."[17] Marshall closed his report with a warning of "the lengthened shadow of the airplane over the field of battle. . . . The battle is still the infantry, not infantry in the 1914–15 sense of the soldier who slogs along on foot, but infantry in its pristine meaning of 'the true servant.' For only he who makes good use of the weapons on the ground can achieve the final victory in the new age of warfare."[18] Another Marshall, the Chief of Staff of the United States Army in 1941, would not approve the Army Air Force's 84-group program until he could see "the successes of the Stuka reflected in these 84 Groups."[19] The dive bomber had come of age.

There was still one cause for concern. Until Dunkirk, air superiority had been maintained by the German fighters. However, as the British were evacuating the European continent (26 May–4 June 1940), Fighter Command of the Royal Air Force made its first major appearance in the war. At this time the Stuka met its first real air opposition, and its losses were heavy. Nevertheless, the sum total of the Stuka's accomplishments between 1 September 1939 and Dunkirk negated any concern over its future battles.

The Concept Re-examined

With the evacuation of the British forces at Dunkirk, the German High Command began preparations for the invasion of England. The first task was to defeat the Royal Air Force. The implications of the forthcoming battle were fully recognized. Churchill was of the opinion that "there was always the possibility that victory over Britain in the air would bring about the end of the British resistance, and that actual invasion, even if it became practicable, would also become unnecessary, except for the occupying of a defeated country."[20]

the Western Front

German aircraft were concentrated on bases in the area between Hamburg and Brest. Because of the range limitations of the Stuka, part of the dive-bomber force initially was withdrawn to Germany to rest and to be refitted for the actual invasion that would follow. Of the total force of 2600 aircraft assigned to defeat the Royal Air Force, only 280 were Stukas. Their limited radius of action restricted their use to only a small portion of the British Isles, but they could cover large areas of the English Channel.

While full-scale battles were being planned against the Royal Air Force, Stukas made harassing attacks against British shipping and ports. On 8 August one wave of 57 Stukas and another of 82 bombed convoys off the Isle of Wight.[21] A few flights were made against coastal targets, including airfields, but such efforts were on a small scale.

The initial phase of the primary attack started 10 August 1940. Here, for the first time, the Stuka encountered significant opposition. Its limited performance turned into a great drawback; with an externally suspended bomb load its speed in a dive was only 150 miles per hour. "At the required altitude for the dive, between 10,000 and 15,000 feet, these Stukas attracted Spitfires and Hurricanes as honey attracts flies."[22] The British pilots quickly realized that the Stukas were practically defenseless. The Me-109 attempting to fly escort could not slow down sufficiently to stay with the Stuka in its dive, so Stuka losses rose steadily.

Somehow, the lessons gained in the "limited" war in Spain did not apply to the Battle of Britain. The Stuka, which had previously proved itself as a tactical weapon in support of the Army, was of little value. According to Galland, "in the Battle of Britain it proved disastrous."[23] On 19 August 1940, less than ten days after the Battle of Britain had started, 220 of the remaining Stukas were pulled out of the battle. The Stuka had failed to play a role in the gaining of air superiority, and it had required huge escorts of fighters in its attacks against shipping; consequently, it was moved back as an ancillary of the army. With the army it had started its career and won its reputation, and to the army it was returned.

As its unsuccessful Battle of Britain was drawing to a close, the German High Command was making plans for the Balkan area. Forces were being concentrated for an attack on Greece. By March 1941, some 490 German aircraft were located in the Bulgarian-Romanian zone. Of this force 120 aircraft, or over 24 percent of the total, were Stukas. With the revolution in Belgrade and the unexpected resistance of Yugoslavia, an additional 600 aircraft, of which approximately 100 were Stukas, were brought in from the Western Front and the Mediterranean. Organized resistance in Yugoslavia was quickly broken, and the Stuka regained a part of its legend in attacks over Belgrade. Afterwards, support was given to the Greek campaign, and again the Luftwaffe never had more than weak opposition. The Stukas again were able to demonstrate the effectiveness they had shown in Spain, Poland, and France. By the latter part of April 1941, all Greece was under German control.

The next operation was to capture Crete. Some 530 Ju-52 transports, 150 Stukas, and 500 other aircraft were assembled for the undertaking. Air opposition to the Germans was so light that only 90 single-engine fighters were used in the battle. The small Royal Air Force contingent was quickly destroyed, while the local commander, surveying the attack from his open-cockpit "Tiger Moth" training airplane, was powerless.[24] Against such air opposition the Stuka did excellent work. Even the British Naval Commander, Admiral Andrew Cunningham, afterwards indicated that Crete could have been saved by two squadrons of long-range fighters.

Following the fall of Crete, a small force of Stukas was used against Malta. They took part in attacks against convoys trying to reach

The Stuka, which had served so effectively in Spain, Poland, and France where fighter opposition was negligible, was easy prey to the agile and plucky British Spitfire, seen here on the line at 1st Combat Crew Replacement Center, AAF Station 112, England.

that island, and on one occasion 40 dive bombers made attacks against the British aircraft carrier *Illustrious.* Losses were heavy but no definite results were achieved. Neither was Malta completely knocked out, and when additional fighter reinforcements were flown in, the dive-bomber attacks were called off.

In November 1941, the British opened their first offensive in North Africa. Here the Germans had an air strength of 190 aircraft, of which 70 were Stukas. Some 100 additional aircraft were brought in after the offensive started, and further assistance was given by 320 Italian aircraft. The Germans could not gain air superiority, and the Stukas lost heavily as a result. This was despite the fact that the British aircraft were largely second-hand equipment, with a considerable influx of various United States P-40 models, which could not live in the air in western Europe. The British offensive came to a halt at the end of their long supply lines, and from January to July 1942 the Axis launched two counteroffensives.

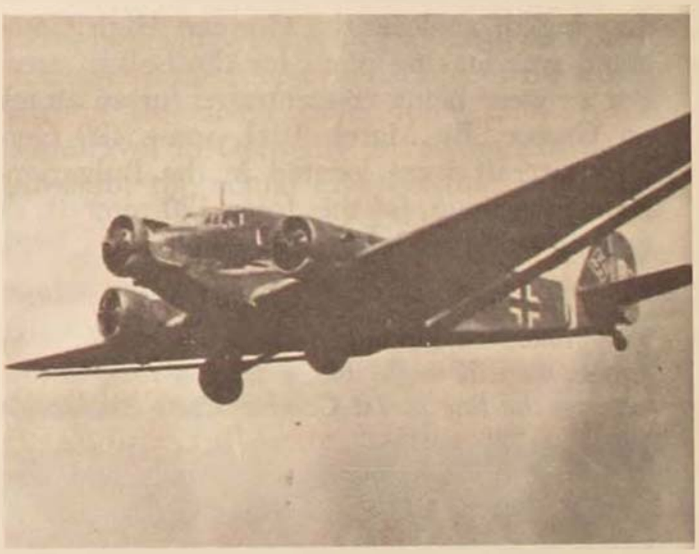
In May 1942, at the opening of the second counteroffensive, the Stukas averaged 100 sorties per day during the first week of operations. This was made possible by some aircraft averaging 2 to 3 sorties per day. However, losses were heavy, and the German armor advanced more rapidly than airfields could be built. The Luftwaffe in this campaign concentrated its attacks against British armored columns. These attacks were not decisive, and air superiority was not gained. In one day alone, 40 Stukas were shot down.[25] By November 1942 the dive-bomber forces had fallen to a strength of 30 aircraft.

In December 1942, with the Allied landings in North Africa, the Luftwaffe strength in the Mediterranean was increased by the transfer of units from Norway, Finland, the Russian front, and France. Of this increase of over 600 aircraft, approximately 55 were Stukas. German air forces operating in this theater were at a disadvantage, being outnumbered and with supply lines badly damaged. The air superiority of the Allies was never seriously threatened, except in isolated cases where the Germans concentrated their efforts. Such local air superiority as the Germans did enjoy was greatly aided by the United States military doctrine at the time, which gave a local army commander control of an air unit.

Again, as in the Battle of Britain, the Germans found that the use of the Stuka was impossible in the face of Allied air superiority. A Royal Air Force pilot flying an obsolete P-40 shot down four dive bombers on one mission; the pilot of a P-38, which had greater endurance than the P-40, shot down seven.[26] In the words of Major General O. A. Anderson, "We would make aces by the gross if we only had to kill a Stuka."[27] As Allied air superiority increased, the Stuka became more and more an operational liability until finally it faded from the theater.

the Eastern Front

In June 1941, with the Luftwaffe leading the assault, the German High Command launched an attack against the Soviet Union.



The Stuka was again successful in the lightly contested invasion of Crete, where it accompanied the Ju-52 transport (above) and other Luftwaffe aircraft. But in the North Africa campaign of 1941–42, Allied air superiority once more overpowered the Ju-87. Abandoned by the Germans during their North Africa retreat, the Stuka arouses more curiosity than fear.

The Luftwaffe, following classical doctrine, had as its first task the defeat of the Soviet Air Force. By virtue of the surprise attack, the Stuka was able to operate against Soviet airfields, communications, and troop concentrations. The width of the front affected all air operations. In the campaign against France and the Low Countries, the Luftwaffe had supported a relatively narrow front with approximately 3500 aircraft; now the same number were required to operate over a distance of 1000 miles, from the Baltic to the Black Sea.

The main offensive was against the central sector, in the vicinity of Moscow. Here were concentrated 1320 aircraft, of which 400 were Stukas.[28] This stripped other fronts, especially in the close-support aircraft category. With this concentration of power, the Luftwaffe was able to achieve local air superiority for a limited period, but by the time winter arrived the Germans had failed to achieve a decision. Air superiority gradually passed to the Russians, resulting in the inevitable heavy losses to the German dive-bomber units.

During the German Eastern offensive in July 1942, Stukas again were used to spearhead the ground advances. Once the Don River was crossed, the wide dispersal required of the Luftwaffe curtailed any high degree of close ground support. An exception was in the Stalingrad area, where Stukas often carried out four or five sorties per day. By September 1942, the Russian Air Force had general air superiority. By November the Luftwaffe could mass but a small defensive force of 70 to 80 aircraft to cover a front of some 300 miles in the Stalingrad zone. As the German offensive bogged down, heavy armament was put on a number of the Stukas, and they were formed into antitank units in an attempt to destroy Russian tanks breaking through the German lines.[29] However, the Luftwaffe was so overextended that innovations could not have any appreciable effect upon the overall battle.

The Luftwaffe showed a strength of 270 Stukas at the end of December 1942, in con-

trast to the 335 that had been in operational units on 1 September 1939. In direct support of troops on the battlefield, where modern artillery was used, the Stuka was becoming more and more vulnerable. When enemy aircraft were in the area, it could not be employed without exorbitant losses.

To replace the Stuka in the close-support role, hopes had been placed on the Hs-126 and the Me-210. The greatest hope had been placed on the latter, but in the opinion of Luftwaffe pilots this proved to be "the most unsatisfactory aircraft Germany ever built."[30] The result of these failures was retention of the Ju-87, which up to that time the Germans had planned to drop from their aircraft program. Therefore, in spite of the growing difficulties of the Stuka against any kind of opposition, either from the ground or in the air, production was continued.

By the late summer of 1943, the Luftwaffe High Command was beginning to realize that a policy of support for the German Army could not be continued in the face of Soviet air superiority. Ideally, the High Command would have preferred to pursue a strategic role and destroy industrial targets behind the Urals. This could not be done because the Luftwaffe was designed and trained for army cooperation. Insufficient time and resources and pressures on the various fronts prevented any alteration of its previous roles.

The Luftwaffe made a final effort to achieve local air superiority against the Soviets in June 1943, when 1000 first-line aircraft were concentrated for the Kursk offensive.[31] For a few days of the offensive, the Stukas flew as many as five or six missions per day. By July the Russians had gone to the counteroffensive and had regained general air superiority. With this, the Germans had no choice but to start their long and bitter retreat. From that point on, any appearance of the Stuka over a battlefield was an isolated and unusual occurrence.

Epilogue

Even with the eclipse of the Stuka, the German High Command still clung to its basic concept of the primacy of a ground support role for the Luftwaffe. During the North African campaign and later in the Russian campaign, units of Fw-190 fighters had been converted into bomb carriers for use on the battlefield. Such employment, without air superiority, was of little value. Nevertheless, Hitler could not abandon the idea of the dive bomber. In 1943, during a demonstration of the Me-262 jet fighter, the Führer stated:

> In the aircraft you present to me as a fighter plane I see the "Blitz Bomber," with which I will repel the invasion in its first and weakest phase. Regardless of the enemy's air umbrella it will strike the recently landed mass of material and troops creating panic, death and destruction.[32]

The Me-262 was no more decisive in a ground support role than the Stuka had been. Had it been employed by air leaders under an air concept, the results might have been different.

The diary of the famed commander of the Afrika Korps, Field Marshal Rommel, shows the changing pattern of the Luftwaffe's power. In May 1941, Rommel believed that "one thing

Once again in the Kursk offensive of June–July 1943 the Luftwaffe and Stuka seemed formidable, but by midsummer the Russians had gained air superiority.

The Henschel 126 (above) and Messerschmitt 210 (left) for a time replaced the Stuka, but neither was satisfactory and the Stuka was retained. The Me-210 was underpowered and soon gave way to the Me-410.

Luftwaffe superiority was a myth after late summer of 1943, and the Stuka became an increasingly rare sight, particularly in battle zone. This one, which landed at an advance Ninth Air Force base of the 67th Tactical Reconnaissance Group on 8 May 1945, was part of the exodus from Czechoslovakia ahead of the Russian sweep westward.

that worked very seriously against us was the fact that the Luftwaffe in Africa was not subordinate to the Afrika Korps."[33] Approximately one year later, in June 1942, Rommel was concerned with the fact that Kesselring, the Luftwaffe commander, could not prevent heavy losses of aircraft.[34] By September 1942 Rommel was not concerned with who controlled the Luftwaffe but with the idea that "anyone who has to fight, even with the most modern weapons, against an enemy in complete control of the air, fights like a savage against modern European troops, under the same handicaps and with the same chances of success."[35]

Later, when home on leave from the Normandy front in August 1944, Rommel discussed with his son Manfred the possibility of a future war with Russia on one side and America and Britain on the other. His son was of the opinion that the West would quickly lose, since "Russia's land forces are on an altogether different scale from those of the West." Rommel's answer was, "That isn't what will decide the issue. Have our better tanks and elite divisions in Normandy been of any avail? No, young man, the Americans have got command of the air and they'll keep it. That is a sentence of death for any land army, however, that has to fight without adequate air cover. . . ."[36]

With this as the testimony of the defeated German Army leader, who died in 1944, what lessons did the United States generals learn? Fortunately for American lives, but unfortunately for future thinking, American ground forces in Europe were never forced to fight with an enemy who had control of the air. Before the United States forces entered North Africa, the Luftwaffe had been virtually defeated. A few ineffectual blows by the German Air Force in its dying struggle gave apprehension to the generals who took air superiority for granted. The United States ground forces were without air opposition at Sicily, Italy, and throughout France and Germany, except for a few sporadic raids by a retreating Luftwaffe. The military fame of those generals in Europe rests on victories achieved under conditions of almost complete air superiority.

As the experience of Korea and Vietnam suggests, future conflicts probably will be as different from the current struggle as the present is from the past. But one with air experience in World War II cannot dispel a nagging sense of worry. Is it prudent to put so much emphasis on aerial weapons, designed not for air combat but for use against technologically inferior forces on the ground? Have we now reached the stage in warfare where Koreas and Vietnams will be repeated again and again, insofar as air control is concerned, and air superiority over the battlefield will continue to be ours without challenge?

Special Consultant, Department of State

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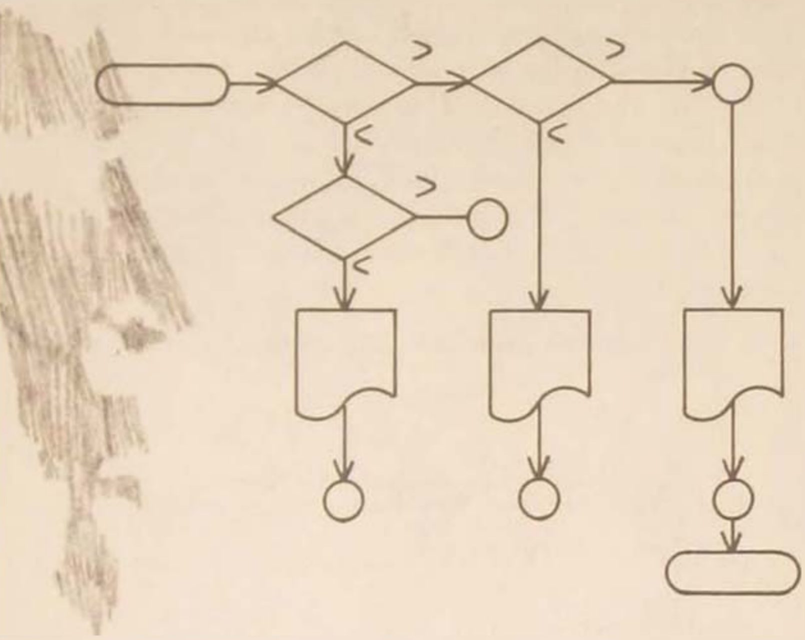


THE NEXT DECADE IN COMPUTER DEVELOPMENT

LIEUTENANT COLONEL JAMES E. HUGHES

WITHIN the next decade the computer will become an integrated part of day-to-day operations and management activities of the Air Force. The staff officer will be able to accomplish his job in close partnership with the computer. A common sight in a major command headquarters in the 1970's will be the staff officer sitting in front of a computer terminal, interacting with his program. He may be largely ignorant of the inner workings of the remotely located computer; he may not have laid out in detail the procedure for solving the problem he is addressing or even clearly formulated it. He will go through several or many steps of planning, formulating, calculating, evaluating—sometimes progressing, sometimes bogging down—before hitting upon a path that leads to a satisfactory result.

A logistics specialist may be using the computer system to determine the materials necessary to support a tactical squadron in Europe for 60 days and to schedule and order their shipment from diverse locations. At the same time a communications specialist may be attempting to construct a communications plan for a combined operation in the arctic. Simultaneously an intelligence specialist, starting with a set of observations of an enemy's actions, may be attempting to apply a multivariate technique of analysis to permit interpolation of unobserved actions leading to a prediction of the enemy's intent. Each is on-line with the computer in a dynamic interaction environment, controlling the progress of his program in a language congenial to him, that is, using essentially natural language syntax and a vocabulary pertinent to his problem. The machine is cycling through the various user programs, plus a background program to absorb time when the on-line users are idle.

This picture implies several characteristics of the computer system of the future:

- It is a generalized, user-oriented system. Consequently, it can handle a wide variety of different applications, yet using it is easy enough that a nonprogrammer can specify his own application with very little specialized training.
- It is an on-line, interactive, multi-access system. Users communicate directly with the system, the system responds rapidly and in understandable terms, and many users are served at once.
- It is a readily changed and extended system. It permits the user to change his application easily and permits the system programmer to extend the system itself by adding a new program or subsystem.
- It is a time-sharing system.
- It is an off-line, multiprogrammed, batch-processing system, for those operations that involve much computing and little user/system interaction.

While many present and past attempts to utilize the broad capabilities of the general-purpose computer in the direct support of command and control, planning, and resource management operations have been expensive disappointments, there is impressive evidence that the impending availability of relatively cheap logical power and the concurrent easing of presently difficult programming will make systems such as the one described technically and economically feasible. User-oriented processing systems in which the staff specialist is on-line with the computer, interacting in a conversational way with the operating program, will make it possible for computers to be used in direct support of human decision-making at all levels of Air Force operations.

It is interesting to examine the tasks in addition to arithmetic operations that are clearly relevant to the decision process that the digital computer is capable of performing:

information storage
collation and correlation of information
information display in various forms
simulation
extrapolation.

The value of the computer in carrying out these tasks is generally considered to lie in the speed with which it can process information and hence the large amount of information with which it can deal. This view tends to overlook the orders-of-magnitude advantage in speed of the computer over hand computation, the speed advantage making possible analytical approaches to decision-making that could never be undertaken by unaided humans.

Far from downgrading the staff officer, the computer will place a higher premium on his abilities. Intelligent and imaginative humans excel in setting goals, generating hypotheses, and selecting criteria. These are the problem-solving phases in which the guidelines are laid down, approaches chosen, and judgments exercised. This is the heuristic aspect of problem solving—the contribution of the user to the man/computer partnership. The computer's contribution is in the algorithmic aspect of problem solving—the ability to execute rapidly and very accurately procedures that have been defined explicitly and in detail. A computer system is only as valuable as the man using it. No data-processing system can by itself ensure efficient management or optimal decisions. Nor can it solve problems in tactics or strategy. It can only support such decision-making by accomplishing its tasks under the direction of a knowledgeable user.

For the military officer, decision-making may simply involve making a choice between two or more possible courses of action in response to a given set of facts. It is the function of the computer system to make certain that the appropriate facts are available in usable form when they are required. The complexity in such decision-making arises from the diversity of information that must be correlated or otherwise manipulated, in order to derive the requisite facts, and the unpredictability of the type and sequence of operations involved.

In another type of decision-making not involving such well-structured information processing, making the decision is more properly regarded as an extended process involving information retrieval, verification, hypothesis formation, and hypothesis testing. It can be thought of as a series of questions and answers which, if properly supported, converge on a single choice. There is considerable room for individual style in such a process, and the sequence of data acquisition and the formation and testing of the hypotheses will, of course, vary from occasion to occasion and from individual to individual. The process is highly dependent on the training and prior knowledge of the decision-maker, and it is imperative that he be kept in the problem-solving loop.

In a sense, every application of a computer is a simulation. Properly planned and understood, it can provide insights that would be costly to obtain by other means. The communications specialist attempting to construct a communications plan for combined operations in the arctic is in reality constructing models and testing them. He very likely will test several alternative system configurations, frequencies, etc., and the one he finally selects will be more than just feasible—it will be optimal by some criteria.

In the next decade, economical, large, on-line, user-oriented computer systems for the direct support of command and management will have an important by-product in the facilities and resources for simulation and war-gaming on a vast scale made available to the professional military man. The need for special groups and organizations whose sole mission is to apply those analytical techniques that must substitute for experience in military matters will lessen if not entirely disappear. With proper planning, simulation and war-gaming can be meshed with the day-to-day operations and become an important function of the organization.

The digital computer and automatic data processing are today inextricably woven into Air Force operations and management, but the computer enters hardly at all into the day-to-day operations of the staff officer. With the advent of direct support systems and on-line computer operation, however, practically all staff personnel will require a working familiarity with computers and data-processing techniques. A very powerful tool will be put in the hands of the Air Force officer. Just how powerful that tool will be will depend on the degree of sophistication he develops in its use.

Continuing the analysis series that appeared in the January-February and March-April issues, *Air University Review* now presents this article by Colonel Hughes and the succeeding one by Dr. Fraser on reliability analysis.

Today, high programming costs and programming lead times pose a serious threat to future electronic data processing (EDP) applications in the Air Force. While the price for a unit of computational power has decreased a hundredfold over the past decade, the cost of designing and installing equipment, writing and maintaining programs, and training personnel has risen. Programming represents a major portion of system costs, and for many applications it exceeds the cost of the hardware. Equally as costly and time consuming is the reprogramming required as a result of changing workloads and operational procedures. However, in the large systems, many of the activities now considered a part of the programming process might more properly be considered operations research chargeable to general overhead. The intensive examination of the organization's goals, functions, and operational procedures that is required in order to effectively apply automation usually provides a payoff that is independent of questions of automation itself.

The programming process is widely misunderstood. Only a small part of the programming process (and the cost) is involved with actually writing routines for the computer, that is, with "programming the problem."

There are many stages in the preparation of a problem for solution by a computer. First, the problem must be analyzed. This is largely an intellectual activity involving study of the situation surrounding the problem and of the problem itself. Only after the analyst understands the problem does he attempt to describe it to the professional programmer, who understands such languages as Fortran, Jovial, etc. There is usually an extended dialogue between the man with the problem (the analyst) and the programmer. The analyst is seldom able to answer all the questions which the programmer asks.

Eventually the programmer understands the problem well enough to start constructing an outline for its solution. As the programmer formulates his ideas for handling the problem, he constructs flow charts to depict graphically the flow of information as it will take place in the machine. Gradually, as he works out the details of the flow charts, questions usually arise which require extensive interaction with the analyst. Finally the programmer is ready to encode in some language a set of statements collectively conveying to the machine the intent of his flow charts.

This is the first point in the overall programming process at which the programmer uses a language for communication to the machine. Heretofore, his dialogue has been with himself or the analyst. The programmer now may write short sections of the routine for the purpose of testing mathematical techniques or other ideas that he wishes to exploit. At this point he needs access to a machine in order to run test cases on the small detailed issues. Gradually he builds up larger and larger segments of a routine which will implement his original flow charts. Because of the complexity inherent in a large problem, more than likely he will test pieces of his routine by running selected test cases on the machine. It should be noted that he may have to write special routines which will not be part of the final problem-solving routine but which serve only to exercise the selected parts that he is trying to check out or debug.

Finally, he gets the whole routine assembled and can run larger test cases, and, ultimately, he can produce genuine answers. It may turn out that the answers are incorrect because (1) the analyst did not understand the original problem sufficiently well or correctly, or (2) the analyst failed to communicate some essential detail to the programmer, or (3) the programmer overlooked some detail in his flow charting or in writing the routine, or (4) the mathematical techniques were not adequate for the situation. So the dialogue may start over again—at the beginning or at some intermediate stage.

Thus in this process, where cost is measured not only in money but in time to implement a system, limitations on operational capability in response to the requirement, and inflexibility of response to changes in requirements, the high cost of programming is attributable to (1) lack of methodology for systems analysis, (2) the communication problem, and (3) technological problems inherent in computer design. Today conceptual tools for analyzing management information needs and for devising information systems are virtually nonexistent. There is no way to estimate with precision the real current and future information needs of an organization.

For the military organization, a satisfactory solution can only be found through a complete overhaul of current notions of computer design, programming, and operation. The military organization needs to enhance its information-processing systems by improving the ease with which the system can be understood and applied by the user; by minimizing the size of the first steps required in introducing automatic data processing; and by increasing the system's versatility and extendability so that it can be applied rapidly to new situations. Fortunately, selective development and integration of technologies now in the laboratories can provide such improvements.

Let us look at the technological developments in software and hardware that will be the building blocks for the computer systems of the next decade.

software

The existence of programming systems is fundamental to efficient use of electronic data-processing equipment. The user is seldom a professional programmer. The user is more likely to be a military man, manager, or engineer interested in using the computer as a tool in his principal job. The computer can be placed at his disposal through the use of a programming system, often called software. The programming system or software consists of a program which can be used for building, controlling, and modifying the complex sequence of problem-solving procedures required in sophisticated computer applications. It has been said that software is to the computer what education is to the child.

No analysis in depth of programming systems has ever been conducted, but a recent survey found it useful to group them into six categories:

• *General-purpose programming and executive systems* address those interfacing problems which occur between system programs and user programs. They attempt to provide linkages between system and user programs without reference to specific systems or users. Generalized programming techniques attempt to anticipate the numerous housekeeping functions required by complex program configurations regardless of the content of particular programs. Generalized programming techniques endow computers with great power, flexibility, and generality by providing them with programs capable of manipulating other programs in the same way that more conventional programs manipulate data.

• *Functional systems* are those which have been designed to perform a large and complicated but nonetheless well-delineated job function, i.e., information retrieval. The ultimate criterion for design decisions is whether or not a particular alternative will contribute to the performance of the system in that function which it would exercise more than any other.

• *Man/machine interface systems* concentrate on the enhancement of man/machine communication through the development of various types of response techniques. Systems in this category contribute to man/machine interface techniques either by introducing a new dimension along which communication can occur or else by developing new techniques for improving the communication along familiar dimensions. In these systems the designer has in mind a wide class of users operating in a broad spectrum of problem areas. Thus, the techniques introduced are quite general in nature and of wide potential use.

• *Special-purpose problem-oriented languages* illustrate an approach to problem solving which gains in flexibility and ease of use precisely because the problem areas addressed are extremely narrow and highly specific. The fact that the problem area is highly constrained, coupled with the willingness on the part of the designer to sacrifice generality for the sake of ease of use by the problem solver, enables designers of problem-oriented language systems to provide extremely satisfactory tools for specific classes of users. It is not surprising that, in light of the extreme specificity of each problem-oriented language, there is little or no carry-over from one problem class to another.

• *Time-sharing systems* make a computing facility available to a multiplicity of users simultaneously. The notion of time-sharing permits the combination of maximum throughput with a tight coupling between the user and his programmed process. In a time-sharing system, a number of consoles are available to users, and each user interacts with his program at his own pace, the machine cycling through the various programs—possibly including a background program that absorbs time when all on-line users are idle. Time-sharing systems have been built with widely different properties and features, and the determination of the most suitable set of features for a system must be made without regard to whether or not the system will be made to time-share.

Among the major concerns of the time-sharing designer are the development of proper algorithms for scheduling, the development of routines capable of restoring programs interrupted at some prior stage to their proper place in the computer upon being recalled by the user, the development of sufficiently sophisticated executive routines to minimize the time delay experienced by the user between his input and the system's response. Thus, the time-sharing designer is concerned with generalization of his computer in the sense in which it is available to a large number of users simultaneously.

• *Generalized data management systems* represent an approach to software development that can best be described as generalizations of the preceding points of view. The designers of generalized data management systems attempt to construct within the confines of one computer system environment programs which incorporate the sophistication and power of general-purpose executive routines, the job specific concentration exhibited by the functional systems, the flexibility and power of user on-line systems, the narrow-band specificity of problem-oriented languages, and, to some extent, the specific sense of generality implied by time-sharing.

hardware

Memories are the pacing item in present-day computer systems, both economically and functionally. Future developments in storage techniques will have a greater influence on computer design than any other single factor.

The speed of today's computers is limited by the speed of memory access because the speed of the associated electronics can be made substantially greater than presently available memories. Magnetic film memories promise a notable step in computer memory development. It is estimated that very compact magnetic film memories with access times in the 100-nanosecond (.0000001 second) range, costing less than half a cent per bit, can be available in the next decade. This technology will support development of very large-capacity memories.

The outlook for auxiliary memories is a less happy one. The speed at which memory can be accessed paces the entire processing operation, and memory access time is the overriding concern in the design of an information store for the central processor. Speed, however, is expensive and will remain so. For large bulk storage it will be necessary to resort to auxiliary memories, and it is expected that the orders-of-magnitude discrepancy between retrieval times associated with internal and auxiliary memories will be alleviated to some extent; but no completely satisfactory solution to this problem can be foreseen at this time. Over the next ten years the problem of matching large data bases to fast processors will very likely continue to stretch the ingenuity of the system designer.

Microcircuit technology, an extension of the semiconductor art, will have a major impact on computers. Microcircuits are not new devices or new circuit techniques. The revolutionary factor is size. Potential factors are reduced cost, increased reliability, and increased performance. Within ten years we can expect to see extensive applications of digital computers and complex digital processing where today's cost and size constraints are prohibitive.

Advances in display technology per se will have primarily an economic impact on data-processing system development. The more recent advances in display devices, particularly dynamic displays, have been achieved primarily through the availability of cheaper buffer memory and digital control logic. It is expected that the same sorts of cheap logic and memory that spur the availability of digital computers will also provide improved, cheaper displays. Displays having the following properties will find use in future systems:

• Individually operated visual displays providing a rapid and dynamic means for the computer to generate lines, points, characters in format, and position determined by the computer program and the user

• Pointing devices, such as the light pen, to allow the user precise and flexible feedback to the computer

• Keyboard and handprinting or writing devices to permit flexible, rapid entry of words, definitions, and instructions

• Page printing devices to provide hard copy for operator use and for distribution away from the machine, capable of reproducing anything that the operator can request and view on the visual display

• Page reading devices, the converse of the page printing devices, giving the automatic machinery the ability to read the same material as the user without heavy transcription penalty.

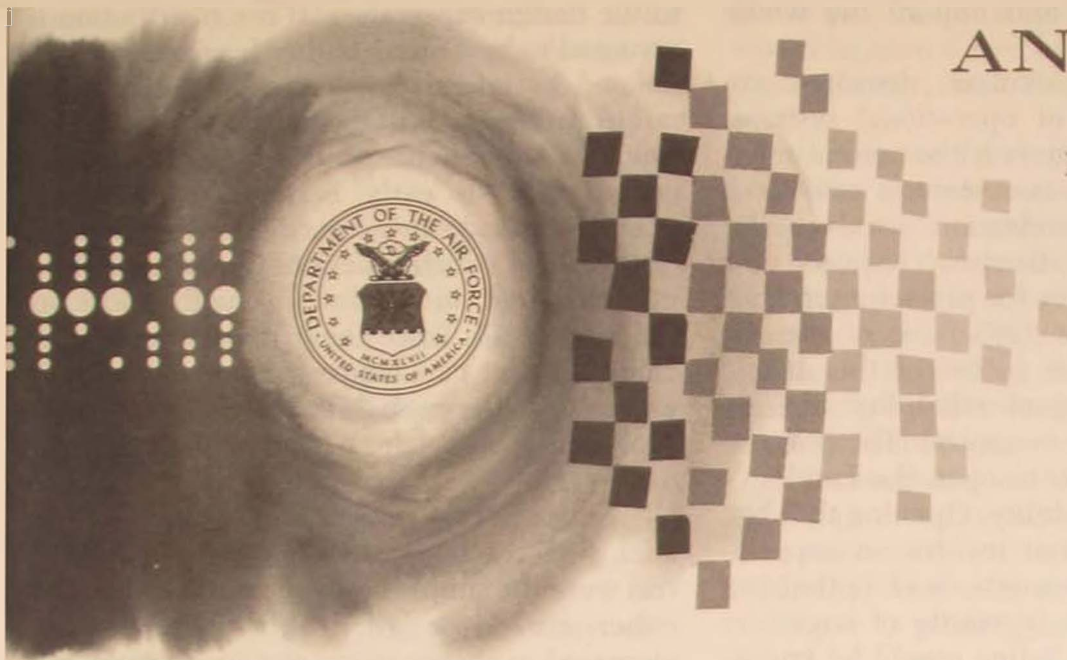
To SUMMARIZE, hardware development of magnetic film devices and integrated circuitry promises to make available greatly increased memory and information-processing capacity at a moderate cost. Experimental programming systems are now being used that have solved many programming problems by simplifying procedures for defining data and parameters, creating and displaying files, allocating storage, monitoring execution of programs, and facilitating solutions of particular classes of problems through special problem-oriented languages. However, the programming techniques have not, for the most part, been reduced to practice in the sense that they are available to machine configurations different from those for which they were developed. They have been developed independently, and no attempt has been made to integrate them.

The mere accumulation of a large number of these programming aids within a single machine complex provides no solution: accumulation in a nonsystematic, nonintegrated fashion would soon overload any machine. The technological challenge of the next decade is the extension, refinement, and integration of these techniques into systems capable of providing efficient support to users working on real problems of a substantive nature.

Hq Air Force Systems Command

RELIABILITY ANALYSIS

Dr. James A. Fraser



High reliability, like so many goods things, carries a price tag—if it's not dollars, it's time, or weight, or space. The high cost of reliability forces us to be selective in our applications of high reliability. We cannot afford to spread the sweet icing of reliability over the entire cake. We must reserve it for the most critical components and systems, so there is an increasing need for analysis of the trade-offs of reliability, dollar-cost, time, weight, and space. Unfortunately, all of these characteristics have limitations in today's weapon systems. In the past our designers had the luxury of unlimited weight, or space—as in the design of bridges. No one criticized the bridge designer so long as the bridge was safe. If there was a little more steel than was required to do the job, few criticized—few even knew about it! The bridge was a good bridge. But not so in the missile or space vehicle of today. *The analysis of trade-offs must provide us with the precise balance of reliability with weight, cost and other factors for every component of our modern weapon systems.*

—Maj. Gen. Gerald F. Keeling, DCS/Procurement and Production, Air Force Systems Command

When failure of a system would be catastrophic, reliability which approaches 100 percent is a mandatory requirement. Space systems designed for long-term operation without repair or replacement of failed subsystems are one example, provided, of course, that the space system is sufficiently important. Most manned space operations qualify: they carry not only men but also the national prestige of the United States and perhaps of the free world. Aircraft on long-mission airborne alert qualify. The power supplies and the gyroscope subsystem of ballistic missiles qualify, as they frequently must operate continuously without failure for very extended times. Fuze systems for nuclear weapons qualify because, even when their operating time is short, their failure could negate counterforce strategy and imperil the whole free world.

In weapons employment, decisions are based upon analysis of operational systems. One factor in this analysis is the system reliability. Its accurate measurement is critical to the analysis. Its optimization involves the magnitude of force structure required for preservation of peace or for prevailing in war. In September–October 1965 issue of the *Air University Review*, the author of this article discussed the meaning of reliability and explained how it can be measured. The purpose of the present article is to open the Pandora's box of optimizing reliability. Opening that box does not and should not involve an encyclopedic listing of all the methods of optimizing reliability. In fact, the ingenuity of engineers is so great that such a listing would be impossible. Instead, only one method will be explained, analyzed, and discussed. This method is redundancy.

The word "redundancy" designates a design method whereby increased reliability is achieved by using more than the minimum required number of functionally identical components in a subsystem or system. It also requires consideration of the ways in which the extra components are combined.

The principles of analysis will be illustrated by a fuze in an armament subsystem. A fuze may perform in one of four ways with respect to time of operation. First, it may perform properly, according to the desires of the design engineer. It may perform too early. It may perform too late. Finally, it may fail to perform at all and be a dud. At first glance, these categories seem to be mutually exclusive, but they are not unless further definition is made. A fuze need not operate at a precise location relative to the target in order to be called a "proper." It is not possible to build a supply of fuzes that are identical in every respect. Guidance systems vary. Operating conditions vary. These and other variables produce a distribution or dispersion of fuzing positions. The dispersion is normally taken into account when the fuze system is designed. Thus we may say that a fuze is a proper if the distribution of its fuzing positions corresponds to the design expectancy. If the distribution is assumed to be Gaussian, then a proper may be defined as one that operates within plus or minus three standard deviations of the desired point of operations. If this definition is accepted, then an "early" is simply a fuze which operates at a point preceding this range. A "late" is one which functions at a point following this range, and a "dud" is one that does not function at all. Since these four categories include all that can happen, the probability of an early + the probability of a proper + the probability of a late + the probability of a dud = 1.

Suppose two fuzes are connected in parallel, with the hope of increasing reliability. If this were the simple case where the component either worked or failed, reliability would be increased as shown in my previous article; but, since four things can happen, the analysis is more complicated. Let P be the probability of a proper for each fuze;

E – the probability of an early
L – the probability of a late
D – the probability of a dud.

With a two-fuze redundant system, earlies could result if:

(1) both functioned early

(2) one was an early and one a proper (2 ways for this to happen)

(3) one was an early and one a dud (2 ways for this to happen)

(4) one was an early and one a late (2 ways for this to happen).

That is, the probability of the system functioning early is:

$$
\begin{aligned}
& E^2 + 2EP + 2ED + 2EL \\
&= E(E + 2P + 2D + 2L) \\
&= E(1 + P + D + L), \text{ since } E + P + D + L = 1 \\
&= E(1 + 1 - E), \text{ since } P + D + L = 1 - E \\
&= E(2 - E). \text{ Note: } (2 - E) \text{ is always greater than 1 because } E \text{ is always a fraction.}
\end{aligned}
$$

Now compare this with E, the probability of an early, when there is one fuze. Since the factor $(2 - E)$ is always greater than 1, the parallel redundant fuze system *always* increases the probability of earlies.

Next we shall analyze the probability of propers. The system would operate properly if:

(1) both fuzes operated properly

(2) one was a proper and one a dud (2 ways for this to happen)

(3) one was a proper and one was a late (2 ways for this to happen).

Thus, the probability of the system operating properly is:

$$P^2 + 2PD + 2PL = P(P + 2D + 2L)$$
$$= P(1 - E + D + L),$$
$$\text{since } P + D + L = 1 - E.$$

Compare this with P, the probability of a proper when *one* fuze is used, and the results are surprising. Reliability may be increased, unchanged, or decreased depending upon magnitude of E, D, and L.

Continuing the analysis, we now examine the probability of a late in the redundant system. Late system operation could occur if:

(1) both fuzes were late

(2) one fuze was a late and one a dud (2 ways for this to happen).

Thus, the probability of the system operating late is:

$$L^2 + 2DL = L(L + 2D).$$

Hence, in most practical systems, parallel redundancy will decrease the probability of lates. In the rare case where dud probability was sufficiently high to make the factor $(L + 2D)$ greater than one, parallel redundancy would increase the probability of lates.

Finally, examination of dud probability shows that the only way the parallel redundant system can result in a dud is for both fuzes to dud. Thus:

$$\text{Probability of system dud} = D^2.$$

This means that parallel redundancy *always* decreases the probability of duds.

The surprise in this analysis is that if reliability is understood to mean the percentage of propers obtained, the use of two fuzes in parallel may actually reduce reliability. This, of course, raises a question regarding what would happen if two fuzes were used in series. Consequently, this design will be analyzed next.

If the two fuzes are connected in series, both must operate to cause a detonation. Thus, earlies can occur only if both fuzes are early.

Hence, the probability of the system's functioning early equals E^2. When this is compared with E, the probability of an early with one fuze, it is clear that the two-fuze series design *always decreases* the probability of the system's functioning early.

Turning now to the most important analysis, the probability of propers, it is evident that the system will function properly if:

(1) both fuzes are proper

(2) one is proper and one early (2 ways for this to happen).

Thus, the probability of proper is:

$$P^2 + 2PE$$
$$= P(P + 2E)$$
$$= P(1 + E - D - L),$$
$$\text{since } P + E = 1 - D - L.$$

Hence, two fuzes in series *may* increase the incidence of proper, or *may* leave it unchanged, or may decrease it, depending on the relationship between E, D, and L.

The system will operate late if:

(1) both fuzes are late

(2) one is early and one late (2 ways for this to happen)

(3) one is proper and one is late (2 ways for this to happen).

Thus, the probability of the system operating late is:

$$L^2 + 2EL + 2PL$$
$$= L(L + 2E + 2P)$$
$$= L(L + 2 - 2L - 2D), \text{ since } 2E + 2P = 2 - 2(L + D)$$
$$= L(2 - L - 2D).$$

Hence, series operation of two fuzes in all practical systems will always increase the probability of lates. The only exception is the unlikely case where the probability of single-fuze late operation plus twice the probability of single-fuze dud is equal to or greater than 1.

The series system will be a dud if:

(1) both fuzes are duds

(2) one fuze is early and one a dud (2 ways for this to happen)

(3) one fuze is proper and one a dud (2 ways for this to happen)

(4) one fuze is late and one a dud (2 ways for this to happen).

Thus, probability of system dud is:

$$D^2 + 2ED + 2PD + 2LD$$
$$= D(D + 2E + 2P + 2L)$$
$$= D(1 + E + P + L),$$
$$\text{since } E + P + L + D = 1.$$

This means that series operation always increases the probability of a dud.

The next thing to consider is the question of which arrangement is best:

(1) one fuze

(2) two fuzes in parallel

(3) two fuzes in series.

The answer is not clean-cut: It depends upon the relative values of E, P, L, and D. Reliability of the system will be improved only when the probability of propers is improved. In series operation, the system probability of propers is increased only if E is *greater* than the sum of D and L. In parallel operation, system probability of propers is increased only if E is *less* than the sum of D and L. If E is equal to the sum of D and L, a single fuze would be just as reliable as two fuzes.

This, of course, leaves the system designer in some difficulty. He cannot know what is best, unless he has knowledge gained from past experience regarding the frequency distribution of earlies, propers, lates, and duds. If this frequency distribution can be found only by flying many fuzes under battle conditions, engineering judgment will have to substitute for test information.

Fortunately, there are other alternatives. First, frequency distributions from simulated battle conditions may give a sufficiently good approximation of what will actually occur in battle. However, countermeasure activity by the enemy may cause duds, earlies, and lates that could not be accounted for in predesign estimates. Thus, the true frequency distribution may never be known. If this is the expected situation, the type of failure analysis illustrated above can be continued to consider three, four, or more fuzes; or redundancy can be abandoned in favor of some other method for improving reliability. At any rate, it is amply clear that an analysis based upon how a system may fail is very necessary *before* a designer makes decisions regarding redundancy.

Since the major theme of this article is optimizing reliability through redundancy, it is now appropriate to analyze other methods of applying redundancy. Let us consider a two-component type of redundancy where only one component operates and the other is activated by a switch, if the first component fails. This can be called "standby" redundancy and can be analyzed by comparing it with the usual parallel two-component redundancy.

Standby redundancy can be illustrated with two amplifiers in parallel but with only amplifier A operating at first. When A fails, a decision device triggers a switch, which in turn activates amplifier B. This system appears to have advantages in that amplifier B is not wearing out due to operation until after amplifier A fails. Indeed, this is so, but there is more to it. Let us analyze the system by looking for modes of successful operation rather than failure modes, as was done in the fuze example.

The system will be a success up to a specified time, T, if:

(1) amplifier A operates successfully until time T *and* the switching device does not make a false decision until time T, or

(2) amplifier A fails at time T *and* the switching device operates properly, thus substituting amplifier B for A *and* amplifier B operates properly, or

(3) amplifier A operates correctly and is continuing to operate correctly when the switching device gives a false signal; however, amplifier B is switched in properly and operates properly until time T.

The probabilities associated with each of these successful modes of operation could now be analyzed in much the same manner we employed with the fuze example. However, this has already been done very well by Nathan

Lichter and Gilbert Friedenreich.[1] Some of their conclusions are as follows:

(1) The terms involving the time at which the switching device makes a false decision drop out of the equation. This indicates that the reliability of a standby redundant system with two identical channels is independent of the time at which the switching device makes a false decision.

(2) The reliability of the standby redundant system will never be less than that of a single channel.

(3) For standby redundancy to be more reliable than theoretical independent active redundancy, the probability of successful switch-over must be greater than the reliability of an individual channel.

Thus, the intuitive expectation of increased reliability from the fact that the standby amplifier is not wearing out is revealed by analysis to be possible but not certain. The critical factor turns out to be the probability of successful switch-over.

Other factors in this analysis include:

(1) The fact that the employment of active redundancy may reduce the failure rate of both amplifiers because of load sharing.

(2) The fact that failure of the amplifiers may occur through short circuits or through open circuits.

Readers interested in the details of these analyses are referred to the Lichter-Friedenreich article. Enough has been said to illustrate the fact that sometimes analysis of a system from the standpoint of successful modes of operation is a necessary prelude to redundancy design decisions.

Still another reliability analysis available in the recent literature is that by Muth.[2] His analysis is particularly pertinent to this presentation because it discusses what appears to be an excellent method of improving reliability when failure would be catastrophic. The idea is the obvious one of having spare parts immediately available so that repair can be made quickly if failure occurs. Muth's analysis shows that the benefit of repair capability can vary from being negligible to being comparable to that of additional standby units, depending upon the failure rate of the component part and the mean time to repair of a part that has failed.

Thus, the analysis indicates that if a system must operate continuously without failure, very long mean times to failure for the component parts are required. Further, it shows that the ability to make repairs is not necessarily sufficient to prevent catastrophe to the system. It all depends upon how often the system is likely to fail and the speed with which repair can be accomplished.

In conclusion, when very high reliability of a system is required and redundancy is proposed as a design method for obtaining the goal, it is necessary to analyze the proposed system in detail. Depending upon the mode of failure, or the mode of success, the effect on reliability may be quite different from the obvious expectation of increase.

Warfare Systems School

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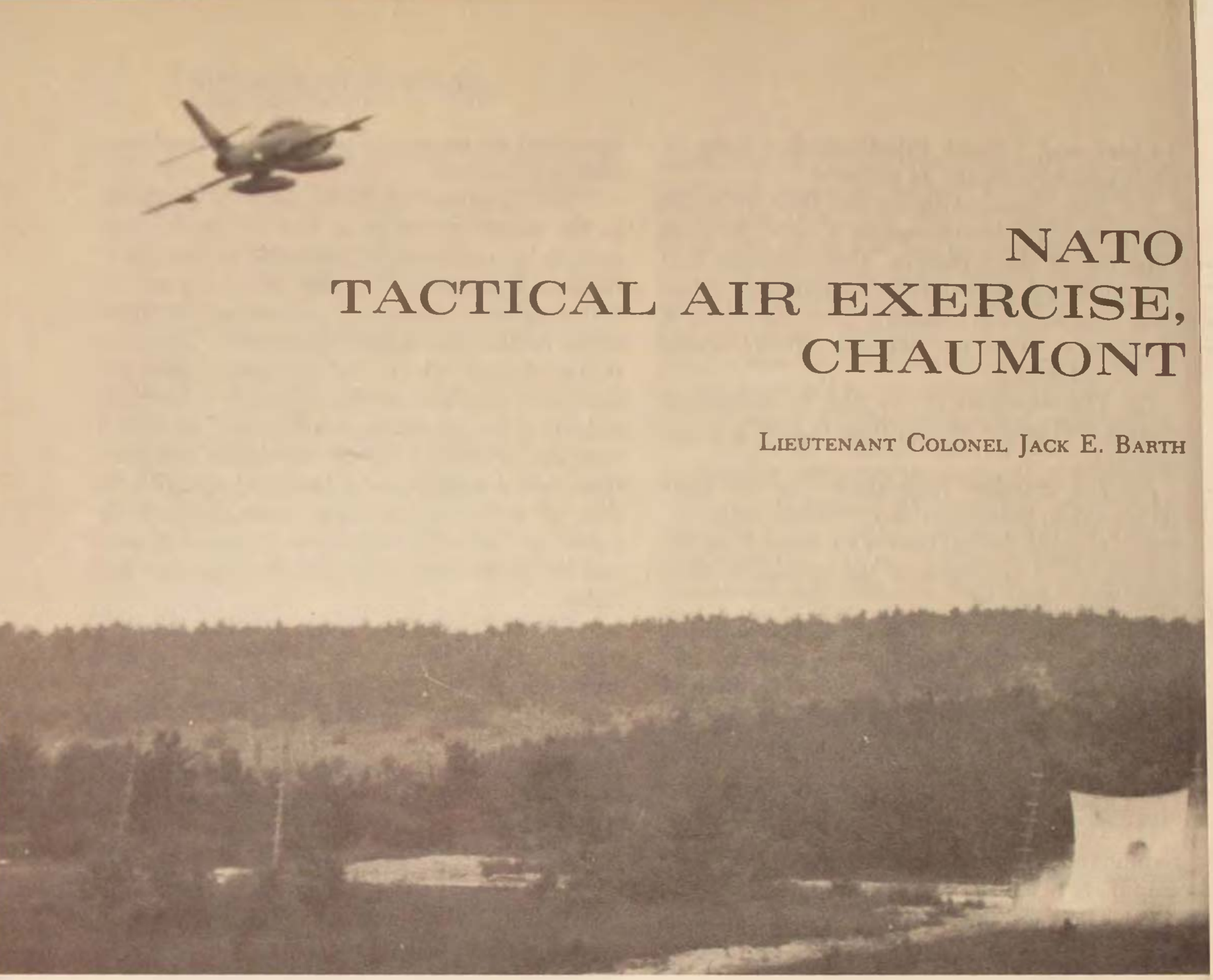


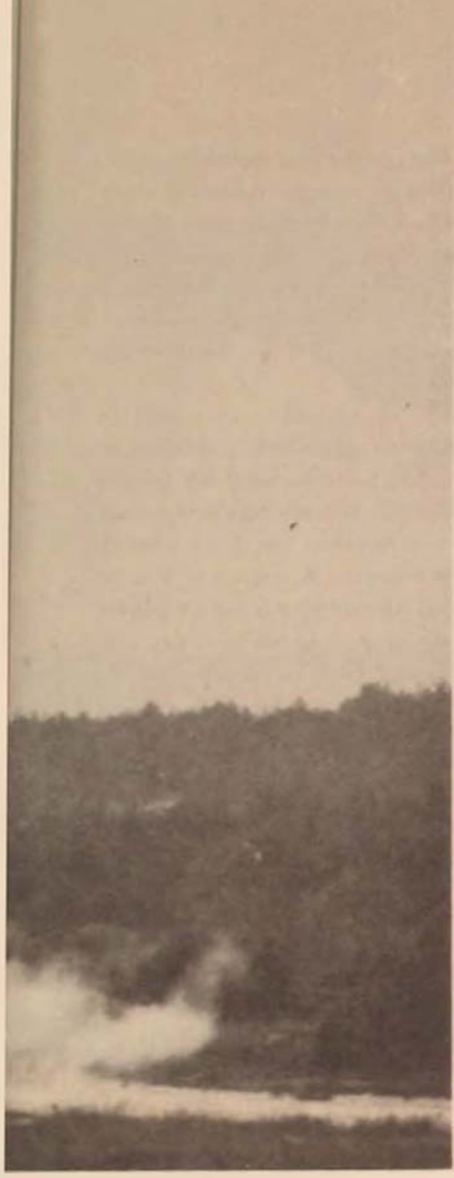
NATO TACTICAL AIR EXERCISE, CHAUMONT

LIEUTENANT COLONEL JACK E. BARTH

IN June 1965, near the medieval city of Chaumont, France, jet pilots, their mechanics, and ground crews from seven NATO nations gathered to compete in the largest tactical air exercise of the year. For two weeks Chaumont Air Base, a U.S. Air Force "dispersed operating base" that normally functions with a minimum of assigned personnel, was a "beehive" of activity.

As in the past, the top scoring team would be awarded the coveted Broadhurst Trophy. Named in honor of a former commander of Allied Air Forces Central Europe, Sir Harry Broadhurst, the trophy was presented for the first time in 1962. Since then one of AIRCENT's two major subcommands, the Fourth Allied Tactical Air Force with headquarters at Ramstein Air Base, Germany, has won each of the competitive tactical events.

General chairman of 1965's weapons meet, Air Commodore E. B. Hale, RCAF, Chief of Plans and Policy, AIRCENT, and Colonel Rufus Causey, USAF, Commander, Chaumont Air Base, welcomed the NATO aircrews and international officials on opening day. Immediately after the welcoming, jet mechanics and other maintenance specialists prepared aircraft of the seven nations for their low-level familiarization flights to Suippes Range. The range, located near Reims, was partially manned by Chaumont's permanent range specialists, along with judges and NATO officials from as far away as Italy and Norway.



A salute to the colors of the seven nations of AIRCENT, NATO's largest air arm, assembled at Chaumont for the 1965 tactical air weapons competition for the Broadhurst Trophy

Fourth Allied Tactical Air Force team captain, Wing Commander W. H. Bliss, RCAF, accepts Broadhurst Trophy from General Jean Crépin, Commander, Allied Forces Central Europe.

During the two-week meet almost all aircraft, vehicles, and buildings at Chaumont sported the red bee.

Skilled jet crews from Belgium, Canada, France, Germany, the Netherlands, the United Kingdom, and the United States were on hand to fly daily competition in skip bombing, rocketry, and strafing. More than 250 ground specialists backed up the flight teams, which flew F-105's, F-104's, Canberras, F-100's, and F-84's. Only one spare aircraft was available to each of the seven countries competing, which made round-the-clock maintenance essential to meet the tight scheduling of continuous low-level sorties. Not one aircraft failed to make its take-off time during the entire two-week period.

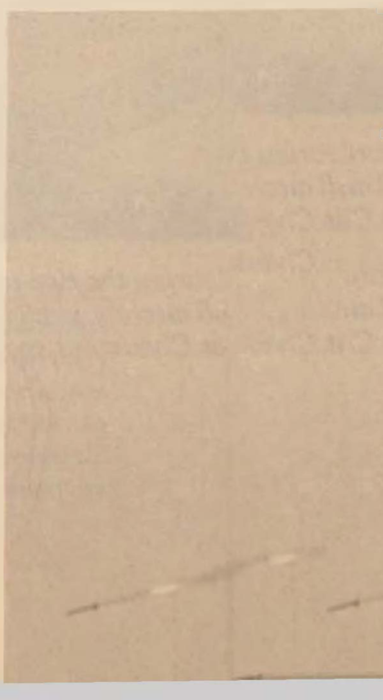
When military professionals get together to test their skills on a daily basis, stringent flight requirements create considerable stress. The usual—or unusual—bit of humor tends to relieve the strain. Among others, the bright red humble bees helped by being there. We couldn't feel their sting or hear them scatter from the hives, but everyone at Chaumont felt their presence. The bees were painted or stenciled on just about every vehicle, building, and aircraft in sight. Ground crews from Royal Air Force Squadron Number 213, based at RAF Bruggen, Germany, moved about the base at night with large buckets of red paint, an assortment of paint brushes, and fluorescent decals. In the pinch, it was the red bee that gave everyone a little laugh and relieved the tension.

During the first week of the annual meet, 16 aircrews from AIRCENT's major subcommands, Second and Fourth Allied Tactical Air Forces, competed daily with each other. These first aircrews were then replaced by 16 additional teams. The weekly rotation afforded opportunity for a larger number of NATO crews to improve their low-level skip-bombing, strafing, and rocketry techniques.

Air Chief Marshal Sir Edmund Hudleston, AIRCENT commander, had initially stressed that crew safety was of paramount importance. Tight scheduling moved out sorties every few minutes during the day, so that detailed coordination between the tower operators, operations training personnel, and range supervisors was vital not only for safety of flight but also for development of maximum combat training proficiency.

One didn't need an alarm clock at Chaumont. The runup of jet engines commenced each morning at six o'clock, and since the barracks were located within a few hundred

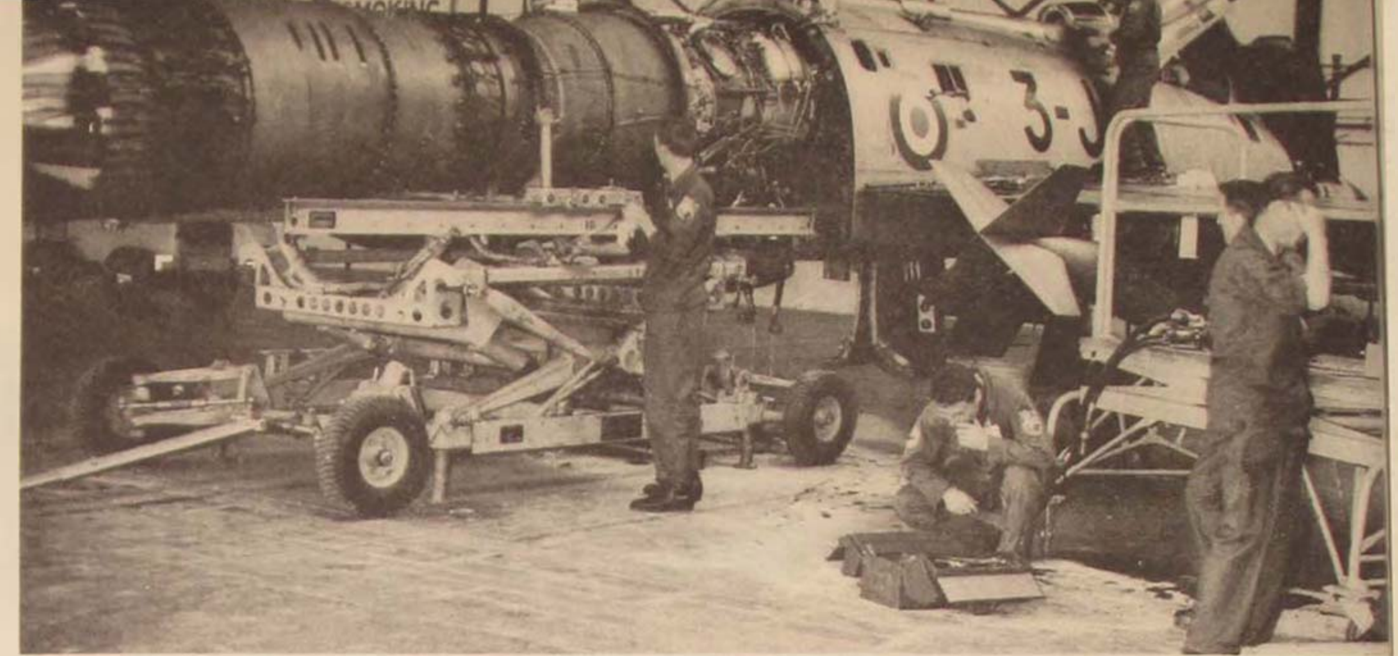
French military commanders of the Chaumont area keep up with progress of the weapons meet.



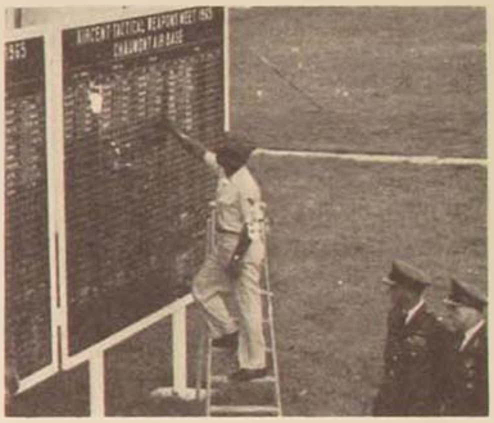
German Air Force F-104 takes off on a skip-bombing ission over Suippes Range, near the city of Reims.

A flight crew of RAF Squadron 231 ("Bee Squadron") returns from a skip-bombing sortie over Suippes Range, and the ground crew is puzzled by the number of write-ups on the aircraft.

An F-84 sends its rockets streaking for the target.



French Air Force mechanics make an engine change to keep their F-100 flying in the tactical exercise.



Air Chief Marshal Sir Edmund Hudleston, Commander, AIRCENT, and Lieutenant General Johannes Steinhoff, Chief of Staff, review the operations scoreboard.

yards of the hangar, the shrill whine of turbines soon crescendoed into a roar that awakened even the soundest sleeper.

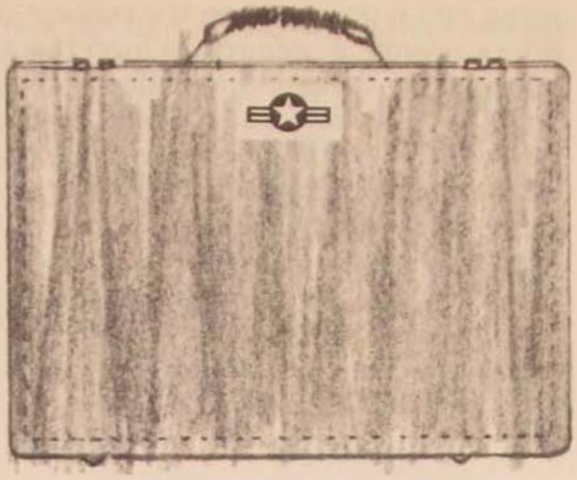
Maintenance men normally ran their preflights at this early hour to insure sufficient time for repair of malfunctions or replacement of vital parts if needed. The sorties were scheduled every ten minutes, which allowed a minimum of time for maintenance during the flying periods. Take-off deviations of more than plus or minus three minutes automatically downgraded the score.

The Allied Tactical Air Forces ran a close race throughout the meet. There was seldom more than a few points' difference in the total score. At the end of the first week Fourth ATAF, commanded by General Gabriel Disosway, held only a 36-point lead.

At the close of the competition and after several rechecks by NATO judges and officials, the final score added up to a total of 3383 points. The Fourth ATAF team, captained by Wing Commander W. H. Bliss, RCAF, was declared the eventual winner by a margin of 123 points. During the final ceremony General Jean Crépin, Commander-in-Chief, Allied Forces Central Europe, noted that AIRCENT's 1965 tactical weapons meet was the most competitive ever held.

Hq Allied Air Forces Central Europe

Air Force Review



SELLING VALUE ENGINEERING

The USAF Road Show Approach

Colonel Stanley E. Allen

FOR SHEER brevity, nothing beats the professional language of the value engineer—at its lowest common denominator, noun-verb-noun. Pencils make marks, wives spend money, and sooner or later officers write articles. A value engineer, from force of habit, would reduce the title of this piece to a sparse "USAF Sells VE." If he is a skeptic (and almost all are), he might add a parenthetical "maybe."

Now, noun-verb-noun articulation seldom earns the value engineer a reputation for sparkling repartee. Inevitably, though, he is known as a no-nonsense man who gets to the point. I feel I should do no less.

In today's environment there are no "maybe's," parenthetical or otherwise, in industry–Air Force liaison in the value engineering field. Secretary McNamara in a recent report to the President on DOD cost reduction said: "We must make certain we do not specify standards of performance, reliability or durability higher than those required by the military mission." The key, he asserted, is value engineering. Seeing savings as high as $500 million annually by FY 67, Secretary McNamara said he has authorized the hiring of 265 additional full-time VE specialists "who, by simplifying our weapons and equipment, will pay for themselves many times over."

This, of course, is a move to bolster in-house VE capability by the services. And from the beginning of the program, the Air Force has far outstripped the VE efforts of its contractors. Now, however, we can see signs that industry value engineers may give their reinforced military counterparts a run for their money.

To help industry realize the full potential in the VE challenge, the San Antonio Air Materiel Area has emphasized three points that I'd like to highlight:

First, the "Road Show," which SAAMA is pioneering for the Air Force Logistics Command, travels across the country making an aggressive, educational "hard sell" for value engineering, directly at the contractor's plant.

Second, SAAMA Road Show specialists are going into finite detail on the concept of sharing VE savings, a unique DOD incentive without precedent in defense production.

Third, SAAMA, fully aware that nothing can dampen enthusiasm like long delays in evaluation, is telling industry how it puts every value engineering change proposal (VECP) on a tight time schedule.

The flying Road Show is AFLC's answer to a perplexing problem, the lack of industrial response when DOD announced its VE program. In April 1962 the Defense Department authorized a new clause in military contracts, for the first time permitting its contractors to share VE savings. DOD sent representatives to attend industry symposiums to explain VE dollar incentives and at the same time published considerable material on the subject.

Initially, the program drew little reaction from industry. Companies that constantly value-engineered their commercial products as a competitive way of life showed little inclination to apply the same philosophy to military hardware. Our defense contractors simply weren't buying an opportunity to expand dollar margins on military contracts. Why? Perhaps they didn't understand that the military would share VE savings. Maybe they were wary of delay, dismissing the VE clause as just another piece of contract boiler plate. Perhaps they weren't absolutely convinced that this would be a long-range program, backed by highest-level authority. Whatever the reason, industry wasn't buying the military value engineering program.

Still, the Air Force was convinced that the VE concept was sound and that dollar incentives could make significant reductions in the cost of military hardware.

So what do you do when you have an excellent product that sells poorly? Well, one solution was as obvious as door-to-door sales. You get out, push doorbells, and sell your customers face-to-face in their own executive suites.

SAAMA saw the Road Show as a pretested Yankee technique to sell value engineering to its contractors, and AFLC bought the concept. The Road Show team visits an industrial plant and sits down with company management, supervisors, and production people for a shirt-sleeve session on value engineering.

Make no mistake—this is a "selling" job. We try to project value engineering in practical terms, directly related to items currently under contract and hardware expected to be built later. We explain exactly how and where a value engineering change proposal is submitted for evaluation; we go over the time involved to process a VECP, its impact on Air Force logistics worldwide, the method of computing savings, and the procedures for payment.

During one of our early Road Show calls last year, we discussed value engineering with one of the nation's top defense contractors. Company management had assigned a bright young executive to handle the program, his brochures on the subject were beautiful, and his training setup elaborate. The VE program, he beamed, was extremely active in his plant. Our natural response was: Fine. How many VECP's has your company submitted, and how much does your share of the savings amount to? His answers were respectively: None and nothing! Very simply, he didn't understand that we were willing to split VE savings with his corporation. The operation was a complete success—but the patient was in *rigor* and very near *mortis!*

At another Road Show presentation at one of SAAMA's largest producers, the board chairman cited the group for its plain practicality. He left no doubt that dollar-sharing incentives were "incenting," that there were dollars as well as cents in incentives.

We visit both large and small firms that are currently building or servicing military hardware—little outfits like Lockley Machine Company (practice bombs) and giants like General Dynamics. The Road Show has visited 24 such plants since it took to the air in December 1963, indoctrinating more than 600 contractor personnel in value engineering. Before we're through, we hope to call on many more firms.

Incidentally, we don't consider the matter closed after a Road Show visit. We follow up with letters to company management, pointing out changes in policy, revisions in dollar incentive computation, and other matters new to military value engineering.

Right now we're beginning to see a much better understanding, a new awareness, and closer, smoother cooperation between the Air Force and its defense contractors in the VE field.

From the start of the VE program in April 1962 until SAAMA put the show on the road 21 months later, the depot had received only 22 VECP's, virtually the entire AFLC total. Since the

Cracked collector cases from the giant R-4360 aircraft engine are no longer discarded. After welding, they are reused. The contractor that proposed the reclamation procedure, Aerodex, Inc., of Miami, Florida, split the savings of $176,350 with the U.S. Air Force.

Road Show took to the air, however, we have received 103 VECP's, and submissions are rising. We feel that the increase is related directly to our "traveling salesmen."

Although Air Force in-house value engineering still exceeds that of industry, I believe the situation may be reversed. The market is there; incentive dollar-sharing has just been expanded, and the atmosphere for industry–Air Force cooperation is as crystal clear as a Texas morning.

This is the way Air Force value engineering shaped up in FY 65: SAAMA received 59 value engineering change proposals from industry and approved 25; AFLC received 132 VECP's from its contractors and approved 60; USAF as a whole received 379 VECP's from industry and approved 215. The combined VE savings from in-house and contractor value engineering efforts during FY 65 were $31.5 million for SAAMA, $64.6 million for AFLC, and $130 million for USAF.

Although Air Force VE specialists are still outperforming their industrial counterparts, we can almost plot the progress of industry attitude regarding the VE program: polite indifference, quizzical interest, cautious participation, and now the beginning of confident effort.

As soon as American industry begins to show the same ingenuity it has used to improve and trim the cost on everything from color TV to refrigerators, I am confident that actual savings will surpass the $500-million VE goal set by Secretary McNamara. If the USAF Road Show can speed full acceptance of value engineering by two years, one year, or even six months, its "salesmen" will have done an invaluable service to the nation's economy and military posture.

However, although things are looking up for the VE program, nothing could bring it to a halt faster than long delays in evaluating the VECP's that industry submits. So SAAMA has set a 49-day target for processing a VECP, i.e., 49 days from the day it is received from a contractor to the day the Air Force accepts, rejects, or returns it for further study.

One other thing could slow the momentum of the VE program, a pinchpenny reluctance to share savings fairly with contractors who submitted the VECP's. On this score, DOD has been eminently fair and generous. Defense Procurement Circular No. 11 authorizes a contractor to share "downstream" savings for as long as three years. Too, DOD emphasizes that a VE incentive reward merits special consideration and weight in proceedings before the contract renegotiation board.

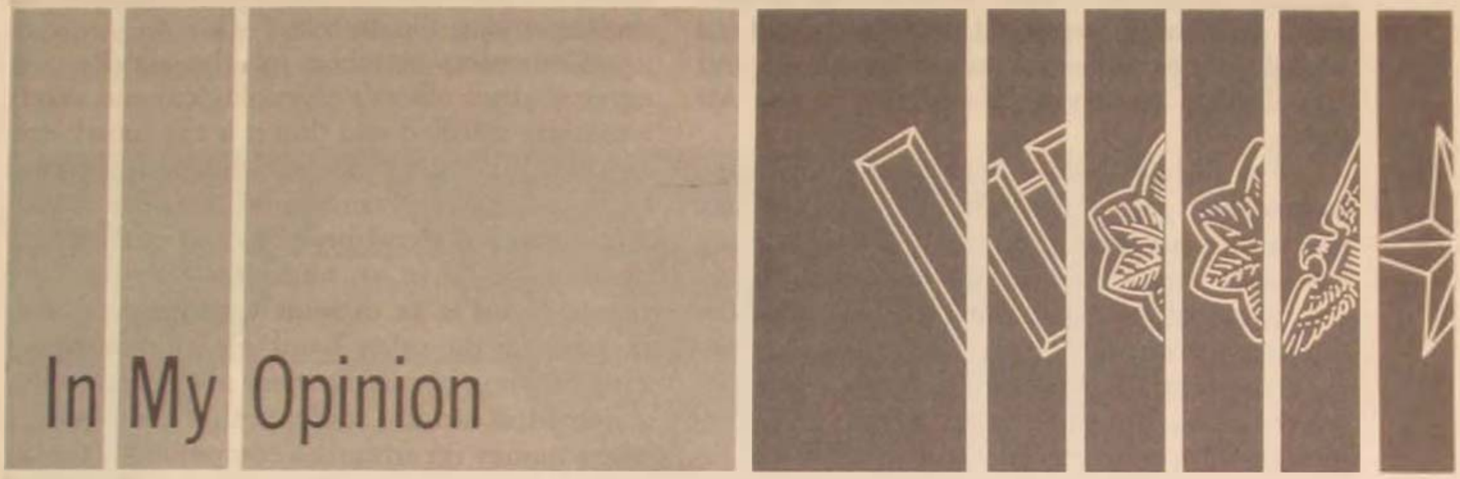
Experience at SAAMA is proving Defense Procurement Circular No. 11 to be a powerful stimulus. For example, Standard Manufacturing Company, a Dallas small business, has submitted seven VECP's on the MJ-1 bomb-lift under the new downstream incentive clause incorporated in its contract. Of these seven, four have been accepted, one is in evaluation, and two have been rejected. This is no isolated case—other contractors also are submitting significant numbers of VECP's for evaluation under DPC-11 criteria.

At a recent Road Show presentation, I got into an animated discussion with an executive from General Dynamics. Finally he grinned and said, "Pardon me, Colonel, but your enthusiasm is showing." I have to plead guilty. I believe that the military and industry, together, are ready to show sharp, dramatic progress in an exciting new field: value-engineering defense goods and services.

Today, the incentive echoes as loud as the challenge. Our Road Show salesmen still have calls to make, but they're getting a warmer reception all the time, and USAF VE "sales charts" are climbing. The Air Force, I feel, is on the verge of declaring some extra VE dividends for its "stockholders," i.e., the American taxpayers.

In the parlance of the value engineer, "VE makes sense." Spell it "cents" or pronounce it "dollars," it still adds up to an exciting new era in defense production.

San Antonio Air Materiel Area



PROMOTION: A VIEW FROM THE BOTTOM

First Lieutenant Richard W. Elder

Only Fifty Percent of Those Eligible Promoted to Captain

Washington, D.C.—Headquarters USAF announced yesterday that of the 5600 First Lieutenant line officers eligible for promotion only 2800 or 50% were promoted to the ronk of Captain. Of those promoted, 140 or 5% were promoted in the secondary zone (3½ years TAFCSD), the remainder being promoted upon the completion of 4½ years' commissioned service. Those officers promoted who do not hold a regular commission will be offered one immediately. The young officers who were promoted have every reason to be proud, for they have been elected for membership into the elite middle management of today's aerospace force. Selection was extremely difficult and competitive, with only the best qualified being promoted. Best wishes and congratulations are extended to each new Captain for continued success in his Air Force career.

IT COULD never happen; not conceivable; not possible.

The purpose of this article is to propose that selective promotion to captain is not only conceivable under the present promotion structure but absolutely essential if a continued high leadership level is to be maintained in the United States Air Force.

Who is the young officer of today? What are his goals? What motivates him? Perhaps most important, though, what makes him different from his predecessors? Every year many hundreds of college graduates enter the Air Force to pursue careers as operations or staff officers. Then, within four or five years approximately 55 percent of these men will have voluntarily resigned in order to seek employment with industrial organizations or return to school. Those who can face the realities and complexities of service life remain in the Air Force.

For rather obvious reasons the Air Force has recently placed special emphasis on college education—not as a guarantee of outstanding job performance but rather as an additional selection tool for ascertaining the base of officer intelligence and aptitude. The college degree is an important index of an individual's capacity to learn. By eliminating nondegree commissioning programs such as Officer Candidate School and Aviation Cadets, the Air Force is tightening entrance requirements in an attempt to raise the educational level of the officer corps and enhance its professional status. As evidenced by numerous studies, the result of this contracting selection process has been to increase the intellectual and educational levels of the young officers entering on active duty. Through the Air Force Academy, Airman Education and Commissioning Program, ROTC, and OTS programs a number of highly qualified college graduates are being commissioned. Regardless of the reason prompting these young men to join the Air Force, the majority of them are selecting the Air Force and a four- or five-year active duty obligation probably with the idea of making the service a career. They are willing to spend at least four years, rather than take a short three- or two-year Navy or Army tour, in an honest attempt to determine if the Air Force has something to offer.

motivating factors

John Ruskin once said, "In order that people may be happy in their work three things are needed: They must be fit for it; they must not do too much of it; and they must have a sense of success in it." A. H. Maslow elaborated on this principle by constructing a "need hierarchy concept." He views an individual's motivation not in terms of a series of drives but rather in terms of a hierarchy with certain "higher" needs becoming activated to the same extent to which certain "lower" ones become satisfied.[1] The principle is summarized by the accompanying illustration.

Generally, members of the service will agree that an officer's physiological and safety needs are satisfied and that it is the social, ego, and self-fulfillment needs with which we must be most actively concerned. Increased pay, additional collateral benefits, and early retirement might have an effect on the top three needs, but it is an extremely limited one. Promotion, on the other hand, clearly activates a man's feeling of achievement and self-development. Most studies indicate that the desire to make money is certainly a compelling force but that it is rarely the dominating one. After a certain point, salary increments cease to motivate; promotion then holds the real magic. With expanded opportunities for faster promotion, a double-barrel impact can be achieved. Faster promotion will provide not only an increase in financial remuneration but also faster career progression. The challenge is provided by the daily activities; the problem is to afford the challenge to the proper individuals. Does current Air Force promotion policy provide for this?

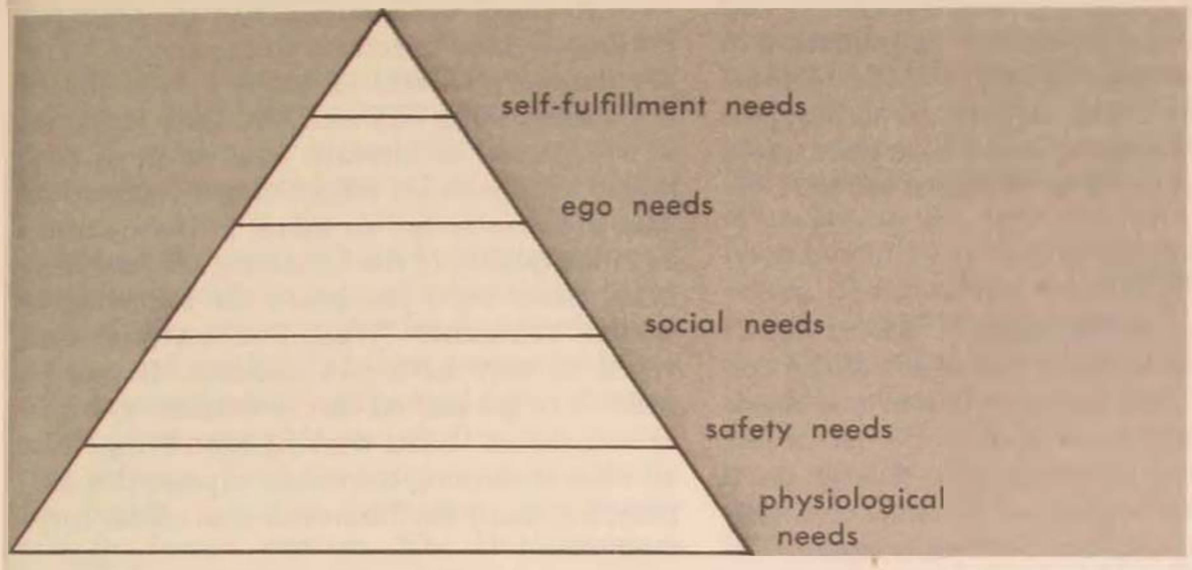
current policy

Current Air Force directives are designed to ensure that regular and reserve Air Force officers compete for temporary promotion on an equitable basis. For the regular officer, temporary promotion is an active duty promotion in advance of permanent promotion to the same grade. For the reserve officer on extended active duty, temporary promotion is the only means by which he may be advanced in his active duty grade.

Under the present system, lieutenants are considered for temporary promotion to captain early enough that promotion will be effective at the 4½-year commissioned service point, and captains with 12 years' promotion list service date (PLSD) are eligible for primary-zone consideration for temporary promotion to major.

PLSD is the principal criterion used for regular officers. Although the primary criterion considered is selection date, other variables are introduced into the system. These variables are dependent upon the existing officer grade structure plus Air Force requirements and are normally announced when each new change, addition, or deletion occurs. Under existing regulations, selection boards use the "best qualified" method to nominate and select officers for promotion to major, while the boards use the "fully qualified" method to select officers for promotion to captain. Eligible officers are considered by these boards either as a result of being in a primary zone of consideration or, in the case of captain to major, meeting the secondary-zone eligibility criteria for nomination by the major air command of assignment.

For promotion to captain, *all* eligible first lieutenants are considered. As the "fully qualified" method is used, there is no limitation on the number selected. For promotion to major, all eligible officers in the primary zone are considered. The Secretary of the Air Force determines the quota for all grades. The secondary zone provides a way for the exceptionally well-qualified officer with less service than those in the primary zone to be promoted before his contemporaries. All who are nominated by the major air commands or Hq USAF are considered by the board. The board, however, may not exceed the percentage determined by the Secretary of the Air Force. Currently this percentage has been a minimal five percent. As has been evidenced by recent promotion cycles, the present system has a few shortcomings.



mediocrity stressed by present system

By virtue of the very fact that the Air Force can promote 100% of its lieutenants to captain, a system of perpetual mediocrity is established. The officer who is eventually released from the service for failure to be promoted to major has been carried by the Air Force unnecessarily for seven to nine long years. In all fairness to both the Air Force and the individual, elimination of this type of individual at the four-year point would be most appropriate. Some may say you can't determine a man's full potential in just four years. This is an old wives' tale which psychologists have long since disproved. Under the present rating structure a very definite evaluation can be made to determine if an individual possesses the growth potential required for steady progression in an Air Force career. As a monetary consideration, early release of a below-average officer not on flying status would save the government approximately $85,000 in salary alone between the four-year mark and the fourteen-year mark when he would be passed over a second time. If this individual's services are terminated early enough, he is still easily employable and has little reason to feel that "I gave the best years of my life to the service and now they kick me out." Certainly not everyone is suited to a military career, and those who are not should not be permitted to stay in the service for long periods of time. Every effort should be made at the earliest possible date to eliminate those who are not suited or qualified for truly professional careers.

self-defeating pattern

In a recent article Edgar H. Schein stated: "When the expectations and needs of the college graduate and the expectations and needs of the organization are sufficiently out of line with each other a considerable danger exists of both parties landing in the trap of a self-defeating induction and training program. The organization for a variety of reasons has to take the initiative to prevent a self-defeating pattern from emerging. . . . The challenge is to recognize the great potential of the college graduate and to create organizational circumstances for him that will utilize rather than defeat the very qualities which make him valuable—his education and his youthful enthusiasm and idealism."[2]

A 13-point policy letter from Air Force Chief of Staff General John P. McConnell further elaborated on this point: "Most young officers are highly educated, full of ambition and energy, eager and imbued with hope but too many are poorly received, poorly treated, inadequately counseled and ignored to a degree which frustrates their ambitions and voids their good intentions. Commanders will make certain they know all their officers and that each is kept fully informed on career opportunities."[3]

Although, as evidenced by General McConnell's statement, efforts are being made for the Air Force to "take the initiative," the officer promotion system still remains a most formidable obstacle. In its present form the promotion system defeats rather than utilizes the very qualities that make the young officer valuable—"his education and his youthful enthusiasm and idealism."

officer force by default

In 1964, 65.1% of the rated officer corps were retained, while only 27% of the nonrated personnel chose to remain in the service.[4] The resultant overall rate of 46% is a little shy of the desired 50 to 55% retention rate; however, it is expected to increase as a result of continued emphasis on officer career motivation. The problem is not so much in the quantity as in the quality of the remaining officers. How many times have you heard the following or similar comment? "Well, I've invested four years, already have two children. It will be difficult to get started on the outside, so I may as well stay in—beats working for a living." Not all officers electing to remain express this attitude, but many do. The result is an officer corps maintained by default. Why not initiate a system that will produce such comments as "You're darn right I'm remaining in the Air Force. My opportunities for recognition and promotion are comparable to any in civilian life. The Air Force very definitely provides to the young, aggressive officer who is willing to exert the effort ample opportunity to become a true professional with increasing responsibility."

A system whereby lieutenants are promoted to captain on a "best qualified" rather than a "fully qualified" basis would provide the needed impetus for changing attitudes concerning officer retention. In other words, inaugurate a system that would produce only 50% promotions to captain rather than the present 100%. The basic reason for the current policy of promoting lieutenants to captain approximately a year prior to the completion of 4½ years' commissioned service is to promote the young officer early in an attempt to sway his decision, before he makes up his mind concerning a service career. The end result has been just the opposite. What kind of promotion system provides for 100% of the eligibles to be promoted? There is no feeling of accomplishment in these percentages. Why not inaugurate a real selection process and make it as selective for promotion to captain as it presently is for promotion to major?—a process whereby well-qualified officers who are chosen by well-qualified officers will choose additional well-qualified officers.

selectivity for survival

In light of this critical analysis of the young officer in relation to current promotion practices, does it appear logical that the promotion system in its present form would attract young officers to stay in the Air Force? No, in my opinion it does not! What would attract them? Since we know the type of educational background they possess, their level of work experience, and the level of their career goals, we can very easily develop the final determination—that of an equitable and challenging promotion package. First, the program must provide for highly selective promotion opportunity and for forced attrition. The ideal program would have primary-zone phasing and also below-the-zone promotion opportunities for the exceptionally well qualified. The promotion emphasis should be based upon the capacities of individuals rather than upon categorical job descriptions. Promotions must be highly selective, otherwise the full significance of the upgrading process loses its meaning.

The ideal career progression program for officers would provide for the following:

(1) Combining regular augmentation and temporary promotion to captain. This would alleviate the problems presently experienced by conducting a dual-structured promotion and augmentation program. All those individuals selected for captain could plan on a full professional career, not one that will be terminated because of the "reserve officer" enigma.

(2) Promoting lieutenants to captain on the "best qualified" basis and not on the "fully qualified" basis as is presently done. Also, establishing a secondary-zone promotion to captain at the 3½-year mark for the exceptionally well qualified would create an elite middle management and an *esprit de corps* of military professionals never before experienced in the Air Force. Competition would remain keen to the majority level by an increase in secondary-zone promotions to ten percent. Although the number of captains would be reduced, the quality would increase by such a degree as to more than offset any numerical strength loss. These officers would be more than able to assume the additional responsibilities. When this group becomes eligible for promotion to major, still on a "best qualified" basis, approximately 80 to 90% would be promoted, since the real selection process would have occurred many years earlier. The end result of this phasing would be approximately the same number of majors as are presently on duty, without forced attrition at the middle point of a man's career. The resultant financial and manpower savings would be tremendous.

Critics of this program will undoubtedly say that after a man is selected for captain there will be no incentive for continued maximum productivity; however, if the men are carefully screened initially, each in an attempt to achieve maximum self-development will continually seek additional responsibility. The quest for more and more success and promotions will normally be sufficient stimulus for highly selected executive personnel.

retrogression

"He's too young—no experience—impetuous!" Need we remind the critics that they too were inexperienced but accepted a challenge far greater—a world war; 24-year-old colonels, 18-year-old lieutenants; all instrumental segments of our fighting force. The times have changed, but the quest for continued freedom remains the same. Like his earlier counterpart, today's young officer, with a natural bent for self-assessment, will scrutinize his own future prospects. In his brief moments of introspection, he gives little thought to the coveted "silver star" but does concern himself with the next promotion. The pragmatic here and now; the future is too flexible and undetermined. What he seeks is challenge, an opportunity that tests his intelligence and demands his best efforts. As long as the daily problems increase and as long as they promise to increase in scope as his experience increases, he will respond to the challenge. In return for his giving, however, he demands a great deal. As has been proved by many career motivation surveys and studies, his allegiance is complex and conditional. When disappointed in his expectations of compensation, he terminates his relationship quickly and with finality.

Since two factors in the equation—the individual officer and the Air Force—are constantly changing, as is the field that lies between them, each should examine the goals and objectives in relation to the other. Not a rose-colored evaluation, but rather an attempt at a realistic appraisal of their respective needs. The young officers are continually attempting an honest appraisal; however, the Air Force, although easily capable of projecting men into space, is unable or at best unwilling to initiate a new and modern promotion system. The resultant effect can be best summarized by the following statement:

> The organization that is known mainly as stable, solid and set in its ways will easily attract more people than it needs of the kind who will keep it in the groove. It will have trouble, however, in getting and holding men who have the ability, the turn of mind, the determination to pioneer.[5]

The program as presented here is certainly no assurance of instant success, but I do feel that it is an honest, realistic, and workable solution to a very pressing problem. The very presence of conscientious, aggressive individuals who insist that every step forward carry the promise of yet another step will speed up the change necessitated by the complex aerospace age. As the needs of the Air Force become more fluid, more open for innovation, young officers possessing a high degree of imagination and self-reliance are a survival must. Selective retention earlier in their careers will contribute to this necessity.

51st Combat Support Group

Notes

1. A. H. Maslow, *Motivation and Personality* (New York: Harper and Brothers, 1954).
2. Edgar H. Schein, "How to Break in the College Graduate," *Harvard Business Review*, XLII, 6 (November–December 1964), 68.
3. "McConnell Sets Forth Improvement Program," *Air Force Times*, 2 June 1965, p. 43.
4. USAF Military Personnel Center, "Semi-Annual Career Motivation Letter," 20 August 1964, AFPMPBC.
5. Frederick R. Kappel, *Vitality in a Business Enterprise* (New York: McGraw-Hill, 1960), p. 19.

THE JUNIOR OFFICER AND HIS SUPERVISOR

First Lieutenant Charles P. McDowell

One of the most readily obvious problems of any military organization is the procurement and retention of highly competent and viable officers. These officers, the professional military men, are the main source of leadership and control of the military structure.

It has long been demonstrated that procuring officers is not nearly as difficult as retaining them. The normal attrition rate of Air Force officers at the end of their required duty period presents an extremely expensive loss, both in terms of what it costs to train them (and those who will replace them) and of time. When the senior first lieutenant is released from active duty at the end of his four years, he takes with him needed experience and a degree of potential that cannot be measured.

It is therefore very much in the interest of the Air Force to determine why these people elect to leave the service and, more important, what can be done to retain them. Of course there are many answers to the first question—lack of parity between military and civilian pay, continual reassignment, etc. It is the second question which demands priority in answering.

It is my contention that the junior officer's desire to remain in the Air Force may in large measure be a function of his relationship with his immediate supervisors, primarily those officers in the major and lieutenant colonel groups. These are the men who not only supervise the young officer but give him direction and motivation. The junior officer's behavior will certainly be influenced by the atmosphere of the group in which he works; and the atmosphere of the group will depend largely on the major or lieutenant colonel who runs the group. All too often these field-graders have been out of the junior officer category for a number of years and are likely to have become less and less aware of the attitudes and feelings of the young lieutenant. The lieutenant normally has a vast supply of energy and enthusiasm. But this energy and enthusiasm are often without direction—not due to anything more than a lack of experience in the practical application of both his job and his officership. It is this lack of practical experience which forces many a junior officer to rely heavily on his experienced noncommissioned officers and which frequently motivates his superior to limit his responsibilities. It goes without saying that an experienced NCO is a valuable member of the team; but the young officer should learn from him, not use him as a crutch in making decisions. On the other hand, the young lieutenant's lack of experience is sometimes ignored, and he is given too much responsibility too soon. Either situation—being without a boat or adrift at sea—is not likely to be the best basis for a positive career orientation.

The junior officer is apt to be reluctant to take his problems to his boss because he has been taught that he is supposed to be helping the commander, not furnishing him with new problems. It is a rare lieutenant who will go to his chief and say, "Major, I must be a real knucklehead; I have what I am sure is a simple problem, but I am stumped!" His problem may indeed be simple—for the major—and if brought to his attention it could readily be solved. At the same time it could give the major a good opportunity to demonstrate his interest in the lieutenant's problems. Even though it takes time, this type of interest may make the difference between leadership and headship and be the seedbed of team spirit. If the junior officer is discouraged from approaching his chief when he needs guidance, then most likely the chief is not going to be aware of the need and, therefore, cannot help him. In this connection it should be pointed out that it is no more desirable for the junior officer to use his superior as a crutch than for him to rely too heavily on his NCO's. The point is that the field-grade supervisor must be available to his junior officers and must be willing to lend them a sympathetic ear when it is needed. The counseling of these young officers should not be placed on a too rigid basis, such as one guidance and counseling session every few months; counseling should be a continuous and subtle part of the supervisor's workday.

Good officers are not born; they are made. They are the product of patience. They grow in quality as they are given quality guidance and leadership. Each superior has an obligation first to identify his junior officers and then to learn their capabilities. These capabilities must then be matched with responsibility, so that they can be expanded and refined. In doing this the supervisor not only will get a better product in return for his time but also will be contributing to the worth of the officer and the quality of the Air Force. This, in my opinion, can only lead to a greater appreciation of and interest in the Air Force by the young lieutenant. And it logically follows that the junior officer will be more positively inclined not only to remain in the Air Force but in turn to become a better field-grade officer himself.

OSI Detachment 7016

Books and Ideas

THE PERIL OF MISPLACED LOYALTIES

Major Ray L. Bowers

Basil H. Liddell Hart

British military policy during the decades before the Second World War remained almost uniformly dismal. The nation's population, beset by economic woes and disheartened by the terrible losses of 1914–18, had little zest for the problems of military organization, problems intensified by accelerating technological advance. Reform and modernization of the military system rested ultimately in the hands of a military profession rendered peculiarly complacent by the recollection of victory in 1918. Britain possessed in these years the world's two foremost theorists on military affairs in Major General J. F. C. Fuller and Basil H. Liddell Hart, the latter functioning outside the army since his retirement in 1927 from war injuries. Fuller and Liddell Hart became the spokesmen for new methods of warfare, methods developed around the mobility of modern armored and motorized armies. Their books became vastly influential abroad, leading Nazi Germany and, for a time, the Soviet Union to organize their forces about the concept of mobile, mechanized warfare. Successful application of the new ideas by the German Army made possible the blitzkrieg victories early in World War II. In Britain, meanwhile, official doctrine and policy only gradually absorbed the ideas of the nation's famous theorists, so that in 1939 Britain and her French ally stood gravely inferior in modern war capabilities. The closed-mindedness which blocked acceptance of Liddell Hart's and Fuller's views was widespread, and central to the closed-mindedness was the existence within the British officer corps of misplaced concepts of loyalty.

Military officers respond to a host of sometimes overlapping loyalties. Every soldier feels loyalty toward his men, toward his country and cause, to his superiors, to morality, and to his personal honor. The ultimate ethic of profession involves, however unconsciously, an arranging of these allegiances into a useful spectrum. It is here, in grasping toward an arrangement of loyalties, that the British military profession largely failed between the wars. In retrospect, mistaken loyalties appear to have been widespread among British officers.

Loyalty meant one thing to General Sir Archibald Montgomery-Massingberd, who in the late Twenties violently abused Fuller's writings. To him, Fuller's appeals for new methods represented a lack of "loyalty," which was a "far more important quality for a soldier to possess" than "brains." Criticism, it would seem, constituted disloyalty. Fuller at the time was still on active service, but the harassment by his powerful foe and others like him led to Fuller's premature retirement soon afterwards. Montgomery-Massingberd served as Chief of the Imperial General Staff during the mid-Thirties, where he thoroughly obstructed the movement for mechanization. Enraged when he learned that books by Fuller and Liddell Hart were prescribed for study in preparation for the officers' promotion examination, he had that part of the examination canceled. His was a misplaced *loyalty to professional orthodoxy*.

Unconventional soldiers like Fuller and Liddell Hart seethed in such an environment. Liddell Hart's superior officer pronounced that "writing on military subjects does not justify accelerated promotion." Fuller was refused permission to publish a book and was told that "no officer on the active list should be allowed to write any military book, as it was detrimental to military discipline"! Fuller was convinced that Liddell Hart's wish to remain on active service had been denied not for medical reasons but because Liddell Hart was a writer. Professional orthodoxy blocked the suggestion that Fuller be restored to active service, in concern for "upsetting the turn of promotion," even though Fuller's was "the best brain in the Army."

Resistance to theories of mechanization was strongest among officers in the cavalry. Theirs was a misplaced *loyalty to outmoded weapons,* stemming from sentiment, delusion, and self-interest, moving Liddell Hart to observe painfully that "the early battles of World War II were lost in the Cavalry Club." The reformers had little patience with Lord Haig, who insisted that the airplane and the tank were but accessories to the man and the horse —the "well-bred" horse—and with other conservative officers who called tanks "those smelly things." In 1936 Montgomery-Massingberd urged that the Army provide two horses for each tank officer, since "hunting taught quickness of decision." In presenting the Estimates for 1934–35, the War Office spokesman dwelt on "the importance of cavalry in modern war." The amount earmarked for forage was three and a half times that for motor fuel.

Opposition in the cavalry to mechanization remained stubborn. A persistent but useless idea was that of using tanks and horses in combination, thereby prolonging the role of the latter. The War Office apologized for the cavalry's "great sacrifice" in slowly yielding to modern mobility: "It is like asking a great musical performer to throw away his violin and to devote himself in future to the gramophone." Such nonsense was finally junked, and tank expansion was accelerated in 1937, but only through the relatively inefficient method of converting the cavalry rather than by expanding the Tank Corps—one last concession to vested position.

Throughout the period between the wars, a narrow *loyalty to branch of service* remained strong. The chronic wrangling among the Chiefs of Staff over shares of the budget led to the suspicion that the result was mere compromise, not sound military policy. Both the

Army and the Navy sensed that the expanding possibilities of air power meant a declining role for themselves, and they sought to cut down RAF responsibilities, sometimes urging that the separate air force be abandoned and aviation returned to themselves. The Navy, working hard to refute the idea that ships were vulnerable to air attack, installed heavier deck armor and antiaircraft batteries and practiced against radio-controlled target planes. At one trial staged for the King, the target plane remained undamaged, so it was flown into the sea anyway as if it had been hit—seemingly an expensive deception. The air leaders themselves held doctrines for independent and strategic employment of air power and exhibited neither enthusiasm nor energy for operations in tactical support of ground forces. The close tank-and-air partnership skillfully practiced by the Germans was wholly lacking in the British forces. A coherent and sound answer to the nation's defense problems remained impossible amid the centrifugal outlooks of the separate services.

Strong through these years was a seemingly instinctive tendency among officers to accept uncritically the mistakes of the last war. This *loyalty to past mistakes* led to hasty rejection of many of the reformers' contentions. In a lecture in 1931 Liddell Hart argued that Britain, in deploying a massive land army on the continent of Europe in 1914–18, had broken with her historic strategic policy; in the discussion following the lecture all the Army officers present upheld the actual strategy from every viewpoint, as if they felt obliged to defend the earlier decisions. The later volumes of the British *Official History* whitewashed countless errors, according to Liddell Hart, out of misplaced loyalty to friends and profession. The report of the Kirke Committee, which had been set up to examine the tactical lessons of the war, was restricted to very limited circulation by Montgomery-Massingberd, and thus young officers who lacked the experience of war were hindered from learning from the mistakes of their predecessors.

Another kind of prevalent misplaced loyalty was excessive *concern for personal advancement*. Liddell Hart was amazed at the amount of time spent by rising officers in analyzing their promotion prospects from the Army List. One officer who eventually reached highest rank carefully kept a ledger of all his rivals, recording their assignments, performance, and health. Intermediate infantry and cavalry officers who lacked mechanical bent, sensing that mechanization meant declining career prospects for themselves, opposed the movement for reform. One high official hitherto interested in military progress became, out of political expediency, an advocate of curtailed

Major General J.F.C. Fuller

spending. Another refused to approve administrative reforms because he sensed that men of ability would move close to his position and therefore become rivals.

Perhaps most dangerous of all was the error of *loyalty to preconceived ideas.* The Ardennes region of southeastern Belgium and Luxembourg consisted of heavily wooded, rolling countryside, traversed by a network of narrow and twisting roads. Military professionals regarded the Ardennes as impassable to modern armies, a delusion which had been uncritically accepted for generations. Foch had described it as an "almost impenetrable massif," and the Allied planners of 1918 assumed that the region was "almost impassable." The British General Staff view in the Thirties held that "the Ardennes were impassable to tanks," a view also accepted by the French. The fatal alignment of the Allied armies in the West in 1940 was based on this assumption, and the German armor moved through the Ardennes without serious difficulty, to crash across the Meuse through the thinnest sector of Allied resistance. Liddell Hart, who had traveled through the Ardennes, repeatedly warned in the Thirties that the region offered few obstacles to mechanized forces and that ample opportunity existed for deploying off the roads when necessary. War games among the British high command in 1936 pointed to the possibility of German penetration of the Ardennes. Still the false preconceptions prevailed. At that, the lesson of 1940 was incompletely learned, for in December 1944 the Ardennes was again weakly posted—this time by the Americans—inviting Hitler's last gamble.

The long-awaited first volume of the *Memoirs*† of Liddell Hart appeared in its American edition late in 1965, to the gain of this country's historians and practitioners of military affairs. Here is the history of one man's lifelong quest for the truth, in the face of the manifold false loyalties of others. All the examples of misplaced loyalties mentioned here, along with many others, are recounted in Liddell Hart's superb autobiography. Though often disillusioned by mediocrity in others, Liddell Hart yet was never long embittered; he still found greatness in men, particularly in the persons of Lloyd George and T. E. Lawrence.

Ultimate loyalty, to Liddell Hart, remained always the pursuit of true knowledge through perception and contemplation. No individual was of such vast prestige, no idea so well established, no tradition so hallowed as to be exempt from Liddell Hart's inquiring scrutiny. His current pen, scarcely mellowed by the years, stings even the venerated Winston Churchill. Unfortunate Montgomery-Massingberd emerges considerably less glorious. Yet Liddell Hart's many books are not works of muckraking; always his aim has been constructive—to expose the fallacies of the past and achieve honest assessment of the present.

The contributions of Liddell Hart to modern military thought are of vast dimension and scope. As a theorist of armored warfare, he put forward the idea of deep strategic penetration, suggested by his intensive study of the Mongol cavalry armies of the thirteenth century and of Sherman's generalship in the American Civil War. His reassessment of British strategy in the First World War reminded his nation of its historic role in warfare, based upon sea power, commercial wealth, and land-sea operations peripheral to the main continental campaigns. His comprehensive theory of the "indirect approach" to strategy brilliantly captured the essence of generalship, far better than the traditional principles of war. He used history to show that geographic or psychological directness usually led to stiffening resistance by the enemy and that decisive victory occurred only when the opponent was first unbalanced by some unexpected or "indirect" move. Liddell Hart grasped early the implications of the air weapon, and during the Thirties repeatedly pointed out the strategic uselessness of the Navy's grand battle fleet in the face of the increasing range of aircraft. Constantly he pressed the vital role of tactical

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†Basil H. Liddell Hart, *The Liddell Hart Memoirs, 1895–1938* (New York: G. P. Putnam's Sons, 1965, $7.50), 434 pp.

air power as the true partner of the tank in modern mechanized warfare.

His imaginative ideas on disarmament attracted wide enthusiasm in the Thirties; he proposed eliminating "offensive" weapons—heavy artillery and his cherished tanks. This was a most practical solution, being relatively simple to enforce and making aggressive wars virtually impossible against the defensive weapons thus rendered dominant. Shortly before World War II, he turned his vigor toward the immediate problems of preparedness. It is here that this first volume closes; the reader will eagerly await the sequel.

This is an important yet easily digested book. The professional officer should proceed thoughtfully through it, perhaps reading only a single chapter at a sitting. Many of the personalities encountered will be unfamiliar to Americans; as the reader proceeds he should make a few jottings on each new character, for many appear again and again. The reward for the serious reader of Liddell Hart's *Memoirs* is a matchless one—an intimacy with this century's most brilliant and creative thinker on military subjects. The book's essential significance for today's officer is profound. For, of the many darting and provocative insights which fill the pages, central to all remains the lesson of misplaced loyalty, a peril to which Captain Liddell Hart himself has never succumbed.

United States Air Force Academy

A JOURNALIST LOOKS AT THE FUTURE

DR. ELIZABETH HARTSOOK

AS FOREIGN correspondent for the *New York Times* in Europe since 1942, Drew Middleton, author of *The Atlantic Community*,† has been in a good position to observe the many new developments that have occurred in Europe during recent years, particularly in respect to the North Atlantic Treaty Organization and the Common Market. His book traces events in Britain, France, Germany, Italy, and the Soviet bloc during this period and relates them to United States policies and interests in Europe.

Middleton's main concern, as he notes in his preface, is that "the present situation [in Europe] and the American attitude to it represent a juncture more dangerous for the future of the West than any since the end of World War II." He is convinced that "America will emerge from her preoccupations with Southeast Asia to find that the foundations of her policy, and her security, in Europe have been eroded to the point where they cannot be restored." He attributes this state of affairs to "the failure of the policy of the Forties and Fifties to meet the vastly different problems of today," to the tendency of successive U.S. administrations to base U.S. European policy on "the belief that the United States, by virtue of unrivalled military and economic strength, is the leader of the West"—whereas, in his view, leadership on that basis cannot be reconciled with the Europe of today. He perceives Americans as clinging to a dangerously outdated view of Europe, not grasping yet how

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†Drew Middleton, *The Atlantic Community: A Study in Unity and Disunity* (New York: David McKay Company, 1965, $5.95), 303 pp.

far and how fast recovery has taken Europe or the degree to which this prosperity influences national political outlooks. Instead, they are often "convinced that this prosperity is due entirely to U.S. aid, and seek gratitude where international cooperation is the most that can be expected." What the United States has to do is "consider the way things are, not the way we would like them to be, and frame new policies to meet the new conditions in every country in Western Europe. NATO, for example, must be remade, not revived—it is inapplicable in its original form in 1965 . . . America must in fact almost start all over again, this time not with impoverished, shell-shocked client nations as our partners but with a group of states with stable governments and remarkable confidence in their economic future."

Besides the economic resurgence, Middleton notes several other factors as explaining Europe's new attitude towards U.S. leadership: the growth of nationalism in all Western European countries; the decline in the Soviet military threat; increasing decentralization within the Communist bloc; the change, since the late Fifties, in the U.S./U.S.S.R. strategic balance, and questions concerning the U.S. military commitment to Europe; European fears of being swamped by a U.S. economic and cultural "invasion"; their indifference, after having lost their colonial interests, to overseas problems such as Southeast Asia.

Middleton's recommendations as to what to do about this situation are tied in with his larger recommendation for a tighter global effort on the part of the whole Western world in trying to contain Communism. As he sees it, the containment of the Communist bloc in Europe is not the end of the conflict with Communism but only a temporary armistice on one battleground of that conflict. The new theater of operations is not Central Europe, but Africa, Asia, the Middle East, and Latin America. This means a united, integrated Europe must join its efforts with those of the U.S. throughout the world in assuming the responsibilities of leadership vis-à-vis the underdeveloped countries and the Communist world. In order to exploit the economic, political, and military strength of the West, "clearly a new international organization, that will respond to this challenge, that will do for the World what NATO did for Europe in the Fifties, is needed." Middleton concedes that the purely political difficulties in establishing the kind of global alliance demanded by the world situation are staggering, but he insists it must be done and gives directions:

> The first step toward forming this greater alliance for progress should be the creation of a council of ministers of all potential member governments . . . to assemble and coordinate the information of the various governments on the economic and political situations in those countries—Tanzania, Burma, and the Congo—where the conflict with Communism is at or near a crisis and where a united non-Communist effort is urgently needed. This would be accomplished by a general review of the whole of the battlefront, from Southeast Asia westward across the world to South and Central America.
>
> By the assemblage and publication of such information, a Western world grown tired of overseas aid would be taught the seriousness of the situation and the urgent need for action. The peoples, as well as the governments, must realize that there is not much time to lose.
>
> Once the objectives have been agreed to, the resources must be identified, country by country, and the strategy for their use planned. This is a point where national interests will clash. No government wants to make available large sums or resources of men and material if they are to be used generally by an alliance and, as will prove necessary occasionally, distributed by another country whose position in the critical area is unsullied by memories of colonialism or neoimperialism.
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> The burden of establishing the alliance will require enlightened statesmanship, especially in Washington. The United States will have to play a major role, although she must expect assistance from some countries whose overseas aid in the past has been limited as well as from those immediately concerned. . . . The major roadblock the U.S. will face on this path back to union and stability in the West is psychological, centering upon the conviction that the United States will not join in any international enterprise unless it is to be the acknowledged leader. . . . If the alliance is to function effi-

> ciently, it will be important that the U.S. appear as one partner, not as a leader. For a number of reasons, some of them good, American leadership is under a cloud in Europe. And it is in Europe that the new alliance must levy on governments for help.

It is as the first step toward this needed global effort that Middleton perceives the urgency of a united Europe closely allied with the United States in an Atlantic Community. As he puts it, "the future of the human race may rest upon the amount of cooperation that can be established within the Atlantic Community." Middleton is very much alarmed over the growing "nationalism" in Europe, particularly exemplified by France but, as he observes, incipient and increasing in all the countries. If it should thus grow, he is afraid this could lead to the development of an independent Europe which, "believing itself to be the third power and following its own policy in its relations with the Communist bloc, Africa, Asia, or Latin America, could destroy the foundations of Western partnership."

There are, of course, two major schools of thinking in regard to Europe's future and the U.S. relationship to it—the one to which Middleton belongs, calling for an integrated, federated Europe closely bound to the United States in an Atlantic Community, and another one which takes less of a tight, organizational approach and which assumes that Europe will probably develop along fairly independent lines. Representative of the latter school is Henry Kissinger, whose recent book, *The Troubled Partnership*, was reviewed in these pages by General Noel Parrish.* To throw further light on the important controversy, it might be useful to compare Middleton's views on some of the major European issues with those of Kissinger.

In line with his belief in the need for more unified Atlantic alliance efforts to fight Communism, Middleton is a strong advocate of the multilateral force (MLF) proposal recently favored by the United States. He sees it as a "bold and imaginative" scheme which has great value as a cooperative concept in bringing about the kind of united Western effort he desires. He believes that the logic for American leadership in this process is stronger now than it was five years ago when Secretary of State Christian Herter first mooted the need for such a force, and he considers that the U.S. decision not to push the MLF reflected a profound lack of understanding of the European situation. Kissinger, by contrast, believes the MLF was an ill-thought-out scheme which gravely compromised U.S. prestige when it was found to be unworkable and had to be abandoned. Not only the Soviet Union and eastern Europe but western Europe as well were bound to have opposed its aim of providing Germany with some form of nuclear weapons control. Instead of strengthening NATO, as it was hoped MLF would do, it probably would have given NATO the coup de grâce. Certainly Germany's own prime objective of reunification would have been stymied by it. Finally, the MLF would only have provided the illusion of a European share in nuclear control, and Kissinger thinks the Europeans could not have been expected to take seriously and as permanent "an arrangement where, in return for an expenditure of upward of three billion dollars they would obtain a veto over some three per cent of our nuclear force while we retained complete freedom of action with respect to the remainder."

On the "German problem," Middleton believes that the United States did the right thing in rearming Germany and that we should help it to some control over nuclear weapons in order to keep it from acquiring them on its own or from turning to the Soviet Union. Because of her economic power, Germany is the potential strong leader in Europe, and everything should be done to keep her tightly on the side of the Atlantic Community. The United States should use its power to insist on German reunification because without a unified Germany there can be no united Europe or Atlantic Community. Kissinger is not sure that rearming Germany was the wise thing to do. He is opposed to giving her nuclear weapons and thought it was a "grave error" for the United States to assume in the MLF proposal that this

*Brigadier General Noel F. Parrish, USAF (Ret), "Rough Weather over the North Atlantic Alliance," *Air University Review*, XVI, 6 (September–October 1965), 83–89.

could be done by a unilateral decision. "For the long-term stability and cohesiveness of Europe, it would be better for Germany to join an institution in which France and Britain are the senior partners, than for the latter two to seek membership in a grouping—as in MLF—where Germany would be the largest European contributor and in which ultimately it would likely represent the 'European' point of view." Efforts to apply united Western and NATO power to settling the German reunification problem have not worked in the past and are not likely to now. The long-term hope for German unity therefore resides in the unity of Europe. As nations lose their former significance within such a framework, the fear of any one state will diminish and the existing dividing lines may seem less crucial.

As to the future organization of Europe and the United States' relationship to it, Middleton sees a federated, integrated Europe, whereby the individual nations give up their sovereignty in favor of a supranational government, as the *only* path to a united Europe and thence to its close alignment with the United States in an Atlantic Community. He does not acknowledge De Gaulle's long efforts to unite Europe in a confederation—with the nations cooperating but retaining their identity and sovereignty—as a form of unification; rather he insists that in favoring cooperation instead of integration De Gaulle is thwarting European unity and fostering "old fashioned nationalism." Although Middleton mainly blames the nationalism of France for delaying progress toward a federated Europe, he concedes that nationalism is present to some degree in all the western European states. Actually, he is afraid that even a federated Europe will turn out to be "highly restrictive" rather than the "basis of a new international group that will enable the West to meet the problems of the future"—a group that ought to include Britain, Norway, Denmark, Sweden, Switzerland, and Austria in order really to represent the Continent in the kind of unified effort he wants.* Again, this reflects his great worry that Europe may unite and develop policies independent of the United States.

Kissinger questions whether there is only one reliable method of bringing about European unity, "whether either our national or Atlantic interests require our passionate commitment to a supranational structure for Europe." He thinks the Fouchet Plan (De Gaulle's "confederation" concept), calling for institutionalized meetings of foreign ministers and subcabinet officials, is not the least plausible road to unity and is the one most consistent with British participation in a future Europe —Britain being just as opposed to an integrated, supranational Europe as France has been. He finds it natural that France and Britain, which have the longest history as national states and no need for trying to escape their past (as in the case of Germany and Italy), should prefer a confederation over a federation. Kissinger believes an effective Europe cannot be built without the wholehearted support of Britain, and he says this suggests "that the future of a united Europe depends more on developments in London, Paris and Bonn than on strictures from Washington." He cautions the United States not to resurrect old national rivalries in the name of atlanticism or single out one ally as its special partner but to leave the internal evolution of Europe to the European countries and concentrate its efforts on the elaboration of Atlantic relationships. In doing so, the United States should bear in mind that a wise Alliance policy will not expect that common positions can be developed on a global basis. "We have sought to combine a supranational Europe with a closely integrated Atlantic Community under American leadership, but these objectives are likely to prove incompatible. Indeed, the United States will have to reconcile itself to the fact that no matter what structure emerges in Europe, a difference in perspective with the United States is probable, particularly about policies outside Europe."

To sum up, both Middleton and Kissinger are in favor of an Atlantic Community; both want NATO preserved. But Middleton would achieve this by a further building of organizations and alliances joined in ever closer co-

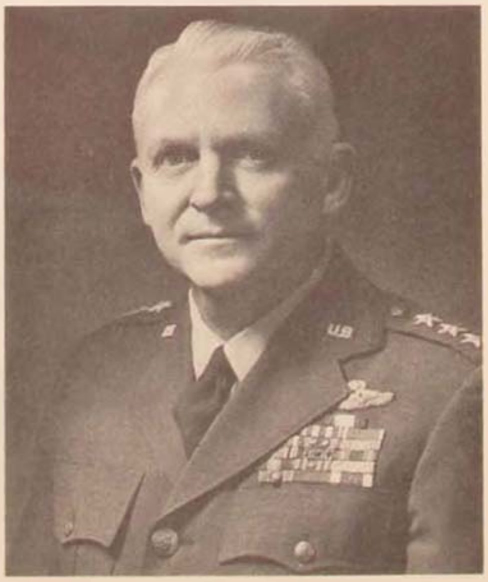
*Paradoxically, Middleton blames France for this "restrictiveness," whereas De Gaulle has suggested the eventual taking in of additional members such as Spain and, contrary to Middleton's repeated assertions, has always wanted Britain in, provided she would give real priority to European interests.

operation: a federated Europe, an Atlantic Community, and a still broader alliance, to include the rest of the free world. He wants a whole new, larger internationally organized fight against Communism, giving first priority to enlisting close European cooperation with the United States in this effort. Kissinger would strive for a similar but more limited result. He thinks that if Atlantic policy is completely centralized, it may grow stagnant, able to agree only on doing nothing, and that overemphasis on either unity or diversity destroys the delicate balance of creativity. He thinks that what the West can mean to others depends in great part on what it means to itself—in other words, on its *example*.

The reader will have to judge for himself the merits of Middleton's proposal for a new, larger cooperative free world effort. But three thoughts come to this reviewer's mind: (1) the almost insurmountable problems in trying to coordinate such efforts in the past when the Communist threat was much more apparent, when the United States had undisputed leadership, and when a much smaller group of nations was involved; (2) the growing evidence, throughout the world, of polycentrism and tendencies away from larger cooperative efforts and toward more independent nationalism or toward regional groupings; (3) the apparently genuine desire of the United States and the most powerful Communist country, the U.S.S.R., to achieve better relations with each other.

Alexandria, Virginia

The Contributors



Lieutenant General Fred M. Dean (USMA) since January 1964 has been Assistant Director for Weapons Evaluation and Control, U.S. Arms Control and Disarmament Agency, Washington, D.C. He completed flying training in 1939, and from January 1942 until July 1943 he served in the European Theater as Commander, 40th Pursuit Squadron, and as Executive Officer and Commander, 31st Fighter Group. He was next assigned to the Advisory Council for the Commanding General, Army Air Forces, and in January 1944 became Chief of the council and General Arnold's Executive Assistant, participating in the Cairo, Malta, Yalta, and Potsdam Conferences. In April 1946 he was appointed to the Joint United States–Brazil Military Commission in Rio de Janeiro. Other assignments have been in the Office of the DCS/Operations, Hq USAF, November 1948–March 1950; as Chief, Analysis Division, Office of the Assistant for Programming, DCS/O, to August 1952; student, National War College, to June 1953; as Commander, Webb AFB, Texas, to April 1954; as student, Manpower Management Course, George Washington University, Washington, D.C., to November 1954; as Vice Commander, Flying Training Air Force, Waco, Texas, to April 1957; as Chief, Air Force Section, MAAG, Taiwan, and Commander, Air Task Force 13 (Prov), PACAF, to September 1960; as Director of Operations, J-3, Joint Staff of the JCS, Washington, D.C., to August 1962; and as Deputy Commander, Twelfth Air Force, Waco, Texas, to July 1963, then Commander to November 1963.

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Hans Multhopp is the principal scientist, Advanced Design, Martin Company, Baltimore Division. After attending the Technische Hochschule in Hannover and the University of Goettingen, Germany, he worked for four years in the Aerodynamische Versuchsanstalt Goettingen, in the field of experimental aerodynamics. During World War II he headed the aerodynamics and new design departments of Focke-Wulf Flugzeuban, Bremen, where he planned the single-jet fighter design from which the Mig-15 and -19 were copied. At the end of the war he came under British control and in 1946 went to the Royal Aircraft Establishment, Farnborough, England, where he worked on general supersonic aerodynamics, thermodynamics of jet propulsion, and preliminary design of transonic research aircraft. From 1948 to 1950 he was with the Aeronautical Institute of the Imperial College of London University, developing subsonic and supersonic wing theory methods. In 1950 Mr. Multhopp joined Martin Company, where he has been working the entire speed regime, from low-speed V/STOL aircraft to hypersonic aerospace vehicles.

Colonel William F. Scott (USMA; M.A., Georgetown University) is on exchange duty with the Department of State. After graduation at West Point in 1943, he served with the 398th Bomb Group, Eighth Air Force. From 1947 to 1950 he was assigned to the Strategic Intelligence School, War Department General Staff, first as a student, then on the faculty. He next served as an exchange officer at the RAF College, Cranwell, England, instructing in bomber operations. He attended Air Command and Staff College in 1952 and afterwards taught air operations at Air University. Subsequent assignments have been as Chief, Electronics Division, ACS/Intelligence; U.S. Air Attaché, Moscow, 1962–64; and Research Associate, Foreign Policy Research Institute, University of Pennsylvania. Colonel Scott's master's thesis, "An Analysis of Time Factors in the Development and Production of Air Weapon Systems," was used during the hearings conducted by the Preparedness Investigating Subcommittee of the Committee on Armed Services, United States Senate, during its 1957 inquiry into satellite and missile problems. He has been a contributor to *Orbis*.

Major Lawrence B. Tatum (USMA; Ph.D., Syracuse University) is a flight commander, 1st Air Commando Squadron (A-1E), Vietnam. After graduation from flying training in 1954, he flew F-86's and F-100's in tactical fighter units in Texas (1954–56) and Japan (1956–58). On the faculty of the U.S. Air Force Academy 1961–65, he taught international relations, defense policy, Soviet foreign policy, and a graduate course in government and politics in the U.S.S.R. In 1963 he served a TDY tour in the office of the Special Assistant to the Joint Chiefs of Staff on Arms Control. Major Tatum has contributed a chapter, "Arms Control: Relevance, Approaches and Problems," to *Defense Policy* (Col. W. W. Posvar and Capt. John C. Ries, ed., Baltimore: Johns Hopkins University, 1965).

Lieutenant Colonel James E. Hughes (M.B.A., Western Reserve University) is a member of the Analysis and Long Range Planning Division, Headquarters Air Force Systems Command. During World War II he served with the Airways and Air Communications Service in the China-Burma-India Theater. Recalled to active duty in 1947, he served in a planning capacity with Hq AACS. He attended the Air Force Institute of Technology 1948–50, and subsequent assignments have been as a project officer, Communications and Navigation Laboratory, 1950-52; Assistant Chief, Communications Division, Hq Air Research and Development Command, 1953–57; and as Air Force Field Development Representative at Bell Telephone Laboratory, 1957–61. In his present assignment Colonel Hughes is concerned with the development of planning factors and guidelines for future applications, design, development, and procurement of Air Force data-processing systems.

Dr. James A. Fraser (Ph.D., Columbia University) has been Professor of Physical Science, Warfare Systems School, Air University, since 1955. After teaching in U.S. and Canadian schools from 1927 to 1941, he enlisted with the Royal Canadian Air Force, was commissioned, and served as a navigation instructor and ground instructor for pilots until his release in 1945. Subsequent positions have been as Dean, Ferris Institute, Big Rapids, Michigan, 1945–46; professor and head of Science Department, State Teachers College, Troy, Alabama; researcher and writer, Eastman Kodak Company, Rochester, New York, 1947–48; and reserve officer on active duty with the Evaluation Staff, Air War College, Maxwell AFB, 1951–53. Dr. Fraser has served as professorial lecturer in the George Washington University Center at Maxwell AFB since 1962. He retains his commission as a colonel in the USAF Reserve with assignment to the Office of Aerospace Research, Wright-Patterson AFB, Ohio. He is a graduate of the Air Tactical School, Air Weapons Course, and Air War College.

Lieutenant Colonel Jack E. Barth (M.A., Southern Illinois University) is Deputy Chief of Public Information, Hq Allied Air Forces Central Europe (AIRCENT). Other assignments have been as Chief of the Information Operations Division, Hq Fifteenth Air Force; with the United Nations in Korea on special projects, Operations and Training Division; and as a radar navigator for eight years on Strategic Air Command B-29's, B-36's, and B-47's. Colonel Barth has completed the Air Command and Staff College course by correspondence.

Colonel Stanley E. Allen (B.S., Indiana University) is Director of Procurement and Production, San Antonio Air Materiel Area, Air Force Logistics Command. He entered the RCAF in 1941, transferred to the American air arm in 1942, and served in both the Pacific and European Theaters during World War II. For the past 16 years he has held various procurement positions, including Chief of the Procurement Inspection Division, Inspector General Office, Hq Air Force Logistics Command. Long an advocate of value engineering, Colonel Allen has headed the SAAMA Value Engineering Road Show on its "sales" trips to industry across the country.

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Dr. Elizabeth Schroeder Hartsook (Ph.D., University of Illinois) is a Research Analyst, Long Range Planning Division, Deputy Directorate for Advanced Planning, Directorate of Plans, Hq USAF. Previous positions have been in military intelligence, European Command and U.S. Military Government, 1946–49; as Research Analyst, Human Resources Research Office, George Washington University, 1953–55; and in the Directorate of Intelligence, Hq USAF, until the present position in 1956. Dr. Hartsook has written extensively about the cold war, U.S. foreign relations, NATO, overkill, etc.

Major Ray L. Bowers (USNA; M.A., University of Wisconsin) is Associate Professor of History at the U.S. Air Force Academy. He flew as navigator-bombardier in the 47th Bombardment Wing (B-45), completing a three-year tour in the U.K. in 1955. He participated in the testing of the B-66 aircraft at Edwards AFB in 1955–56 and served with the 17th Bombardment Wing (B-66) during 1956–58, successively as aircrew member, air targets officer, and wing special weapons officer.

AWARD

The Air University Review Awards Committee has selected "China—The Nuclear Threat" by Lieutenant Colonel Joseph E. Fix III, USA, as the outstanding article in the March-April 1966 issue of *Air University Review.*

ATTENTION

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