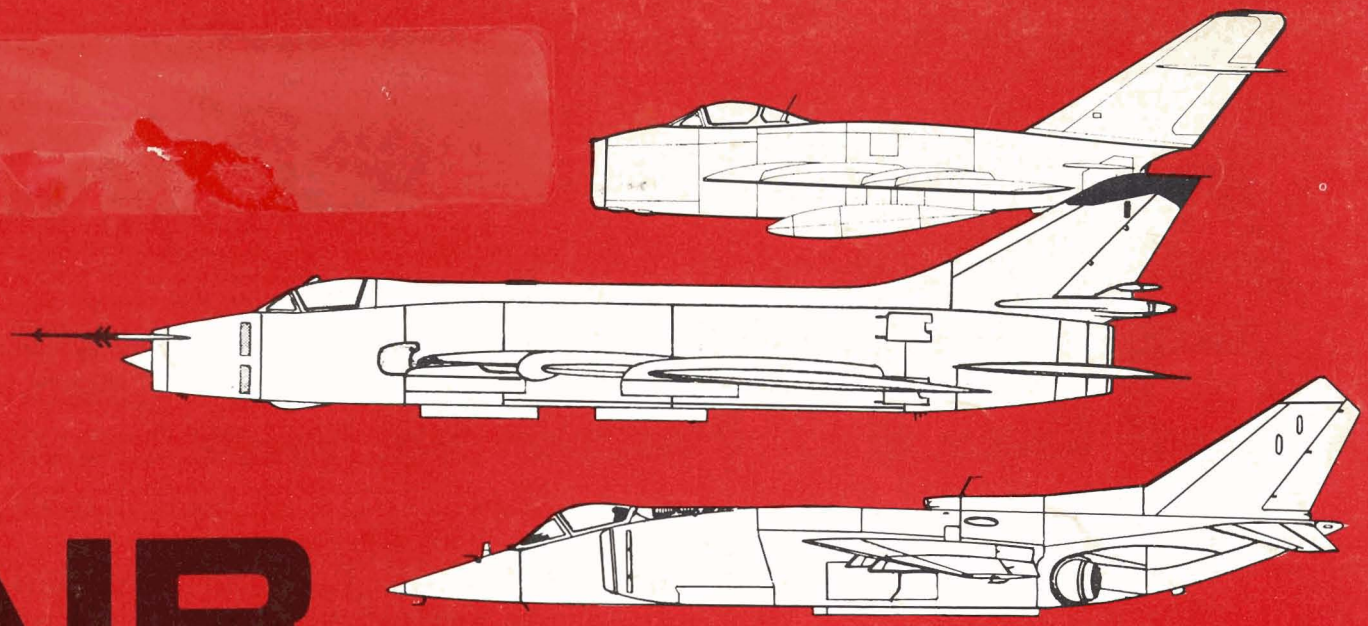

AIR DEFENSE MAGAZINE

OCTOBER - DECEMBER 1976

AIR DEFENSE MAGAZINE

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ABOUT THE COVER: The Soviet and Warsaw Pact aircraft massed on our wraparound cover set the stage for two major portions of this issue of AIR DEFENSE. First, they accent our lead article, "The Air Attack Potential of the Warsaw Pact," which begins on page 6. Secondly, they give you a sneak preview of some of the aircraft that appear on this issue's poster inclosure – "SOVIET AND WARSAW PACT FORWARD AREA AIRCRAFT."

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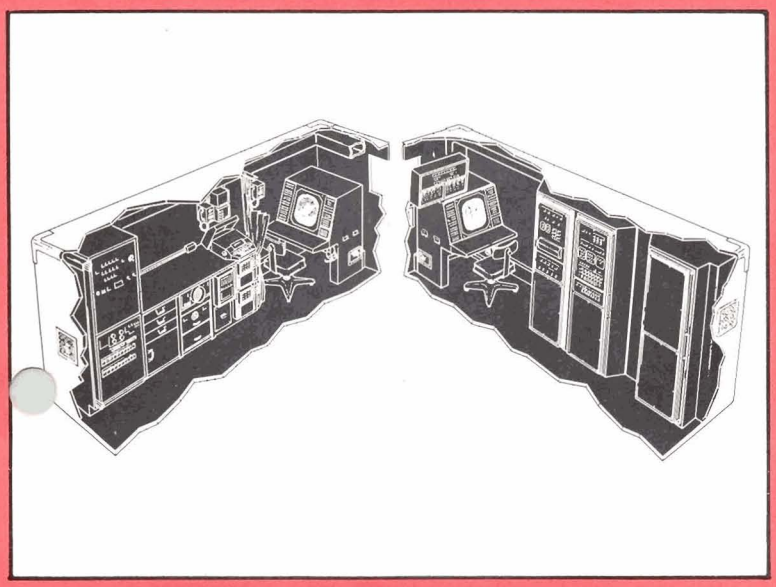

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ENGAGEMENT ZONE

letters to the editor

SHOOT: MOVE AND ?

Dear Sir:

I would like to suggest the following TOE change for your consideration:

Present Chaparral Plt

	Comm
1-M151A2-PL	AN/VRC-47
4-M48s-1/SQD	AN/VRC-47
1-M561-PSG	None

Present Vulcan Plt

	Comm
1-M113A1-PL	AN/VRC-47
4-Vulcans-1/SQD	AN/VRC-47
1-M151A2-PSG	None

New Chaparral Plt

	Comm
1-M113A1	AN/VRC-47
4-M48s	AN/VRC-47
1-M151A2	AN/VRC-47

New Vulcan Plt

	Comm
1-M113A1-PL	AN/VRC-47
4-Vulcans-1/SQD	AN/VRC-47
1-M151A2-PSG	AN/VRC-47

The platoon leader and platoon sergeant both need communication to employ, command, and control effectively. Armor and infantry platoon sergeants have (and need) communication with their platoon leaders. I suggest C/V platoon sergeants also need communication.

The M561 is inadequate for the operation of forward area air defense. The platoon sergeant needs a vehicle that is quick and responsive. The platoon leader needs a vehicle that can go anywhere a Chaparral/Vulcan can go. The M151A2 for the platoon sergeant and the M113A1 for the platoon leader are very good for this purpose.

I realize this change will not occur quickly, but I would like to suggest that in any forward area air defense system, the platoon leader and platoon sergeant need communication and also mobility to keep up with the fast changing tactical situation.

ALLEN J. KIEZER
2LT, ADA
C Btry, 3d Bn, 61st ADA
APO 09076

The equipment for the present Chaparral/Vulcan platoons presented in your letter does not reflect the current DA published Tables of Organization and Equipment (TOE) equipment requirements for these platoons. The difference between TOE requirements *and Modified Tables of Organization and Equipment (MTOE)* authorizations *generates many questions relating to personnel and equipment actually on hand in a given organization.*

TOE have universal application to all like TOE units Army wide. Headquarters TRADOC is the proponent for TOE. The MTOE modifies the basic TOE to meet specific operational requirements and/or funding, personnel, and equipment constraints imposed on major commands. Major commands are the proponent for MTOE.

TOE 44-327H with Change 12, ADA Battery Vulcan and TOE 44-328H with Change 11, ADA Battery Chaparral include the following equipment for the Chaparral and Vulcan platoons:

Chaparral Platoon

1 Carrier Personnel Full Tracked Armored
1 Truck Utility ¼ Ton
1 Radio Set AN/VRC-44. This radio has one receiver/transmitter and two auxiliary receivers. It permits the platoon leader to operate in the battery command net, the platoon command net, and the supported unit command net.

Vulcan Platoon

1 Carrier Personnel Full Tracked Armored
1 Truck Utility ¼ ton
1 Radio Set AN/VRC-44. This radio provides the platoon leader the same operational capability as noted for the Chaparral platoon leader above.

The Special Analysis of Net Radios (SPANNER) study placed constraints on the proliferation of radios in tactical units. Although it is desirable for the platoon sergeant to have a radio, it could not be justified as required under SPANNER guidelines. – Ed.

MORE ON WHO'S BEST!

Dear Sir:

I find the dispute between members of 3/61 and 2/67 ADA over the best divisional ADA unit for the USAREUR Chaparral ASP of 1975 very interesting. What would appear to me to be most relevant is who finished first USAREUR-wide at the ASP.

If you examine the record as to who was rated tops in Chaparral ASP in USAREUR for 1975, you will find that 2/60 ADA was #1. DCSOPS, USAREUR can confirm this for you. 2/60 and 6/56 ADA are corps-type battalions, and their Vulcans are towed rather than self-propelled. But their Chaparrals are the same as any other C/V battalion's.

Regarding the 1976 Chaparral ASP, let me put a question to bed before someone comes in claiming that they finished #1. There was no USAREUR evaluation of this ASP. Any evaluation conducted at the ASP was strictly in-house by the firing unit and had no relationship to any other battalion's score. I was in the appropriate position to know this as OIC for Chaparral ASP Range Safety and Operations.

GEORGE P. RIGGS
CPT, AD
S2, 108th AD Group

BEST PERFORMING CHAPARRAL UNIT

Dear Sir:

Please print the following in AIR DEFENSE Magazine:

Ende von der Goshichte

To set the record straight once and for all ("Best in USAREUR 75," April-June 1976 sue), the Chaparral personnel of Batteries B, and C of 2d Battalion, 60th ADA do not preface their distinction as the best Chaparral Unit by "divisional or nondivisional" TOE Unit in USAREUR. We simply state that the Battalion score of 91.09 percent was enough to earn 2/60 the title, "Best Performing Chaparral Unit in USAREUR during the 1975 Chaparral annual service practice, conducted at Namfi, Crete.

Any question as to the authenticity of this title can be answered by viewing the USAREUR Chaparral ASP Trophy, which is now permanently displayed in our Battalion Headquarters trophy case.

Keep trying 2/67 ADA, it's a long way to the top.

STEVEN E. GARNER
1LT, ADA
Asst S-3, 2d Bn, 60th ADA

JAMES J. CRAVENS, JR.
MAJ, ADA
S-3, 2d Bn, 60th ADA

CREDIT IS DUE!

Dear Sir:

Request that full credit be given regarding the article titled "Air Defense: The Excalibur of the Corps and Division Commander" in the April-June 1976 issue of AIR DEFENSE Magazine.

The document upon which the article is based is a 1974 US Army War College classified Group Research Project titled "An Overview of Combat Air Defense Requirements for the Future." A total of five air defense officers were involved in the effort. In addition to COL Joe House (Executive Officer to CINCUSAREUR) and myself were LTC(P) Joseph L. Hunter (HQ TRADOC), COL J. Hollis V. McCrea, Jr. (Commander, 108th Group (C/V)), and COL Thomas Crowe (Reserve).

The article drew heavily on the separate sections of the research paper written by these officers and their contributions should be recognized.

RUSSELL W. PARKER
COL, ADA
Project Manager, Army Gun Air Defense Systems (ARGADS), DARCOM

ASSAULT PLATOON TACTICS

Dear Sir:

With the deployment of the TRIAD Improved Hawk battery, new dimensions in tactics are possible to establish the air defense umbrella over the battlefield. Though there are many similarities in operations between the Self-Propelled Hawk battery and the TRIAD battery, the latter's increased communication efficiency, the addition of the automatic data link from the deployed platoon to the BOC, and interior system improvements will permit a more sophisticated approach in employment than was previously possible.

In Self-Propelled Hawk, the deployable platoon, controlled from the battery minus by FM radio, added flexibility to the battery commander's inventory of tactics. Its main limitation was the excessive length of time involved in passing early warning and the ease with which communications could be jammed. On the plus side, the rapid deployability of the platoon lent itself to the support of highly mobile elements of armor and mechanized infantry. During the REFORGER exercises conducted in USAREUR in 1974, Batteries A and C, 3d Bn, 60th ADA, moved these platoons continually in support of the brigades of the 1st Armored Division — a total of 21 times for Battery A and 19 times for Battery C. Now we have gained, as a logical evolution, a system only slightly less agile and far superior in engagement capability than SP Hawk. This extension of capability calls for some innovative changes in tactics.

One tactic utilized in REFORGER 74 by Battery A's deployed SP platoon against incoming hostile aircraft was designed to prevent the pinpointing of the platoon's location. This was a quick-shoot method. The SP platoon's high-power illuminator radar was placed in false radiate. The continuous-wave acquisition radar was left in radiate but taken out of rotate and the antenna positioned facing away from the FEBA. Early warning was passed to the platoon command post from the battery minus by FM radio. When the assigned track was approximately 25 km from the platoon, operators brought the HPI to full radiate and placed the CWAR in rotate. Using this method, the platoon was able to engage most of the targets designated with little difficulty. The limiting factor in the use of this tactic was encountered during saturation runs against the battery defended area. Insufficient time was available for the passing of early warning to the platoon since everyone in the BCC literally had his hands full. With the full integration of the deployed TRIAD platoon into the TADL system, the advantage of such a tactic becomes evident. Undue equipment malfunction was not experienced using this method, and the possibility of pinpointing the platoon location with enemy DF equipment was lessened. This tactic could result in giving incoming enemy pilots quite a surprise.

The agile nature of the deployed TRIAD platoon cannot help but tempt the commander to deploy it much closer to the FEBA than strict doctrine suggests. Recognizing that moving too close will make it vulnerable to enemy heavy artillery inspires heedful caution but not so much so that the opportunity to extend the battery's coverage well past the FEBA is ignored. Such a tactic would require numerous moves but would pay off in aircraft kills. In the offensive environment, the extension of the air defense umbrella forward of the FEBA will assume critical proportions. The speed with which the platoon can emplace and march order, coupled with improved engagement capabilities and correct, timely intelligence (an obvious requirement), means that the air defender can impact upon enemy aircraft activities sooner than he anticipated.

Camouflage effort as demonstrated by Battery A, 2d Bn, 55th ADA (Air Defense Trends, October-December 1975) has shown what can be done in a desert environment, but experience in USAREUR has shown that such efforts can be exceedingly effective regardless of the type terrain. The shortcomings of the new lightweight camouflage screening system (LWCSS) mentioned in the article can be overcome by using two nets and the quick release feature. When the CWAR is in use, the two nets are released from each other and lowered below the transmit portion of the antenna. Experience with these nets during June 1975 by Battery A, 3d Battalion, 60th ADA, indicated that any employment that broke the expected outline of the radar materially increased the difficulty in visually detecting it. Army Materiel Systems Analysis Activity's (AMASAA) Technical Report No. 140, dated September 1975, also gives some valuable information on the use of dispersion and camouflage in relation to site survivability. The extent of camouflage effort should increase in proportion to the proximity of the platoon to the FEBA and the length of time it has been in location.

The development of tactics for use of the new TRIAD Improved Hawk battery is limited only by the imagination of the commanders deploying it. As more experience in the field is gained by such units as 3d Battalion, 60th ADA and 3d Battalion, 7th ADA, new and more sophisticated ideas than those expressed here will develop. The TRIAD concept has been proved by Self-Propelled Hawk and will be further validated with the much more capable Improved system.

DAVID K. WHITWILL
CPT, AD
S3, 3d Bn, 60th ADA

GLOS AND "FIGHTER JOCKS"

Dear Sir:

I have received the past issues of AIR DEFENSE Magazine that you sent to the 23d Tactical Fighter Wing here at England AFB.

I wanted you to know that the magazines were well received by the three squadrons. As I'm sure you're well aware, the pilots that fly in the USAF have an insatiable desire to read everything in print on air defense weapon systems. That desire extends beyond foreign systems to include those weapons used by our own forces.

There are ground liaison officers assigned to each of the tactical fighter wings in the USAF. At the ground liaison officers (GLOs) conference to be held at Shaw AFB, SC, in November, it is my intent to inform officers assigned as GLOs of the reception your magazine received from the "fighter jocks."

On behalf of this GLO and the pilots assigned to the "Flying Tigers" . . . Thanks!

MARVIN V. TERRIEN
CPT, Infantry
GLO, 23TFWg

AUSTRALIAN ARTILLERY

Dear Sir:

The School of Artillery in Australia has been receiving regular copies of your publication for the last 2 years, through the courtesy of our American artillery exchange officer. I would like to take the opportunity to tell you how much we appreciate the informative and thought-provoking articles that are so much a part of the magazine. I feel that your publication helps to keep us, in our part of the world, abreast of tactical and technical air defence developments.

May I take this opportunity to congratulate you on the production of such a fine publication and I hope that we may continue to receive our regular copy.

E.P.M. ESMONDE
Major
Senior Instructor Air Defence
Australian Army

Thanks for the kind words! Your American artillery exchange officer will continue to receive copies of AIR DEFENSE for distribution to the Australian School of Artillery. – Ed.

UTTAS FOR AIR DEFENSE

Dear Sir:

I was very interested to read about the Air Defense School's activities in developing training media to be used by air defense organizations in developing their training programs pointed toward acquiring an airmobile capability ("Airmobility for Air Defense," July-September 1976, AIR DEFENSE Magazine). It is certainly obvious that the positioning of air defense elements in the forward battle area is imperative if Army aviation elements are to operate effectively on the high-threat battlefield.

The innovative work, described by CPT Messmore in his article beginning on page 28, is of keen interest to your counterpart training developers here at the Army Aviation Center. Although the CH-47 and the Assault Support Helicopter Company have been assigned to the US Army Transportation School in the way of "proponency," the Army Aviation Center, nevertheless, serves as an integrater in assuring that all aviation units and the aviators assigned thereto have been trained to exploit the full capabilities of the aircraft systems involved. In this regard, you may know that the UTTAS may well be capable of providing the required airlift for air defense organizations and, due to its special capabilities with regard to speed and ability, it may be a more suitable aircraft for this use than is the CH-47. My office will coordinate closely with the training developers at Fort Benning to assure that this possibility is addressed adequately.

COLIN D. CILEY, JR.
COL, FA
Directorate of Training Developments
US Army Aviation Center

INTERCEPT P

MAJOR GENERAL ROBERT J. LUNN

Many comments and inquiries from the field have focused on the Advanced Individual Training (AIT) Program conducted at the Air Defense School. Commanders, NCOs, and junior enlisted personnel alike are inquiring about the qualifications of an Air Defense Artillery (ADA) AIT graduate. In this edition of "Intercept Point," I would like to discuss the ADA soldier's training program and the level of proficiency of our AIT graduates to clear up some of these questions.

The current philosophy of the US Army Training and Doctrine Command (TRADOC) is to train new soldiers effectively and rapidly in order to send the soldiers to their assigned units in a shorter period of time.

In the past, the Air Defense enlistee attended Basic Combat Training (BCT) for 7 weeks and AIT in his MOS for 7 or 8 weeks, depending on the MOS. Supporting TRADOC policy, the Air Defense School has instituted and is refining a self-paced learning process in which the motivated soldier can accelerate his training program. The speed at which the student progresses through the learning steps in each MOS will depend largely on his self-motivation.

Some of the benefits of this program are:

- A saving of money.
- A reduction in training time at Fort Bliss which allows the soldier to arrive at his assigned unit in a shorter period of time. Present figures indicated that 50 percent of the soldiers in AIT accelerate the training program and graduate a week earlier than is scheduled.
- It rewards the capable, motivated soldier.
- Most importantly, it produces a better-trained soldier.

Each trainee spends some time in integrated training, during which he learns the responsibilities of the other members of his team. He does this by rotating through the different crew positions during simulated engagements. The cross-training the soldier receives during these "crew-drills" will speed his transition to an effective team member when he arrives at his unit.

During training, essential standards of proficiency are assured by employing the following instruction techniques:

- Performance-based instruction — Under this principle, the trainee learns by performing the tasks required to accomplish the actual job. Each soldier is required to complete various critical tasks as identified in the soldier's manual for that MOS.
- Performance testing — Every trainee is required to achieve an acceptable standard of performance in each skill/task. Testing is on a go/no-go basis. The trainee who does not reach the required standard of performance will receive additional practice until he does reach it.

• Job relevance — The trainee learns in job-relevant situations. Theoretical or technical matter is presented only when it is needed to learn how to perform a task.

• Individualization — For various reasons, people learn at different rates. Keeping this fact in mind, the goal of ADA/AIT is to accelerate the performance of faster learners and, at the same time, insure an acceptable level of proficiency.

• Quality control — At the end of each major block of instruction, the trainee's proficiency will be tested using hands-on-the-equipment techniques. The student's retention of what he has learned is then tested at the end of the course. This is an assurance that the AIT graduate has achieved an acceptable level of proficiency at this point in his training.

For all Air Defense MOSs, at least two-thirds of the training time is devoted to MOS-related training. The remainder of the time is devoted to training in general subjects and administration.

An ADA/AIT graduate is an apprentice with a basic knowledge in the fundamentals of Chaparral/Redeye, Vulcan, Hawk, and Hercules crewman skills. His MOS-related training includes a significant amount of time devoted to weapon system operation, employment of the weapon system, operator maintenance on the weapon system, aircraft recognition for 16P (Chaparral/Redeye) and 16R (Vulcan), and range firing. However, this training alone does not make the ADA/AIT graduate a qualified gunner. Each 16R fires approximately 360 rounds from the Vulcan, at both ground and aerial targets. A Chaparral/Redeye graduate, in all probability, will not fire a missile. Normally, only two Chaparral missiles and one Redeye missile are fired by each class; however, all trainees do observe their classmates fire.

Remember that the purpose of AIT is to qualify the Chaparral/Redeye, Vulcan, Hawk, or Hercules private to perform duties in his MOS, skill level 10, in a unit engaged in or supporting combat operations. He is not qualified to perform above entry-level skills without supervision, nor is he a qualified annual service practice crewman.

Upon the graduate's assignment, the unit acquires a soldier who has the potential to become a proficient air defense crewman. The extent to which he becomes proficient is largely dependent on the quality of training he receives at his unit and the level of motivation that is instilled in him.

Robert J. Lunn

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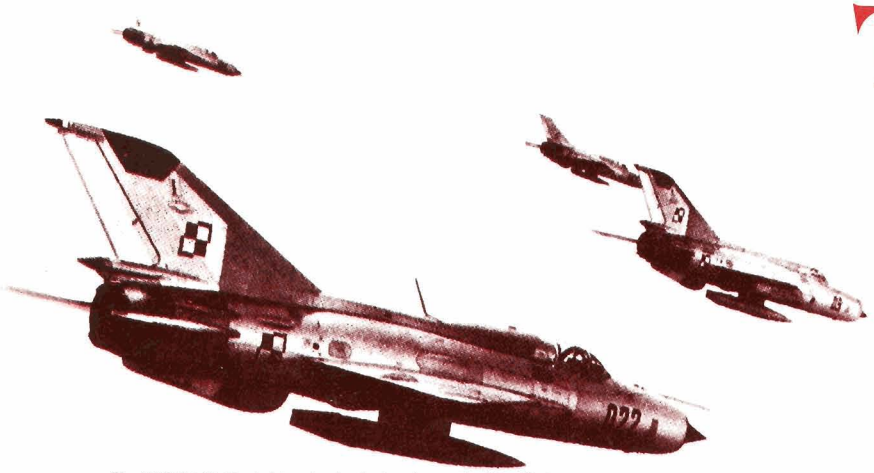

The MiG-21 *Fishbed J* is a dual-role development of the *Fishbed C/D/E/F* fighter, and in its fighter-bomber role is capable of carrying external loads of up to 2,000 kg of droppable stores under the fuselage and on four underwing stations. The standard fighter-bomber weapons load of the MiG-21 *Fishbed J* in service with the Frontal Aviation forces is either four UB-16 containers with 16 unguided 57 mm rockets or four unguided 240 mm rockets.

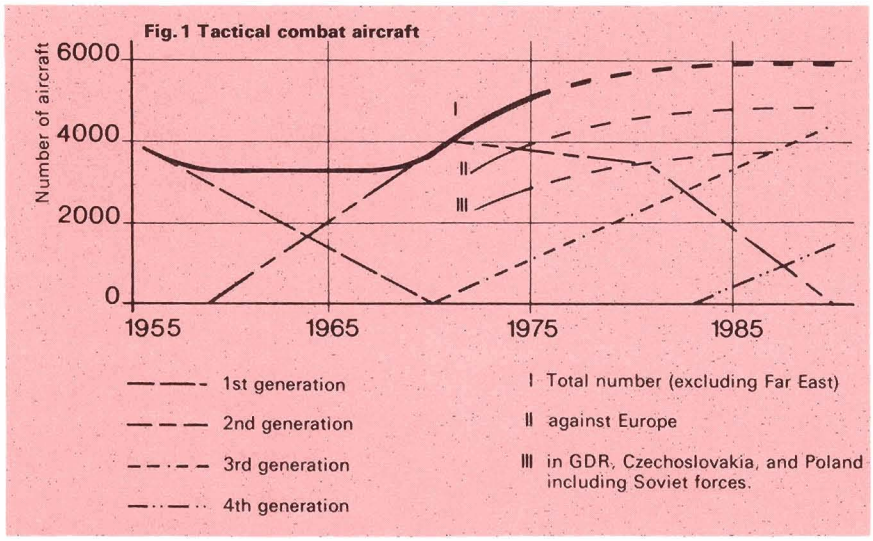

Fig. 1 — Diagram showing the numerical development of the Soviet Frontal Aviation forces. The introduction and phasing out of each generation of combat aircraft is shown in simplified form, and it is clearly apparent that the present rapid increase in third generation combat aircraft has not resulted in any significant decrease in second generation aircraft. Curve I is a plot of the total number of tactical combat aircraft, drawn by extrapolating the trends observed in the 1965-1975 decade. Given corresponding objectives, the total number of aircraft in service in 1980 could well be as many as 6,500.

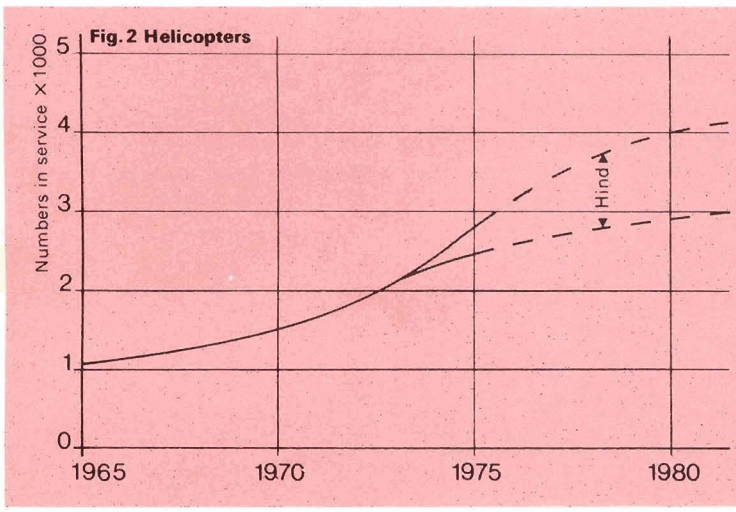

Fig. 2 — This diagram shows the quantitative development of helicopters in the Soviet armed forces. It appears important to mention helicopters in the context of this article since most of them can be used not only for transport but also for combat missions. The effective anti-tank combat capability of the Mi-24 *Hind* is an undoubted fact (see IDR 6/75), and on the assumption that 1,500 *Hinds* will go into service between now and 1980 the total number of helicopters in service would then be 4,500.

by Peter Borgart, Düsseldorf

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At present about two thirds of all Warsaw Pact forces are deployed against NATO. As regards the tactical air forces, known in Soviet parlance as the Frontal Aviation, the proportion of these forces threatening Western Europe is almost 80%, which is considerably higher than for the other services. In view of the fact that they can be used for both offensive and defensive operations, the Frontal Aviation forces are of special significance from the point of view of a surprise attack.

There has been a radical change in the operational concepts of the Frontal Aviation in recent years. First priority is now no longer accorded to air defense, but rather to air attack in all its forms, from close air support up to tactical interdiction missions. But it would be a grave error to conclude as a result of this that East bloc air defense has correspondingly weakened. In the latter sector there has merely been a shift of emphasi in favour of ground based air defense, wit the new SA-8 and SA-9 surface to air missile systems being deployed so as to provide a complete defensive screen.

The first signs of a change in doctrine were already discernable at the Domodjedovo air show in 1967, with more substantive developments becoming visible from 1969/1970 onwards. These consisted of improvements in the performance of older aircraft types, an increase in all-weather capability, the introduction of third generation aircraft for ground strike support missions, the modification of air defense aircraft for a secondary role together with the required training of pilots in this other role.

Present combat aircraft in service with the Frontal Aviation forces have a greatly enhanced performance spectrum in comparison to their predecessors, particularly in regard to payload-range capabilities. In terms of Western operational planning, this means that in the event of an attack by WP states there will no longer be an adequate early warning period. The newly introduced aircraft now enable the WP to launch an immediate offensive from initial positions, i.e., a gradual build-up in forward areas is no longer required.

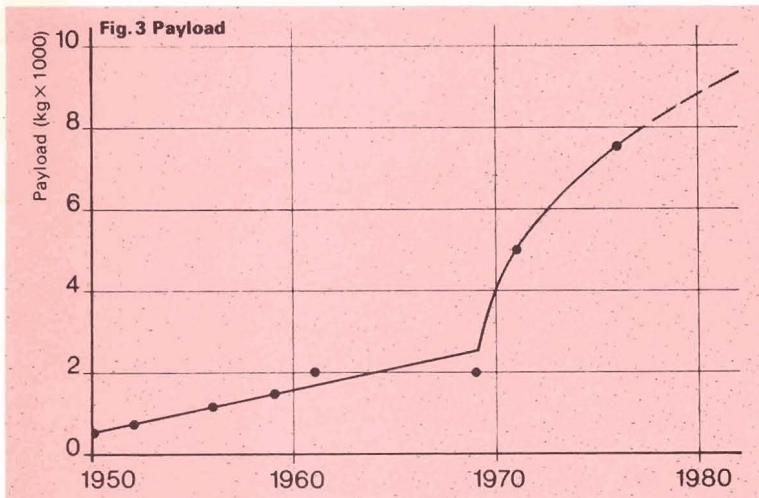
TTACK POTENTIAL WARSAW PACT

Quantitative development

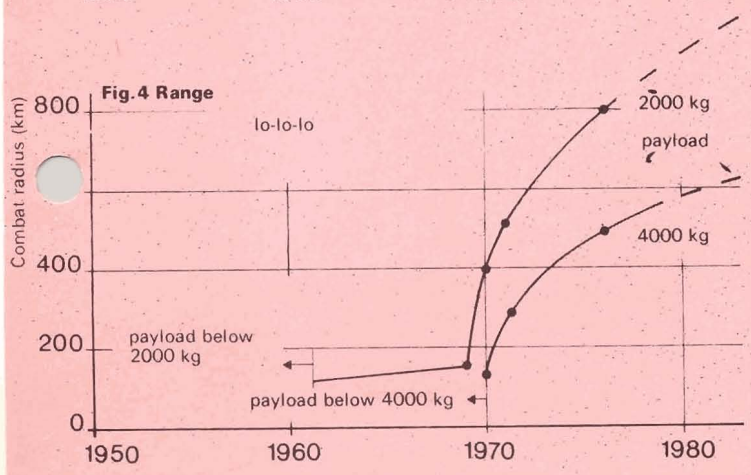
Contrary to information published elsewhere, the total number of aircraft making up the tactical air forces of the WP states shows no tendency to remain constant, let alone decrease. In fact, it has increased very significantly. As shown in *Figure 1*, the total of tactical combat aircraft has increased by over 50% as compared to the 1968 level. This large increase can be explained by the fact that as units receive modern equipment, the older aircraft thus replaced are not withdrawn but are kept in service as an operational reserve.

In mid-1975 the total number of tactical combat aircraft was 5,100 including training aircraft used by units but excluding aircraft operated in the Far East, and 4,000 of these are directly deployed against Europe. A total of 2,800 combat aircraft are stationed in the GDR, Czechoslovakia and Poland, i.e., in the reduction area discussed in the MBFR talks. In addition, there is a constantly increasing number of helicopters in service with tactical units. By mid-1975, their number had almost attained the 2,800 mark, and these were mainly stationed in the Central European reduction area. The combat capability of these helicopters is considerable; their basic equipment includes four UB-16 or UB-32 missile pods containing 16 or 32 unguided rockets with shaped charge warheads. The threat posed by the Mi-24 *Hind*, used primarily in the anti-tank role, is self-evident, and it can be assumed that 250 to 300 helicopters of this type will have entered service in forward areas of the WP by the end of 1975.

The operational combat aircraft of the WP air forces are the MiG-21 *Fishbed C/E* and *J/K/L*, the Su-7 *Fitter A* and Su-20 *Fitter C*, the MiG-23 *Flogger*, and the Su-19 *Fencer*, but apart from these, a further series of other types not previously included in the negotiations will have to be taken into account. These new types constitute an extremely effective operational reserve which is unlikely to receive due consideration in the MBFR talks. Foremost amongst them is the MiG-25 *Foxbat*, used in a high-altitude interceptor role with the Air Defense Forces of the Homeland (PVO), and in a reconnaissance role with the Frontal Aviation Army. *This aircraft is also ideally suited for use as a high-altitude weapons platform for guided stand-off missiles.* The Su-15 *Flagon A*, also flown by the PVO, can be used in an analogous way at very low altitudes, and has excellent low-flying capabilities due to its delta wings designed to take high aerodynamic loads. In addition, the voluminous nose of this aircraft provides space for the necessary avionics, including a terrain-following radar. Then there is the recently-developed Czech L-39 training and ground support aircraft, which belongs to the same category as the *Alpha Jet* and the *Hawk*, and should be of comparable performance, particularly as a ground attack aircraft. Since the L-39 is the successor to the L-29, of which approximately 3,000 were in use with WP air forces, the L-39 will probably have been procured in roughly similar numbers. It has recently become known that a twin-jet variant of the L-39 is also being developed as a pure combat aircraft.



Figs. 3 and 4 — These two graphs show the abrupt increase in combat capability of Soviet attack aircraft accompanied by increases in penetration depth which occurred with the introduction of third generation aircraft in the early 1970s. Even if the total number of aircraft had decreased, the overall air attack potential of the WP states would still have increased. However, since the opposite is true, WP air attack potential has in fact multiplied many times over in recent years.



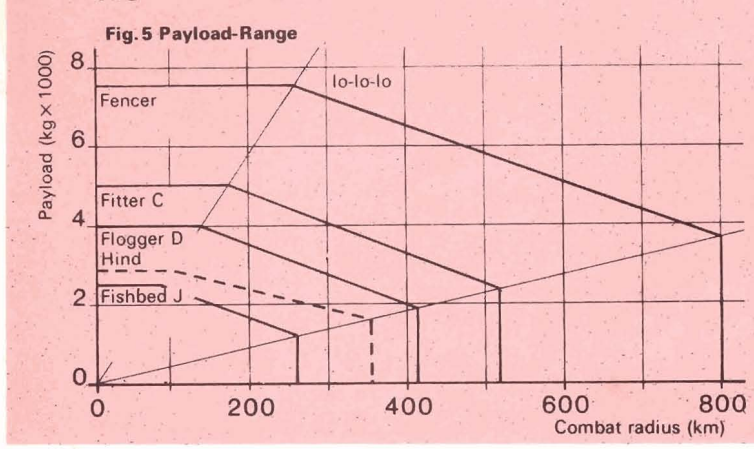
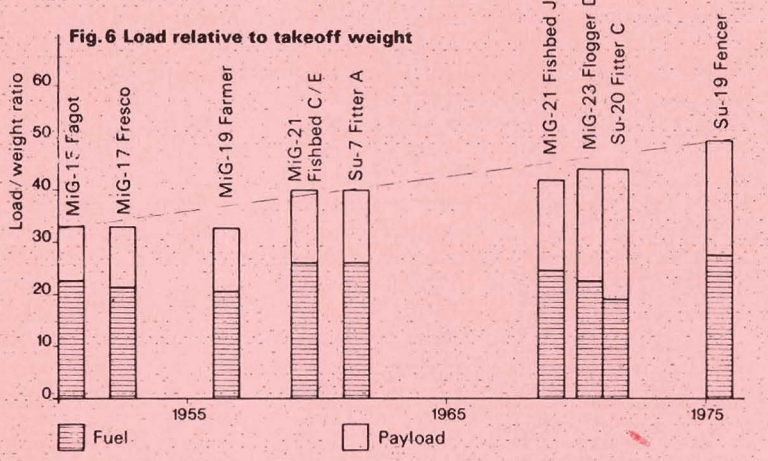


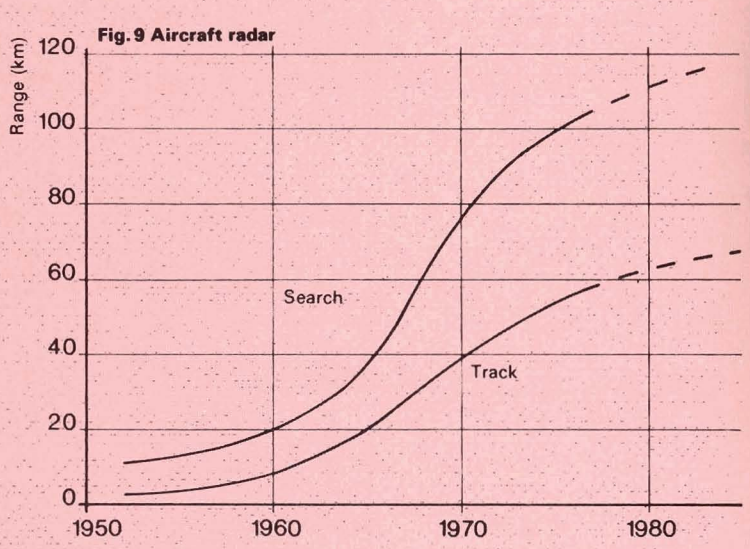
Fig. 5 — This is a simplified diagram of possible low level mission payload-range combinations for the latest tactical combat aircraft now entering service or operational in WP air forces. It clearly shows the underlying operational objectives to be a tactical attack capability with systematic coverage of the entire payload-range spectrum for certain given penetration depths. The fivefold coverage of the 0 to 250 km range zone should be noted, where attack aircraft can deliver weapon loads of 2,500, 2,900, 4,000, 5,000, and 7,500 kg.

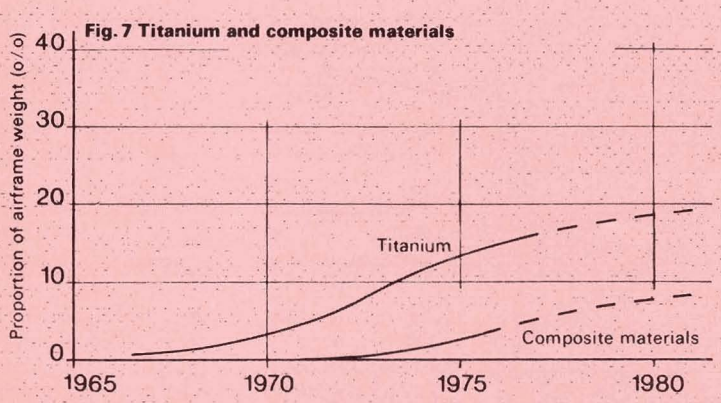
Fig. 6 — This graph clearly shows how the payload plus fuel weight of Soviet combat aircraft as a proportion of take off weight has increased from 33% to almost 50% in the space of 25 years. The proportion of fuel weight depends on the aerodynamic design of the aircraft, being a function of penetration depth, aerodynamics, and specific fuel consumption. The payloads indicated are not absolute maximum values determined by structural limitations, but refer to external loads compatible with missions.

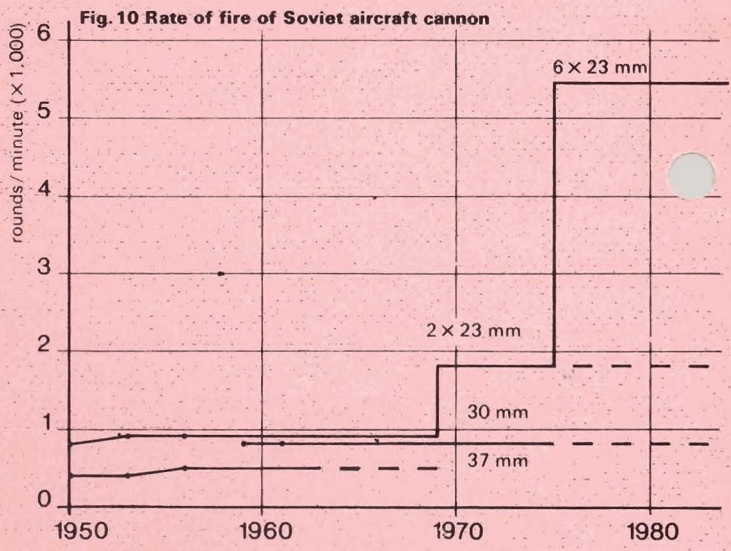
Fig. 7 — The use of titanium in the construction of Soviet combat aircraft began much later than in the West. Initially only used in engines for certain stages of the high pressure compressor, it is now also common in airframe design. The MiG-25 *Foxbat* probably uses the highest percentage, with about 13% of its airframes made of titanium. Wing and tail leading edges as well as the whole of the rear fuselage of this aircraft are fabricated in this material. The curves shown are not average, but maximum values. As far as composites are concerned, there is an even greater technology gap, with development in the USSR only just starting.

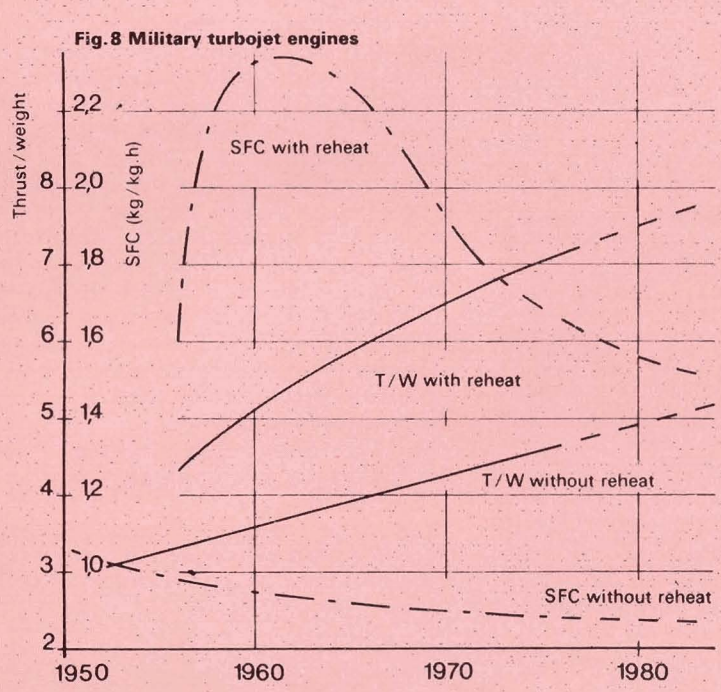
Fig. 8 — The development of Soviet military turbojet engines in terms of their thrust/weight ratio (T/W) and specific fuel consumption (SFC). Intensive materials research, especially in the last few years, has led to higher turbine inlet temperatures, resulting in considerable increases in performance. It is also interesting to note the vast increase in specific fuel consumption that was necessary to increase the reheat ratio from 1.3 to 1.5 in the initial stages of afterburner development.

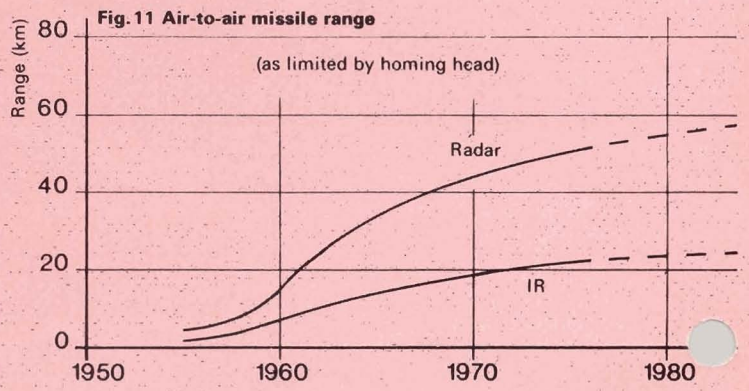












Qualitative development

The technological standard of Western aircraft in the 1950s and 60s was far higher than that of Eastern types. The technology gap in terms of airframes, engines, avionics, and armament was often very great. No doubt this knowledge caused the West to ignore the numerical superiority in aircraft possessed by the WP, since Western military planners had every reason to believe that quality could compensate for quantity. However, the technological gap has since narrowed to such an extent that this type of thinking must now be considered highly dangerous in view of the imbalance existing today. In the years 1969/1970 it became clear to experts that combat aircraft development in the USSR was rapidly becoming a threat.

Vast increases in payload-range performance

For a long time the payload of Soviet combat aircraft remained much below that of their Western counterparts, being only about 5-15% of take-off weight. It must be noted here, however, that the quoted maximum payloads are operational values, and not those defined by structural limitations. While the latter are often quoted for Western aircraft and readily illustrated in impressive loading diagrams, the fact remains that actual operational values for external loads are smaller, since excessive inertial moments would render nap of the earth flying impossible. Hence the 5-15% difference between the values for first and second generation Soviet aircraft and Western aircraft is somewhat diminished. As shown in *Figure 3*, the introduction of third generation combat aircraft profoundly alters this state of affairs, with relative payloads of 25% now being attained. In terms of absolute values the first two decades merely brought an increase from 400 kg to 2,000 kg. Since 1969, this has almost quadrupled to 7,500 kg in a time span of only six years. A typical example of this development is the Su-7 *Fitter A* fighter-bomber introduced in 1961, the payload of which normally only consists of two UB-16 missile containers, i.e. a weapons load of 400 kg with a take-off weight of up to 13.5 tonnes. In contrast, the developed version of the *Fitter A*, the Su-17/Su-20 *Fitter C* introduced in 1971, has a standard payload capability of about 4,000 kg.

The improvements from 1969/70 onwards have not, however, been confined to greatly increased payloads; effective combat radii have also been very much extended. First and second generation Soviet combat aircraft had a hopelessly inferior combat radius to Western aircraft for two main reasons. The first is that Soviet designers traditionally preferred central engine air inlets, and then for second generation aircraft central air inlets with an adjustable inner cone. Both these configurations occupied a large fuselage volume which consequently was no longer available for fuel tanks. Secondly, Soviet aircraft engines then in use had a much higher fuel consumption than their Western counterparts. With the advent of third generation aircraft however, range capability was much improved. New, higher performance engines were developed, and lateral air inlets were adopted, more or less as a necessity in consequence of the increasing diameter of radar antennas. *Figure 4* clearly illustrates how present penetration depths and payloads of Soviet combat aircraft are way above their values of a few years back. In 1969, maximum penetration depth was 150 km with a maximum payload of 2,000 kg, whereas today this has increased to 800 km.

The present day payload-range capabilities of attack aircraft of the Frontal Aviation are shown in *Fig. 5*. The individual curves may be interpreted as maps, which superimposed, show the increases in combat range from a predetermined line and what large weapons loads are feasible in the inner zones with multiple overlapping. It is also apparent from this diagram that the development of WP air offensive capability has not been left to chance, but is in fact the result of a continuing pursuit of certain well-defined operational objectives.

The technology gap closes

Construction techniques and materials — In nearly all respects the technological standard of Soviet combat aircraft remained lower than that of Western types up to the years 1969/1970. The yardsticks for this inferiority are, for example, the specific weights of airframe, engines, equipment, avionics, and armament. These various sources of increased weight all contribute to the fact that for a given take-off weight, the payload (including fuel) is correspondingly less. As is shown in *Fig. 6*, the payload/weight ratio was 33% for first generation aircraft, 40% for second generation aircraft, and is now 50% for the third generation. This implies a decrease in empty weight from 67% to 60% and then to 50%. Although this still does not quite reach Western standards, the performance increase can be said to be remarkable.

The largest single source of empty weight is the airframe, which thus offers plenty of scope for weight reductions. Surprisingly enough, development in this sector in the USSR was very cautious. The conventional design for wings and control surfaces, using skinned spars and ribs, did not vary for many years and is still used today in certain aircraft. The triangular grouping of the main spar, leading edge spar, and the wing root rib can also be described as conventional, with the main landing gear being suspended from the outermost tip of the triangle. This basic design has been used in all swept wing and delta wing aircraft from the MiG-15 onwards, and can still be found today in the *Fishbed J*, the *Fitter C*, and the *Flagon*. Hence the principle has been retained in third generation aircraft. Soviet designers are known to prefer steel for these components, the structures being intended to support point loads, and this practice also contributes toward high airframe weights. But in the last ten years the proportion of titanium has constantly increased and has therefore contributed to a reduction in weight (*Fig. 7*). A great step forward in this respect was made in the development of the MiG-25 *Foxbat*, in which the use of titanium was unavoidable in view of the aircraft Mach 3 capability. Even so, titanium was only chosen for structures subjected to particularly high thermal stresses, such as the leading edges of the wings and tail and the whole of the rear fuselage. Less titanium has been used in the *Flogger* and *Fencer*, but the proportion is still somewhere between 5 and 10% of airframe weight.

The development of composite materials for aircraft construction began in the USSR even later than that of titanium. Even the use of honeycomb sandwich for flaps and rudders is now only in the process of being slowly introduced. As regards composite fibre materials, the time lag between their utilization in the West and the East is greater still, and their use is unlikely to achieve notable proportions before 1980.

Engines — Soviet development of turbojet engines following World War 2 was based on the British Rolls-Royce *Nene*, which was adopted almost unchanged in the MiG-15 and MiG-17. Indigenous designs were rapidly evolved, however, the first production engine with an axial compressor being

Fig. 9 — This diagram shows the performance of Soviet aircraft radar equipment, including that of the MiG-25 *Foxbat* and the Su-15 *Flagon*. The improvements in performance between 1960 and 1970 are remarkable.

Fig. 10 — Graph showing the increase in rate of fire of Soviet 23 mm, 30 mm and 37 mm aircraft cannon. It is clear that the main emphasis has been put on the development of 23 mm guns. This calibre is ideal for use against airborne targets, but only of limited use against ground targets, particularly armoured vehicles. For this reason the development of new 30 mm cannons — 2×30 mm or 6×30 mm — cannot be excluded, especially if it is recalled that guns of this calibre are carried on older aircraft such as the *Fishbed C/E*, *Fitter A*, and the Su-20 *Fitter C*.

Fig. 11 — Since the Soviet Frontal Aviation forces are also responsible for air defense in border regions, the development of air-to-air missiles is also being pursued. This graph includes all the air-to-air missiles at present operational up to the AA-6, which has only been observed to date on the MiG-25 *Foxbat* but could equally well be carried on the MiG-23 *Flogger*. The ranges shown in this diagram are dependent on the capability of the homing head and should not be confused with missile range as determined by maximum flight time.

The MiG-17 *Fresco* — seen here in action over the Golan Heights during the October 1973 War of Yom Kippur — is still used for close air support missions by the Soviet Frontal Aviation and the air forces of the main WP states. It should be replaced in the near future by the *Fitter C* and possibly by *Flogger*.

built into the MiG-19. The overall development of Soviet military turbojet engines as a function of the thrust/weight ratio and specific fuel consumption is shown in *Figure 8*. The thrust/weight ratio of an individual engine without afterburner has increased from 3.0 in 1950 to about 4.7 today, which is still a remarkably low value compared with Western engines. The comparison is equally unfavourable in the case of specific fuel consumption, which was very high due to the relatively low turbine inlet temperature. Only the introduction of third generation aircraft brought engines exhibiting the characteristics of Western component development and correspondingly improved performance. Apart from the modified NK-144 engine of *Backfire*, a military bypass engine for combat aircraft does not yet exist in the USSR. This should not be attributed to inferior technology, but rather to the fact that straight turbojet engines are easier to maintain.

Avionics — The electronic equipment has always been a weak point of Soviet aircraft, and despite many advances, standards are still noticeably below those current in the West.

The specific weight of Soviet avionics equipment is higher than comparable Western equipment by a factor of 1.5 to 1.7, and space requirements are often much greater, with adverse consequences on fuel carrying capacity. The reason for this is due to the necessity to stick to the old techniques — the use of valves, for example, is still widespread. Transistors are only being introduced very gradually, and no printed circuits are used. For many years Soviet on-board radars were only suitable for ranging, having no target search or tracking capability. The first equipment possessing these capabilities was introduced on the *Fishbed D/F*. The development of on-board radar in Soviet combat aircraft right up to the *Foxbat* and *Flagon* is illustrated in *Figure 9*. Today the *Fencer's* radar probably possesses terrain following capability and those of the *Foxbat* and *Flagon* a certain look-down shoot-down capability.

For a long time also the performance of navigation systems remained so inadequate that all-weather missions could only be flown under very limited circumstances, if at all. Even today some tactical attack aircraft are still guided by means of terrestial navigation, although this is no longer the predominant method, guidance being usually effected by ground radar control stations and Doppler and inertial navigation systems. As regards radar warning systems, however, Soviet equipment has always been somewhat superior to that available on Western aircraft. Such systems have been used on Soviet aircraft ever since the introduction of the *Fishbed C/E* in 1959. The latest models enable the pilot to roughly localize emitting enemy aircraft. Very little is known about their IFF equipment, but the problems are no doubt similar to those encountered in the West.

Development has been very active in the electronic warfare sector, where the whole spectrum of possibilities is being utilized by the tactical air forces. Combat aircraft equipped with ECM pods or specially redesigned for electronic warfare purposes are allocated to each unit. Apart from this there are special ECM aircraft such as the An-12 *Cub C* transport and older bombers such as the Yak-28 *Brewer*, the Il-28 *Beagle*, and the Tu-16 *Badger*. Great operational use is made of decoys, all kinds of methods and techniques being used — even chaff ammunition is fired by 23 mm and 30 mm aircraft cannon. Unguided rockets could possibly also be fired from the UB-16 and UB-32 pods, where the five inner tubes could, for example, be reserved for this purpose.

Armament — In recent years, after a period of unlimited faith in missiles, development of aircraft cannon has once again been actively pursued. As is shown in *Figure 10*, a 23 mm twin-barrel cannon was introduced in 1969 and a six-barrelled 23 mm revolving cannon in 1975. These are highly sophisticated weapons, the rate of fire of which has presumably been kept down in order to increase reliability. They can be expected to remain in service until the 1990s.

There has also been continuous development in air-to-air missiles, as shown in the

AA-6 which has recently become operation. This heavy missile, fitted with either a radar or an IR homing head, constitutes the main armament of the MiG-25 *Foxbat A* high-altitude interceptor, but could also be used on the MiG-23 *Flogger*. The AA-6 is presumably the successor to the older AA-4 *Ash* and AA-5 *Awl*. A follow-up to the AA-2 *Atoll* and AA-3 *Anab* must be expected in the near future. *Fig. 11* shows the maximum ranges of Soviet air-to-air missiles, as determined by the performance of their homing heads.

As to the air-to-surface missiles equipping the tactical air forces, only the ageing radio-guided AS-7 *Kerry* need be mentioned. New developments are to be expected in this field. Although nothing is known about the development status of guided bombs, these are likely to be used in the future, and bearing in mind the advances in Soviet laser technology, their guidance systems are likely to be based on this principle. Other free-fall weapons already in use are high explosive, incendiary, and demolition bombs of 100, 250, 500, and 1,000 kg, napalm containers, and boosted concrete-breaking bombs of 250 and 500 kg for the destruction of runways. Besides these there *is a whole assortment of cluster weapons ejected from or dropped in containers, such as fragmentation bombs, high explosive incendiary bombs, straight incendiary bombs, and shaped charge projectiles for anti-tank combat. In order to make optimal use of the various weapons stations, multiple rack systems have no doubt also been developed.*

Infrastructure — Besides the rather spectacular and disquieting improvements in aircraft performance and the increased training of pilots for a secondary role, much has been done to improve combat effectiveness on the infrastructure side. Immediately following the third Arab-Israeli war in 1967, airfields in forward areas were equipped with protective emplacements for aircraft, and it has also been observed that in recent years, increasing quantities of fuel and ammunition are being stored in the USSR's frontal zones. Preparations for mobilization of operational reserves of combat aircraft must also be seen in this context, and in spring and autumn every year 100,000 troops of the Group of Soviet Troops in Germany are rotated, for which Aeroflot transport aircraft are used on a regular basis.

To sum up, therefore, these last few years have witnessed the quiet build-up by the East bloc of a huge air attack potential directed against Europe. Besides a massive numerical superiority in combat aircraft there has been an uncomfortably rapid closing of the qualitative gap. In addition, the existing degree of standardization must not be overlooked, for in times of conflict, this could mean as much as a 20% increase in effective combat capability. The operational readiness status of Soviet Frontal Aviation units is on a permanently high level, and is continually improved and checked on by practice alerts. As part of these practice alerts, units are redeployed from their bases to small auxiliary airfields, of which there are several hundred in frontal areas. This is made possible by the fact that combat aircraft are equipped with heavy-duty landing gear using tyre pressures of 7.0 to 9.0 atmospheres, gravity refuelling systems, built-in engine starting equipment, and take-off aids in the form of JATO rockets. Another significant factor is the ability of pilots to service their own aircraft.

The operational doctrine of the Warsaw Pact, which calls for the immediate availability of units in frontal areas, requires high manning and equipment levels. At present, this requirement can be said to be satisfied. For the West, the biggest danger is no doubt represented by the Frontal Aviation forces, since because of the fact that the long range of its aircraft no longer makes an intermediate stop at first-line airfields necessary, this is eliminated. At the same time the increased range of its new combat aircraft renders the use of tactical anti-aircraft missile batteries superfluous, whereas previously these had to be made ready in a time-consuming procedure. The elimination of these two extremely valuable indicators from an intelligence point of view now makes a surprise offensive at any point in time a distinct possibility — surely reason enough to take account of this danger in the MBFR talks.

The standard armament of Soviet attack aircraft includes unguided 57 mm rockets in external pods. These rockets can be fitted with shaped charge, fragmentation, or chaff dispensing warheads, rendering them suitable for engaging a wide variety of targets. The photo shows a UB-16 container with 16 unguided 57 mm rockets on the inner weapons station of a MiG-21 *Fishbed*.

the

MAJOR HAROLD S. GREENBERG

The Army National Guard of New Mexico has been authorized four automatic weapons (Duster) battalions for the past several years. This figure is likely to remain constant because with four similar battalions in other states they represent the organic air defense battalions of the eight Reserve component divisions.

With the return of air defense battalions to the Active Army divisions, it was only a question of time until the Reserve component divisions were authorized air defense battalions of their own.

In the fall of 1974, meetings were initiated at Fort Bliss, Texas, between the Reserve component divisions and the automatic weapons battalions in an effort to organize an "association" program. Present at the meeting were personnel from the state headquarters and the National Guard Bureau. The "association" program mirrors the "affiliation" program (AR 11-29, dated 12 Dec 75) in many respects, but because of differences and availability of funding is not as comprehensive. As a result of the meetings, the eight National Guard Duster battalions were each "associated" with a Reserve component division.

It was noted at the meetings that there were no Airspace Management Elements (AME) in the Duster battalions. Efforts were initiated to have these elements authorized each of the battalions.

In the fall of 1975, the four automatic weapons battalions of the New Mexico Army National Guard were authorized Airspace Management Elements. This marked the first time these battalions had become involved in the airspace management problem. The organization of the AME in the Duster battalions was similar to those of the Chaparral/Vulcan battalions of the Active Army. (See Table I).

TABLE I

Title	*Grade*	*MOS*
Operations Officer	Major	1174
Asst Operations Off	Captain	1174
Operations Sergeant	SFC	16H40
Asst Operations SGT	SSG	16H40
Radio-Telephone Op	SP4	05B20

This is but the air defense element of the AME. The divisional aviation element furnishes the aviation half of the section.

Initially, authorization of the AME to the Duster

battalions did not mean very much. There was no core of experienced trained AME personnel in the State of New Mexico with which to staff the sections.

The State Director of Plans, Operations, and Training (DPOT) reviewed the situation and requested the assistance of the Senior Army Advisor who directed that I provide training for the four sections. He further coordinated with Army Readiness Region VIII for the assistance of the Branch Assistance Team-Air Defense (BAT-AD) located in Santa Fe, New Mexico, for additional support. At that time, BAT-AD consisted of MSG Leon LaFramboise, a highly experienced air defense specialist.

were all part-time soldiers. They had to be trained during their once-monthly drill periods. The drills were conducted on Saturday and Sunday and were of sixteen hours duration. The four sections were located in Roswell, Las Cruces, Albuquerque, and Tucumcari, New Mexico. The nearest two sections were 162 miles apart. If the training were conducted at each section's home station, it would have to be presented on four different occasions over a period of at least two months. For this and other reasons, we decided to conduct the training for all sections at Albuquerque during one weekend drill.

If we were to accomplish our objectives, however, we would not be able to present more than the class-

guard takes AME!

I was selected for this project because I had instructed in Airspace Management at the Air Defense School, and served as the Chief, Airspace Management Element, 2d Infantry Division, during my tour in Korea in 1971-1972.

During the fall of 1975, BAT-AD and I developed a plan for the training to be conducted. Our first action was to review Army Training Program 44-10, 26 November 1969, Air Defense Section, Airspace Control Element, Tactical Operations Center. The ATP was developed with an Active army training environment or post mobilization training period as the training atmosphere. It required many hours of training time.

MSG LaFramboise and I decided that a prerequisite to attend the training would be experience in air defense operations or with an Army Air Defense Command Post (AADCP). This allowed us to eliminate many of the ATP subjects.

We next tackled the problem of determining the objectives, scope, and time required to conduct the training. The objectives were fairly simple to determine. We were going to train the AMEs of the four battalions to function as part of the Divisional Tactical Operations Center (DTOC) of their associated divisions. To accomplish the objective, we must conduct classroom instruction, develop section standing operating procedures, and finally conduct some sort of practical exercise tying all instruction together. Time available appeared to be the main constraining factor. The personnel to be trained

room instruction during the initial training period. We discussed our decisions with the Senior Army Advisor and the DPOT; they concurred with the plan.

The next task we tackled was to assemble the appropriate reference material. This was more difficult than it sounds. There is very little approved doctrine for airspace management. The usual references were used (FM 101-5, FM 61-100, etc.), along with these sources: • FM 44-1 "US Army Air Defense Artillery Employment" • FM 44-10 (Test) "Army Airspace Control Doctrine" • TC-101-5 (Final Coordination Draft) "Control and Coordination of Division Operations" • FM 100-44 (Test) "Army Procedures for Airspace Management in a Combat Zone" • TRADOC / FORSCOM TT 100-42 (Test) "Procedures for Airspace Management in an Area of Operations" • US Army Air Defense School (USAADS) Working Paper "Airspace Management Proposal" • Gallant Shield '75 "Divisional Airspace Management Element (DAME) Daily Checklist" • Numerous students handouts and lesson plans from USAADS.

In all of our references there was no program of instruction to cover our unique situation. We needed to "roll our own." Development of a performance oriented lesson plan began by making several assumptions.

The initial assumption concerned the time available. As has been discussed previously, training was to be conducted at Albuquerque during one week-

end drill. This meant that of the 16 hours available during a drill, eight hours would be required for travel from home stations to the training site. We assumed that training would commence at 1200 Saturday and end at the same time Sunday.

Some three years had passed since the Echelons Above Division Study (EADS) had been approved in concept, therefore, we assumed that a review of the organization of the Army in the field would be required.

USAADS had been working on a reevaluation of air defense weapon systems employment and deployment to support committed divisions. A new doctrine of one direct support battalion for each committed division was advocated and was contained in the advance copy of FM 44-1. The members of the AMEs of New Mexico have had little opportunity for exposure to Hawk. It was therefore assumed that a Hawk orientation would be required in our program of instruction.

The standards applied required the preparation of all air defense portions of orders, plans, and standing operating procedures (SOP) to effectively monitor the use of the airspace over the division area of operations, function as alternate to division AADCP, and advise the division commander, G3, and staff on the allocation and reallocation of air defense resources available to the division.

To accomplish the training objective we developed nine intermediate training objectives (ITOs). Each ITO had its own task, conditions, and standard.

The first ITO's task was to effect in each AME an understanding of the organizations of the Army in the field, including organization for air defense in a theater of operations. The conditions were that the AME would coordinate with other elements of the airspace management system. The standard was that the AME members be competent to brief the division commander and his staff on air defense matters.

The task of the second ITO was to effect in the

A similar assumption was made as rationale for inclusion of a Redeye block in the instruction. The knowledge of Redeye would assist the AME in its accomplishment of the allocation and reallocation of air defense function.

The final assumption dealt with the working environment of the AME. The AME is an element of the division tactical operations center (DTOC). Due to the previous nonassociation with divisions, we assumed the AME personnel would be unfamiliar with the DTOC in general. It was therefore decided to include an extensive DTOC block of instruction.

Proceeding with development of the lesson plan, the statement of the training objective (to train an airspace management element of an M-42 battalion in the operations of its section) was taken from FM 21-6 (Military Training).

Conditions for the performance of the task were: When organized according to the Table of Organization and Equipment (applying current air defense doctrine and procedures) operate effectively as an AME in a DTOC.

AME an understanding of composition of the Hawk battalion, its capabilities, limitations, and general deployment guidelines. The conditions and standard for this task were: Given one self-propelled Hawk battalion in direct support of the division, the AME must be competent to advise the commander and his staff on matters relating to the battalion.

The next (third) ITO was a result of the Redeye assumption. The task required the AME to understand the organization of Redeye elements of the division, its capabilities, limitations, and general deployment guidelines. The task is accomplished when the AME can advise the commander and his staff in all matters pertaining to Redeye and the division's organic Redeye elements.

The fourth ITO required the AME to understand the organization and functions of the DTOC (Task). The condition and standards of this task were: Given the DTOC, understand the general composition of a DTOC, its functions, communications nets, and security requirements.

After establishing the first four intermediate

training objectives, we were prepared to delve into airspace management element peculiar subjects.

The fifth ITO was a discussion of the AME organization and equipment, including display boards, radios, remote control units, and how various airspace management elements in the Active Army used them. This was accomplished using slides and a representative set of display boards.

The last four ITOs were developed from the tasks specifically delineated for the air defense personnel in the AME. The four tasks included: coordination of the use of airspace over the division, coordination of Army air defense operations, collection and dissemination of intelligence gathered by air defense units, and finally, resolution of conflicts in the use of division airspace. I shall not present further detail on the development of these four intermediate training objectives, since they are self-explanatory and are the tasks outlined for the AME in paragraph J-19 of FM 101-5.

This completed the development of the training objectives for the performance oriented lesson plan.

Paragraph 5 of the lesson plan (Sequence of Activity and time) totals seven hours and twenty minutes, which is within the eight hours to conduct the training.

When the lesson plan was completed we reviewed it to determine whether it properly prepared personnel for the next phase of training, the map exercise. We also wanted to evaluate the training to be conducted to determine whether the operations officers could develop their section SOPs from the class content and handouts. MSG LaFramboise and I believed that a foundation had to be laid that would enable the students to progress to the next level of training and to write the documents necessary for their sections to function effectively.

To conduct a map exercise would require the airspace management element in each of the battalions to develop a section SOP (their division) and write its section SOP to conform to the division SOP. The map exercise would require them to analyze a division operations plan/order and develop the air defense portion. An exercise was then developed that was based upon a typical division operations order and a previously used AADCP practical exercise.

The scheme of the map exercise was as follows:

1. Conduct the exercise one to two months after the classroom instruction. The sections were told to use this interim time to develop and write their section SOPs. The SOPs would be used and tested during the map exercise.

2. On Saturday morning of the weekend the exercise was to be conducted, we would review any subject requested by the section. During this period we would also critique the SOP that the section had developed.

3. Concurrently, the AME equipment (radios, display boards, forms, manuals, etc.) would be physically assembled and made ready for operations.

4. After 1200 Saturday, we would assume the role of Division Commander, G3, G2, etc., and brief the airspace management personnel on the upcoming operation. We encouraged the Battalion Commander and S3 of the unit to attend the briefings. We believed this would build the teamwork so necessary between the Commander, S3, and AME for the concept to function at maximum effectiveness.

5. After the briefing, the draft division operations order would be issued to the AME. Section personnel would then develop the air defense portion of the order and appropriate annexes. An airspace utilization annex would also be drafted, although we explained that the aviation personnel in the AME would also make a contribution to that annex.

6. Sunday morning the map exercise would commence. This was a command post exercise with the AME personnel monitoring radio nets, making reports, and performing airspace management functions, as they would be expected to do in a tactical situation. The exercise lasted approximately four hours. This portion of the exer-

cise involved a sequence that included events normally heard when monitoring the battalion operations and command nets. In addition, airspace management type inputs were fed into the AME by controllers playing the part of the division fire support coordinator, Air Force personnel, G2, G3, and Army aviation personnel. The AME was required to monitor the nets and react to information overheard as well as information received from DTOC sources.

The planning was now complete. We had reached the execution phase of our training program. On the weekend of 31 January 1976, the classroom instruction was presented to the members of the battalion AME section. Members of the 111th Air Defense Brigade of the New Mexico Army National Guard were also present.

The instruction was well received by all personnel present. Numerous questions asked during and after the classes attested to student interest. While presenting the instruction I perceived, and subsequently verified, that the prerequisite of experience in an air defense operations section, and/or an Army air defense command post, was not being met. In fact, almost forty percent of the men in the lower enlisted grades had no experience. The major problem that surfaced among the officers and senior noncommissioned officers was a lack of familiarity with division organization and operations. This caused some difficulty, which was overcome by expanding the instruction on division organization on the spot.

If I were to repeat the process, I would expand the portions of the instruction dealing with division organization. We covered all these areas, but it was apparent that much of the material was not retained to a degree permitting easy recall in an actual situation.

The map exercise half of the program was completed on 15-16 May 1976. In all cases the exercise was favorably received. It was especially evident that an offshoot we had desired (the teamwork between the S3, Commander, and AME) was being accomplished more effectively than we had anticipated. In every case, the battalions requested additional similar exercises. The succeeding exercises would need to be increasingly more complex, thereby assisting the section toward continued development.

I have attempted to accomplish this review objectively, and I would have to assess the project with an overall evaluation of successful. This is not to indicate that the Airspace Management Elements of the New Mexico National Guard are, at this point in training, capable of operating in a tactical environment with complete efficiency. I believe they are capable of operating in a tactical training environment with their associated divisions. There is still much to be learned, and the sections still have to build upon the foundation that has been laid. They must strive to build their proficiency to a level that will permit them to operate effectively in any situation into which they may be thrust by the force of events.

If the title of this article is to be believed, the airspace management sections must now raise their sights and "AME" for superior performance.

MAJ Greenberg wrote the foregoing article while he was advisor to the 4th Bn (AW) (SP), 200th ADA, NMARNG. His experience in air defense includes: Assistant Division Air Defense Officer, 2d Inf Div., S3, 4th Bn (C/V) (SP), 61st ADA, Instructor in Command and Control at USAADS, and numerous HAWK assignments, including battery command in Vietnam. He is a graduate of Pace University, and C&GSC. He is currently enroute to the 2d Bn (C/V) (SP), 59th ADA, 1st Armored Division.

AIRSPACE MANAGEMENT ELEMENT LESSON PLAN

A. TRAINING OBJECTIVE

TASK: To train an airspace management element of an M-42 battalion in the functions and operations of its section.

CONDITIONS: When organized according to the TOE and applying current air defense doctrine and procedures, operate effectively as an AME in a Division TOC.

TRAINING STANDARD: Proper and timely preparation of all air defense portions of orders, plans, and SOPs. To effectively monitor the area of operations, function as an alternate Division AADCP, advise the division commander G3 on the allocation and reallocation of air defense resources available to the division.

B. INTERMEDIATE TRAINING OBJECTIVES

Intermediate Training Objective 1

TASK: Each AME will understand the organization for air defense in a theater of operations.

CONDITIONS: In a tactical environment, coordinate with other elements of the airspace management system.

TRAINING STANDARD: Be prepared to brief the division commander and his staff on air defense organization within the theater.

Intermediate Training Objective 2

TASK: Each AME will understand the composition of a Hawk Battalion, its capabilities, limitations, and general deployment guidelines as a Corps asset.

CONDITIONS: Given one SP Hawk battalion in direct support of the division.

TRAINING STANDARD: Correctly advise a division commander and his staff on the proper integration of the Hawk battery to protect his air defense priorities.

Intermediate Training Objective 3

TASK: Each AME will understand the organization of Redeye elements of the division, its capabilities, limitations, and general deployment guidelines.

CONDITIONS: Given the division Redeye sections.

TRAINING STANDARD: Correctly advise the division commander and his staff concerning organization, employment, allocation and reallocation of the division Redeye section.

Intermediate Training Objective 4

TASK: Each AME will understand the organization and functions of a DTOC.

CONDITIONS: Given a typical division TOC.

TRAINING STANDARD: Understand the general composition of a DTOC, its functions, communications nets, and security requirements.

Intermediate Training Objective 5

TASK: Description of AME organization and equipment.

CONDITION: Using slides, show typical AME organization.

TRAINING STANDARD: Students will properly use the assets they have available in their sections.

Intermediate Training Objective 6

TASK: Coordination and the use of airspace over the division.

CONDITIONS: Field artillery units. Army aviation units, air defense units, Air Force ground attack units, are within the division area and are operating.

TRAINING STANDARD: Apply coordination methods and principles.

Intermediate Training Objective 7

TASK: Coordination of Army air defense operations.

CONDITIONS: An ADA Hawk bn and M-42 battalion are within the division area of operations.

TRAINING STANDARD: Apply coordination methods and principles.

Intermediate Training Objective 8

TASK: Intelligence dissemination and collection from air defense units.

CONDITIONS: An organic M-42 bn, Hawk DS unit, DTOC, Air Force CRC's, and AME status boards.

TRAINING STANDARD: Proper collection, processing, and evaluation of Air Defense intelligence.

Intermediate Training Objective 9

TASK: Resolution of airspace use conflicts.

CONDITIONS: Conflicts between various airspace users.

TRAINING STANDARD: Proper coordination methods between AME and airspace users.

C. ADMINISTRATIVE INSTRUCTIONS

1. When training will be given: 31 Jan 76 - 1 Feb 76.
2. Training locations: Ramada Inn, Albuquerque, New Mexico.
3. Who will be trained: Bn AME personnel of M-42 Bns.
4. Principal and assistant trainers: Major Harold S. Greenberg and Master Sergeant Leon LaFramboise.
5. Training aids: Slide projector, screen, extension cord, classroom, blackboard and supplies, sample status boards.

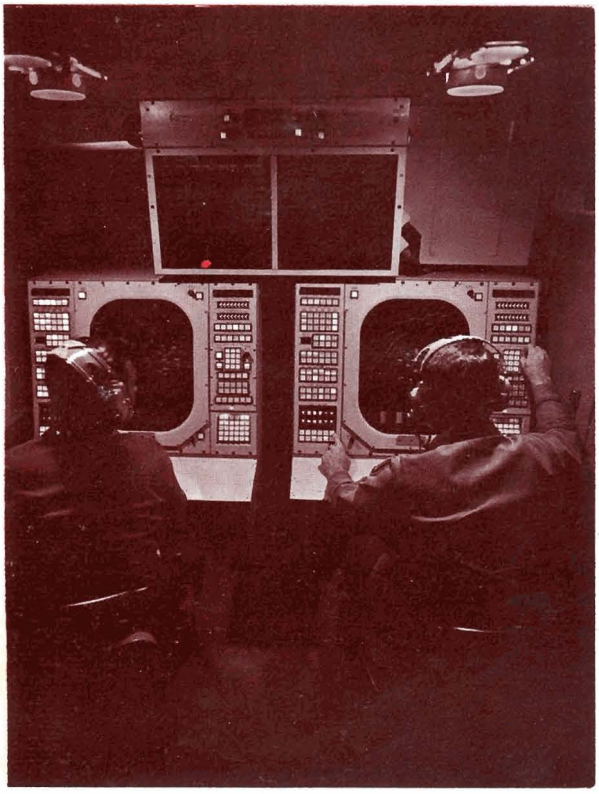
D. SEQUENCE OF ACTIVITY AND TIME

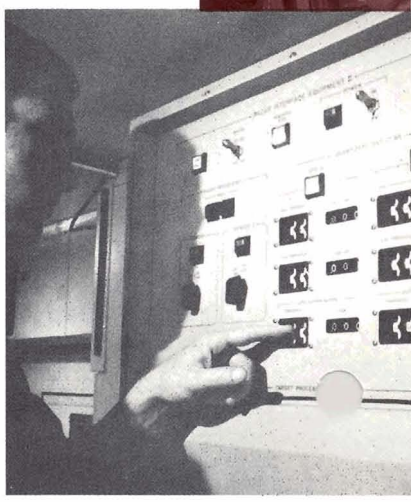
1. The purpose of this instruction is to train the AME of M-42 battalions in the operations of the element within the division. This instruction will include organization of the theater of operations. Employment of Hawk. Employment of Redeye assets, Organization of the DTOC, AME responsibilities and organization, the entire instruction to be reinforced by a practical exercise and development of the air defense and airspace utilization annexes to a division operations order.	5 min
2. Instructor will explain the organization for combat of a theater of operations. He will emphasize the air defense organization, within the theater with special emphasis on division air defense.	40 min
3. Instructor will describe the organization of a towed and self-propelled Hawk bn. He will include capabilities, limitations, and general deployment guidelines.	45 min
4. Instructor will outline the organization for Redeye in infantry, armored, field artillery, and cavalry squadrons of the division. He will detail section organization and equipment as well as basic load of missiles.	50 min
5. Instructor will discuss Redeye capabilities, limitations, general deployment guidelines, and the use of analyzing devices and special operations.	60 min
6. Instructor will insure that students understand the typical organization and functions of a DTOC including communications, physical configuration, and security methods. The student will be made aware of staff coordination procedures within the DTOC.	110 min
7. This portion of the instruction will cover operation and planning aspects of airspace management at Division level. Instructor will cover the following aspects of AME operations: a. Personnel and equipment required. b. Coordination of the use of the airspace. c. Coordination of Army air defense operations. d. Dissemination of intelligence to and from air defense units. 3. Conflict resolution among airspace users.	130 min
	440 min

E. SAFETY RESTRICTIONS — NONE

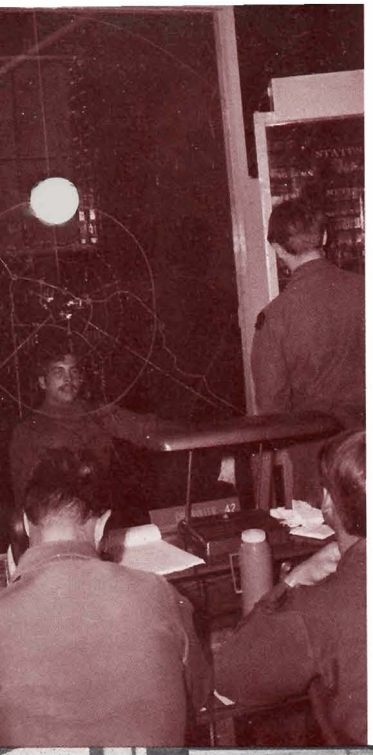
The Guard belongs

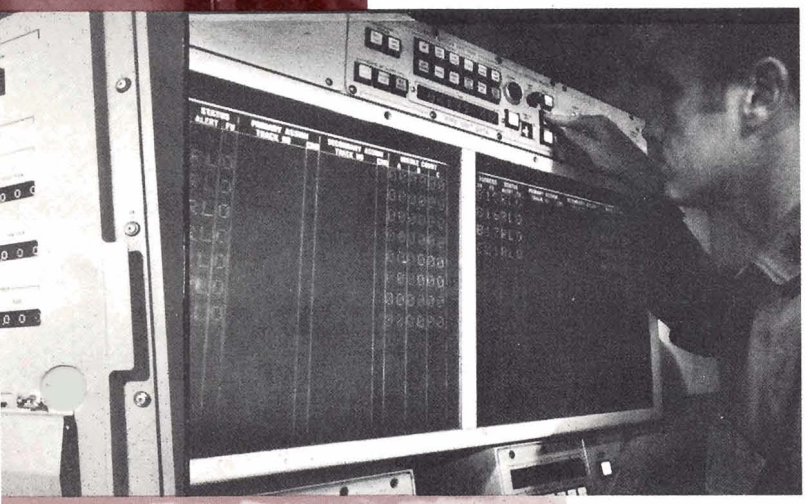
THE NEED FOR ADEQUATE DIVISION AIR DEFENSE COM AND CONTR

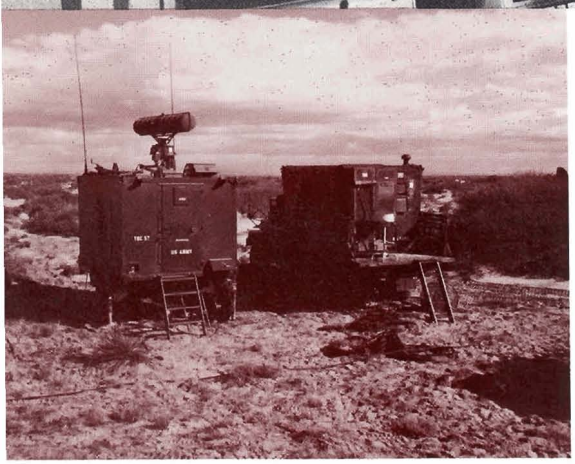




Major Alex Dumbrique, USA (Ret)







The fact that United States ground forces have not been exposed to enemy air superiority since the battle of the Kasserine Pass over 30 years ago, together with recent Middle East experiences, makes the topic of division air defense a timely one. Not only the need for quick reacting air defense weaponry but the requirement to provide for the protection of friendly aircraft while optimizing missile and gun resources are issues whose time has come. This need for adequate command and control in the division area finds its roots in several contexts — doctrinal, recent air defense experience, historical, and technological.

From a doctrinal viewpoint, there are basic considerations and principles that dictate adequate command and control of air defense forces regardless of organizational association. Among the more demanding of the considerations are: ". . . The extremely short time for defense activities as a result of the speed of flight and efficiency of modern offensive aircraft and missiles . . .

"The variety and complexity of the weapon systems constituting the air threat . . .

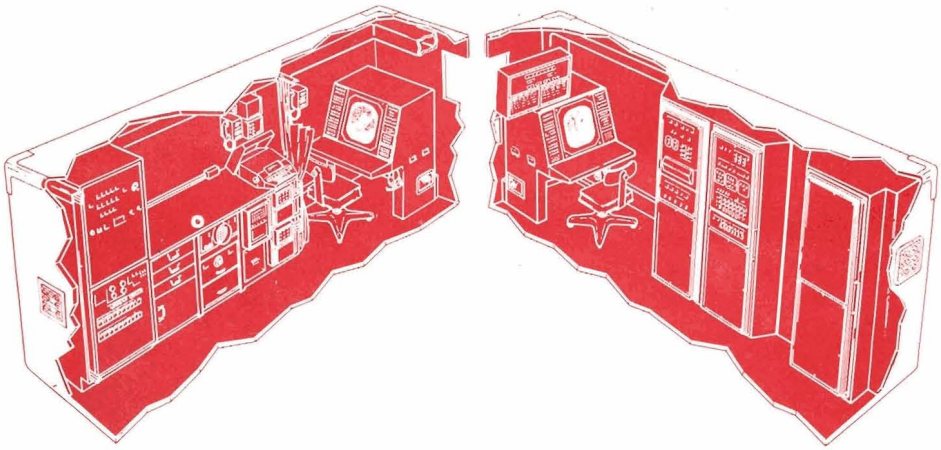
"The variety, number, and complexity of defensive and offensive weapon systems available and being employed by all Services . . .

"The basically reactive nature of air defense . . .

"The need to establish optimum control and coordination measures to present or minimize mutual interference . . ."

In short, time, weapons, threat variety and sophistication, and the need for freedom of action in the airspace over the battlefield all combine to require a prompt, orderly flow of air defense information. These factors also affect the ability of all forces to coordinate their activities and to prevent the restriction of combat missions of the various airspace users.

The basic principles demanding adequate command and control arrangements include the requirements for a totally coordinated and integrated air defense system whose forces, from whatever service, are ". . . organized, equipped, trained . . . positioned and alerted . . . ."



These also support the need for an adequate command and control system that considers the enemy threat as a total entity along with the prioritized defended assets as the points of departure for both planning and resource allocation. This is particularly critical for division air defense since priorities are transient in nature and susceptible to unplanned movements required in dynamic ground combat. The division air defense officer, who is also the Chaparral/Vulcan battalion commander, lacks the means to adequately coordinate and control his fast-moving forces. He is virtually three push-to-talk levels removed from the air defense battle.

Recent air defense experiences in the Middle East reemphasize the appropriateness of the foregoing considerations and principles. Dr. Malcolm Currie, Director of Defense Research and Engineering, stressed the importance of coordination and friendly protection over the battlefield in an address to the American Institute of Aeronautics and Astronautics meeting on Tactical Missiles in April 1974. In his address, Dr. Currie expressed apprehension that the Middle East combatant experiences (where each side shot down its own aircraft with tactical surface-to-air missiles) might be our own experiences in a similar circumstance. He gave top priority to ". . . the intimate melding of surveillance with command and control of tactical weapons . . . while designers of tactical missile systems must be concerned and should be reluctant to leave its solution to doctrinal or procedural measures." The magnitude of the problem may be realized in that one-third of the aircraft downed by Egyptian SA-6 missiles were Egyptian or Iraqi.

The existing command and control arrangements for air defense in the division are essentially manual. The SHORAD weapons (i.e., a Chaparral missile system, a Vulcan gun system, and the MANPAD system (Redeye)) are visually dependent for acquisition, recognition, and firing, and operate virtually autonomously.

The weapons are provided alert warning over a one-way data link from any one of eight forward area alerting radars (FAAR's). Neither the radars, the division airspace management (coordination) element, nor the division AD battalion CP "know" the exact location of all air defense resources at any given moment. Tentative identification is also provided, but the ability of the gunners to correlate either the alert warning or the identification with any target they visually acquire is marginal at best. Apart from the inability to adequately control or coordinate his weapons, the division air defense officer has little influence over resource conservation. In the cited speech, Dr. Currie also noted the Arab-Israeli experience of 1973 as he warned, ". . . an engagement can consume ordnance and missiles at a tremendous rate." The need to conserve limited supply missiles while achieving the desired effectiveness further opts for improved command and control operations. The operational integration of SHORAD weapons, not only within the division but also the exchange of information laterally with adjacent division and vertically with the HIMAD/LOMAD, seems not only desirable but mandatory.

In recent years, the concept of a Hawk battalion being in direct support (DS) of each division has taken root, however, not without manifesting some side problems. When a Hawk battalion is placed in DS of the division, the Hawk battalion commander *is not* the division AD officer. This remains the responsibility of the C/V battalion commander. From a command and control viewpoint, the Hawk battalion OC (presently an AN/TSQ-38 but soon to be an AN/TSQ-73) fully integrates HIMAD/LOMAD air defense missile units to the corps AD group and thence to the overall air defense command (usually the commander TAC air forces supporting the operation). It is a real-time command and control system which effects more efficient fire distribution, while providing friendly protection and also conserving resources. The mission and organizational problems resulting from two independent systems (i.e., SHORAD / MANPAD operating manually and the LOMAD integrated system) pose some operational control and coordination problems. Establishment of a battalion group AADCP (i.e., the Hawk OC alongside the C/V CP) is a plausible solution.

As still another reference triggered by the Middle East experience, R. D. M. Furlong, in his article on "Evolution in Air Defense Requirements," notes: ". . . Israeli air defense operations last October were successful largely because command and control were exercised from a central headquarters in the semiautomated system." This is not to say that centralized control for DIVAD is recommended or desirable, but that the idea of an integrated overall system seems to benefit the force as a whole.

The technological advances of the threat, air defense weapon systems, and the means of addressing the interactions between both permit exploitation which will not only operationally integrate MANPAD / SHORAD / LOMAD but do so in the near real-time required for effective air defense. Advances in computer technology and reliable communications interface devices capable of digitizing data exchange using existing radios are emerging daily as cost-effective candidates needed to do the job. However, effectiveness does not necessarily equate with unwieldy sophistication or full auto-

mation. The measures of effectiveness resulting from the integration of these air defense roles crystalize as the total air defense picture unfolds. Operational ease of the simpler but highly reactive divisional systems, coupled with a very "selective automation" process seems readily at hand with minimal new development.

The following are obvious problems unresolved by the manual system that require early resolution for successful SHORAD/MANPAD employment on the electronic battlefield. These problems include some which are self-evident and some which only manifestly compound one another.

- The need to achieve an integrated MANPAD / SHORAD / LOMAD for increasing effectiveness while conserving resources and optimizing decision influencing data flow.
- The requirements for friendly protection, which place a premium on the need for enhanced identification procedures. Means should be provided to permit identification aid from all available sources (e.g., IFF/SIF sensors, flight plans, air corridors, visual). Exploitation of two-way communications interface devices could virtually make every forward area air defense gunner a part of an automated ground observer corps and this in virtual real-time.
- The need for effective interrogation control to prevent potential self-jamming and aircraft transponder capture or overload.
- The need for exploiting the common data base existing within air traffic and air defense activities.
- The need for practicing radiation control both as a survivability measure and for optimizing the ability to attain more efficient radar coverage.
- The need to recognize and assist control of ECM/ECCM and other EW activities.
- The need to optimize dynamic air defense movements about the battlefield.

During a period when the goal of the US Army is to increase the efficiency of the combat division, the time is at hand to critically review the effectiveness of air defense command and control in this important combat area. User studies of division-level air defense command and control should provide valuable insight as to the measures of command and control effectiveness which must be attained. It should also provide the potential for examining and benefiting from "product-improving" the systems that are currently or will soon be deployed.

The availability of battlefield processors ranging from micro processors to mini computers to the larger GP systems offers a range of alternatives for enhanced division air defense command and control.

Other beneficial programs and technologies include:

- The quantum advances in digital communications.
- Newly evolving techniques and devices.
- Trends toward low-cost, computer-driven interactive displays.
- Status recording.
- Remote radar processing using low-cost mini computers.

These things offer ways of attaining not only lateral and vertical integration of division air defense forces, but also sensor integration, enhanced identification and, finally, more effective EW control and coordination. Collectively, these assets approach the reality of providing a true umbrella of protection over the ground gaining areas on the electronic, very dynamic battlefields of today and tomorrow.

The author formerly served as Chief of the Command and Control Branch at the US Army Air Defense School. He also served as an operations analyst with the DA team evaluating STRICOM air defense and airspace utilization. He currently is the Litton DSD Manager, Military Requirements, Southwest Region, and is active in command and control system development in the air defense, artillery, and intelligence communities.

V-2 MISSILE ATTACKS AGAINST THE UNITED KINGDOM

Historically, there is not a lot that can be written about the V-2 missile attacks because of the short duration of V-2 missile employment. Attacks were concentrated on the London area and on Antwerp. As the main supply base for two Allied Army groups, Antwerp was a legitimate military target, but the motive for the London raids would have to be considered more for psychological shock effect than anything else. Ironically, the weapon actually benefitted the United States far more than it did Germany because of the technical knowledge and services we acquired from its inventor, Dr. Wernher von Braun, that were applied to postwar missile development in this country. But it did create some anxiety among Allied leaders while it was in action.

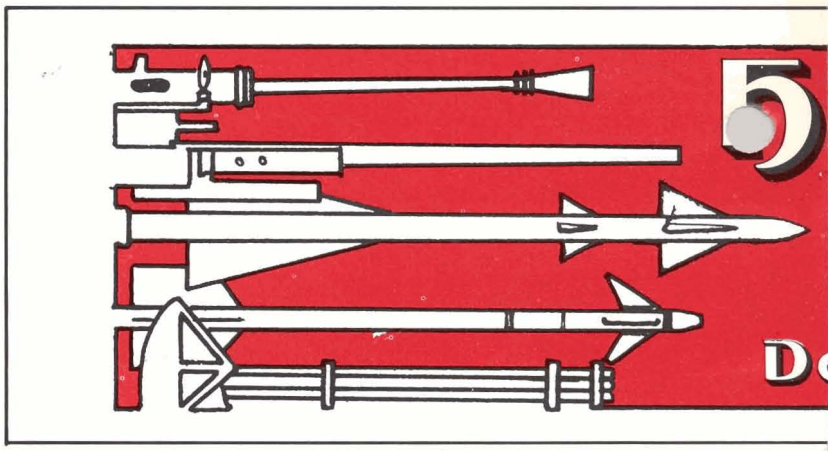
The first V-2 rocket fell on London on 9 September 1944 and the last on 28 March 1945. During this period, 1,115 rockets fell in the United Kingdom, launched from The Hague and Leyden areas of Holland, a distance of 190 to 220 miles from London.

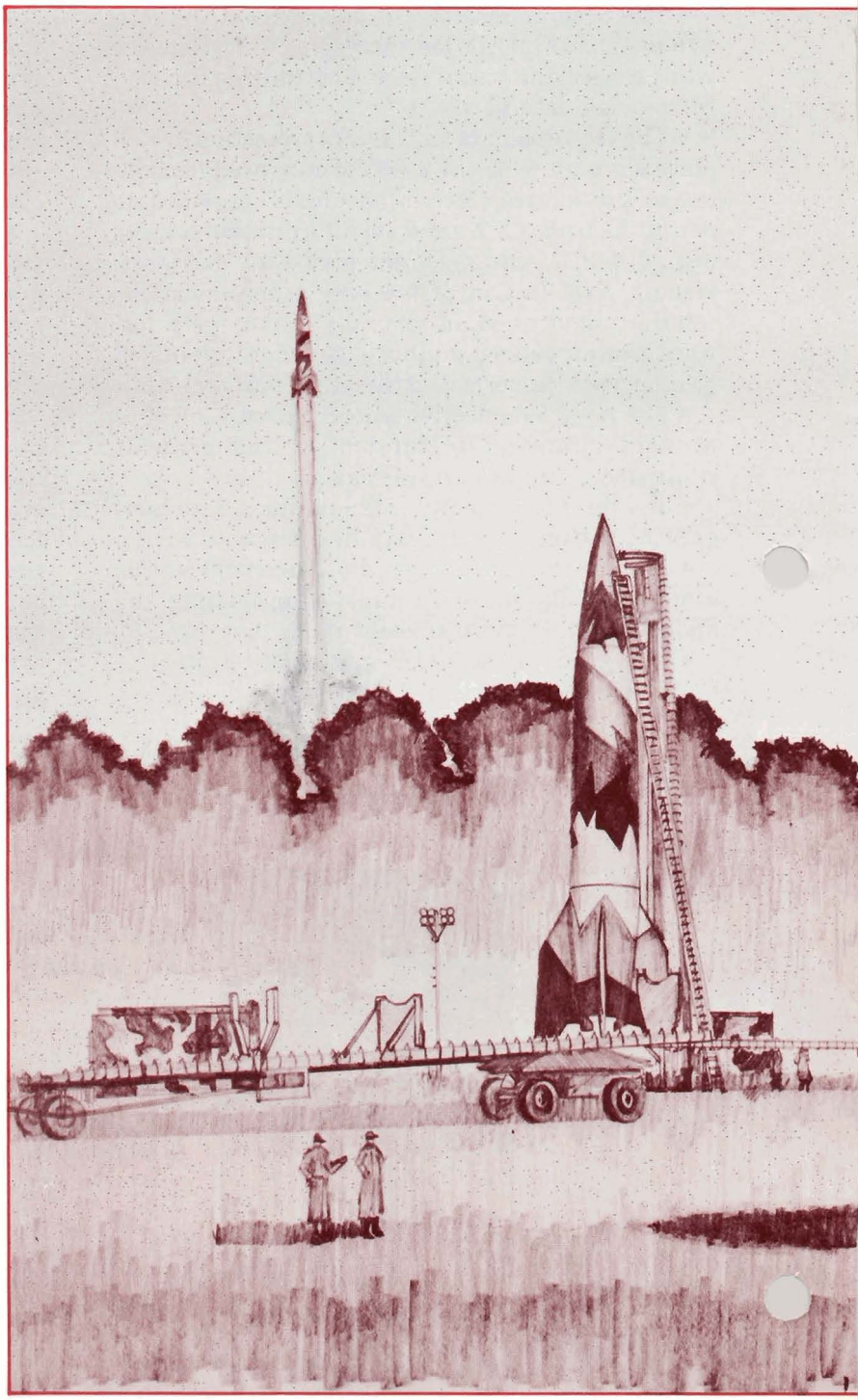
The V-2 rocket was a cigar-shaped, streamlined, guided missile 46 feet, 10 inches long, with a maximum diameter of 5 feet, 5 inches. It consisted of a large conical warhead, a cylindrical center section, and a tapered afterbody carrying four external fins. The takeoff weight was 14 tons, of which 1 ton was explosive materiel and 9 tons were fuel. The fuel was consumed in the first 60 seconds of flight.

The trajectory of the V-2 was determined before firing. The projectile was launched vertically from a special firing table. Its initial speed was slow but increased rapidly. At the end of the burning time of 74 seconds, a maximum speed of some 5,000 feet per second was attained at a height of 19 miles. The maximum altitude for a 200-mile range was 58 miles, with a time of flight of 5.5 minutes. Theoretically, the calculated maximum range was 230 miles, although the maximum recorded range was 210 miles. At its maximum altitude, the speed of the rocket was 3,800 feet per second, increasing on the downward portion of the trajectory to 5,300 feet per second. When the rocket reached the lower atmosphere, the speed decelerated to a striking velocity of about 3,700 feet per second.

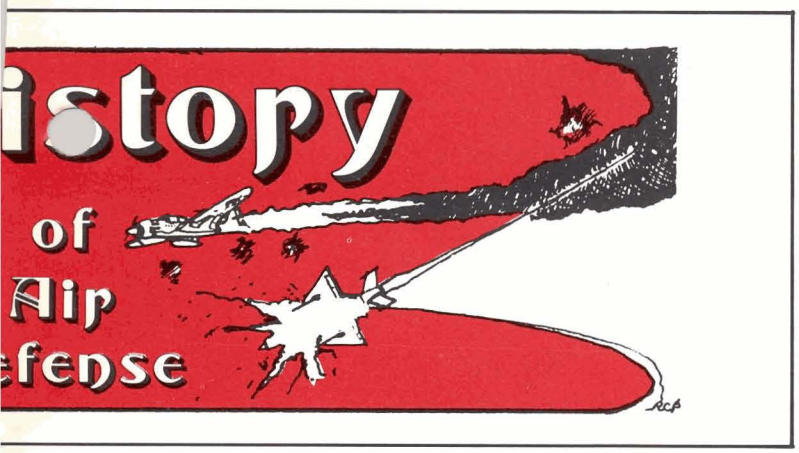
At first, it was thought it would be impossible to detect the V-2s on a radar scope, but, after a little practice, crews were able to distinguish them at certain points in the flight. Radar first was used to locate the launching sites so that the V-2s could be destroyed on the ground by bomber attack. Five types of radar equipment were used in the United Kingdom for detection of the V-2s.

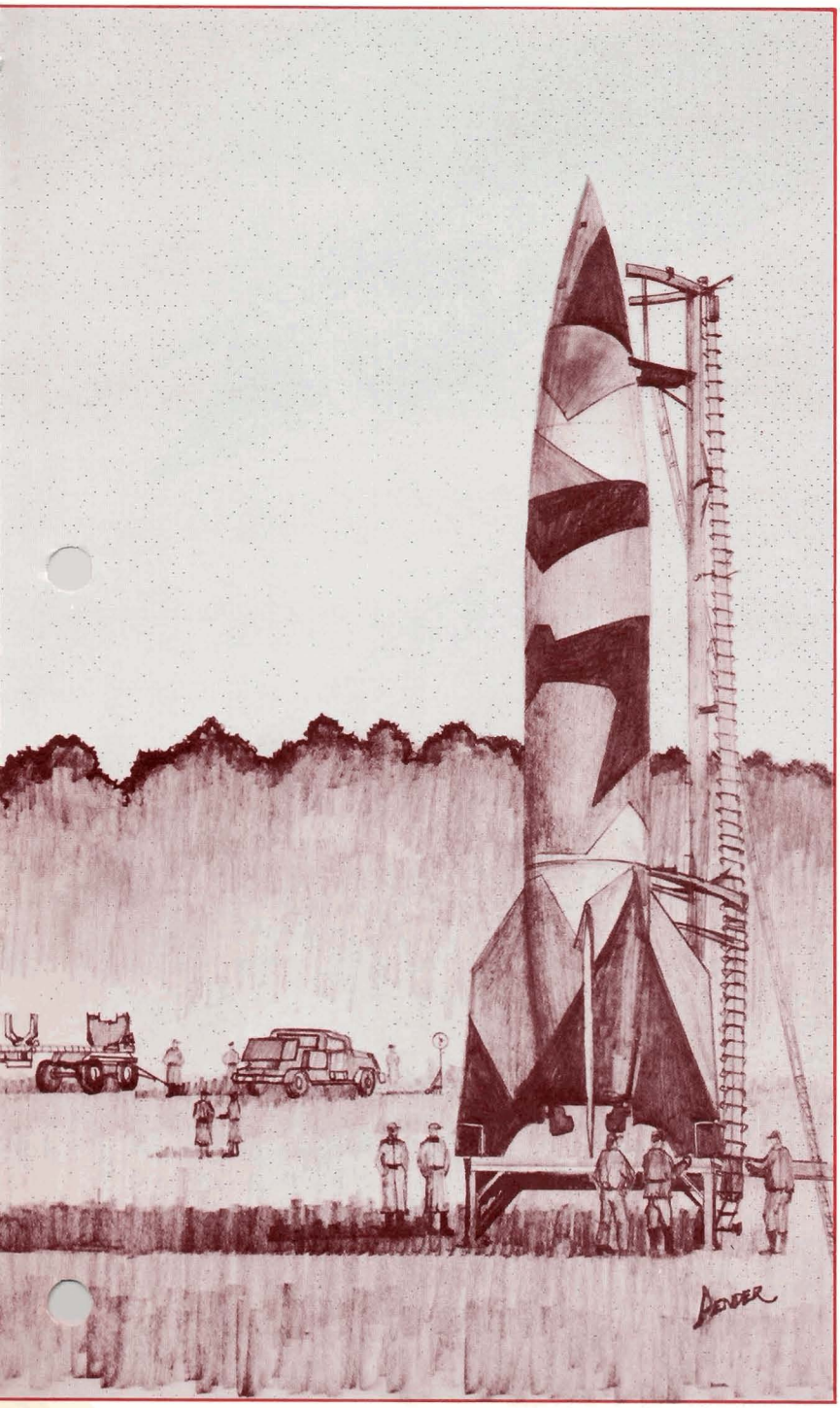
- Five long-range radars placed on the east coast were able to detect them soon after they were launched.





A special trailer vehicle, the **Meillerwagen**, *was devised to carry the V-2 roc*





et to launching positions near The Hague and Leyden areas of Holland.

• Standard British GL-2 radar sets were placed at gun sites in the London area.

• Modified GL-2 sets were located at Aldeburg and Southwald, north of the usual flight paths, and one at Walmer, south of the flight paths.

• An SCR-584 radar set was placed at Steenbergen, Holland, about 30 miles south of the launching sites.

• Benjamin, an experimental radar specifically designed to detect and track the V-2, was used for only a short time.

Defense against the V-2s in the United Kingdom was limited. Once the missile was launched, there was virtually nothing to do but hope it would land in a relatively open area, which frequently happened. The only effective defense involved actions that might interfere with development and launching of the missile and minor passive measures. To this end, the British took decisive steps, but these were limited to attempts to:

• Prevent the enemy from making the rockets by bombing laboratories, factories, and lines of communication.

• Attempt to deny the enemy raw materiels for manufacture.

• Bomb and capture launching sites.

• Establish a warning system to lessen the damage from a hit.

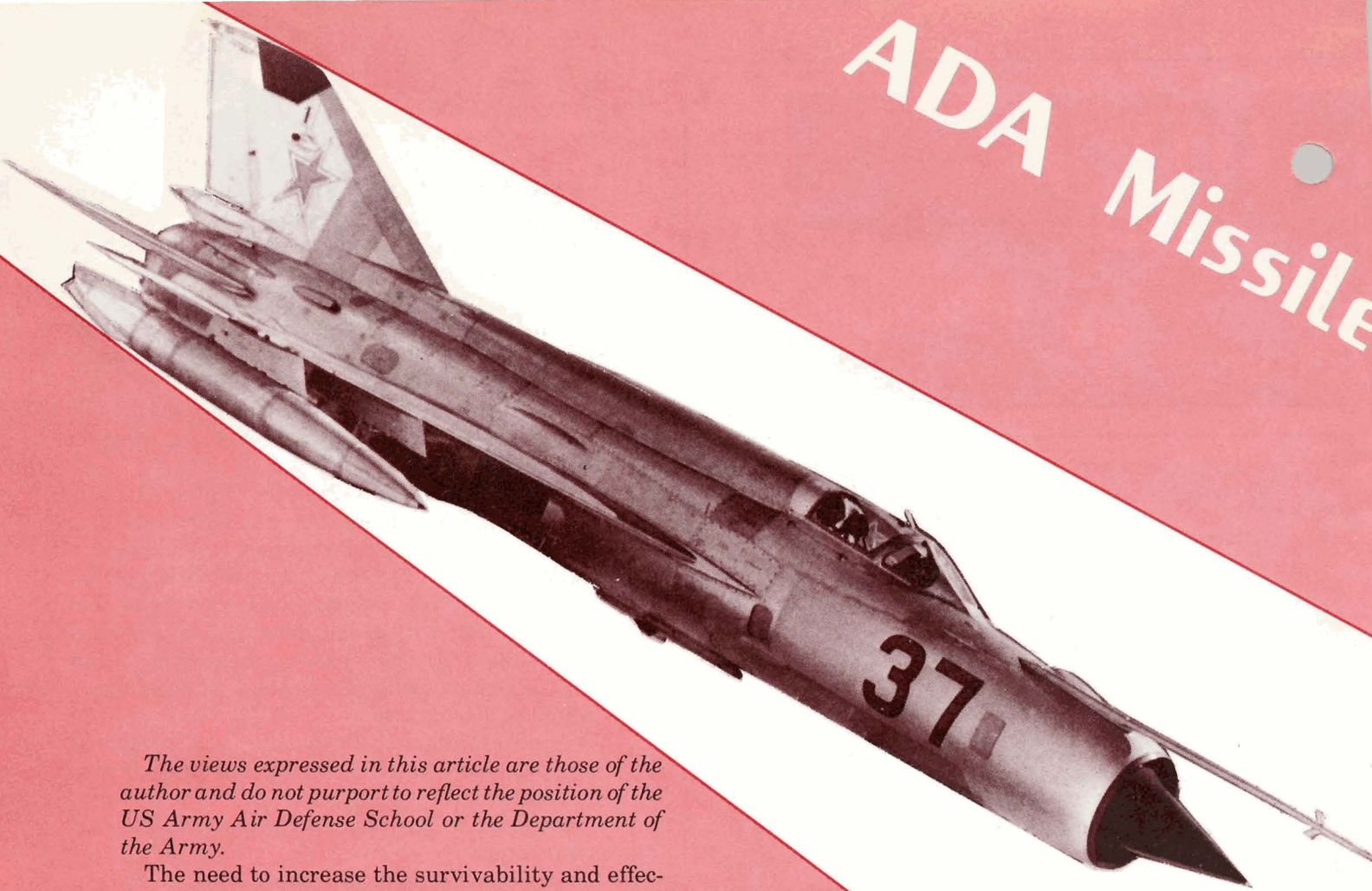
By 19 March 1945, a plan for barrage fire against the V-2s was drawn up by the Antiaircraft Artillery Command, but the attacks ceased before the plan could be put into effect. By use of radars, both the probable trajectory of the rocket and the probable point of impact could be determined. A total of 12,000 rounds was to be fired at each rocket while it was descending. Since the plan was never carried out, no information was obtained on the effectiveness of antiaircraft against the V-2. Radio jamming of the V-2 mechanism was attempted but proved unsuccessful.

In firing at London from the Dutch areas, the rockets were being fired beyond their operational range, and many fell in the Thames Estuary region instead of in the city. A comparison of the results of launchings against London and Antwerp showed a definite increase in scatter when the range of the V-2 was extended beyond normal.

In all, approximately 1,152 V-2 rockets were fired against London, 517 of these missiles falling in or near the target.

In the final analysis, the V-bomb attacks against England and the Continent came too late. Earlier employment would not have won the war for the Germans but would have impaired seriously the Allied effort, including disarranging preparations for the Allied invasion.

ADA Missile



The views expressed in this article are those of the author and do not purport to reflect the position of the US Army Air Defense School or the Department of the Army.

The need to increase the survivability and effectiveness of our precious few Army air defense missile systems available for deployment with the field forces has long been recognized by air defenders. This is especially true in the NATO scenario where the most difficult tactical environment can be expected to prevail. It is not intended to restate herein the case for added Army air defense units. Suffice it to say that our principal potential opponents, the Warsaw Pact nations, believe a much higher density of field army air defense missile units is warranted to insure the mobility and survival of their combat forces. Their thinking probably derives from the lessons they drew from World War II, where the Russians were pounded unmercifully by the German Air Force, and also from the experiences of their Communist allies in North Korea and North Vietnam. There, our unchallenged air forces severely limited the enemy's maneuver capability and the tactics he could employ and exacted heavy losses of facilities, equipment, and manpower.

Our current air defense missile systems may be one generation behind the latest comparable Russian equipment, and this is most noticeable in the United States equipment's relative slowness in emplacement and mobility. These limiting characteristics combine with the lack of indepth defenses which discourage frequent displacements that would enhance survivability and thus perhaps effectiveness. Were significantly more systems available, better coverage of the maneuver forces could be maintained while elements were displacing to keep up with the changing tactical situation.

The extremely limited number of ADA missile units, combined with their design characteristics, dictates locating on prominent terrain in order to "see" the enemy and maximize the systems' effectiveness. These tactical employment concepts, along with the relative softness and interdependability of the radars, antennas, power sources, and launchers, make them relatively easy to detect vi-

Unit Survival

COLONEL PAUL P. CORONEOS

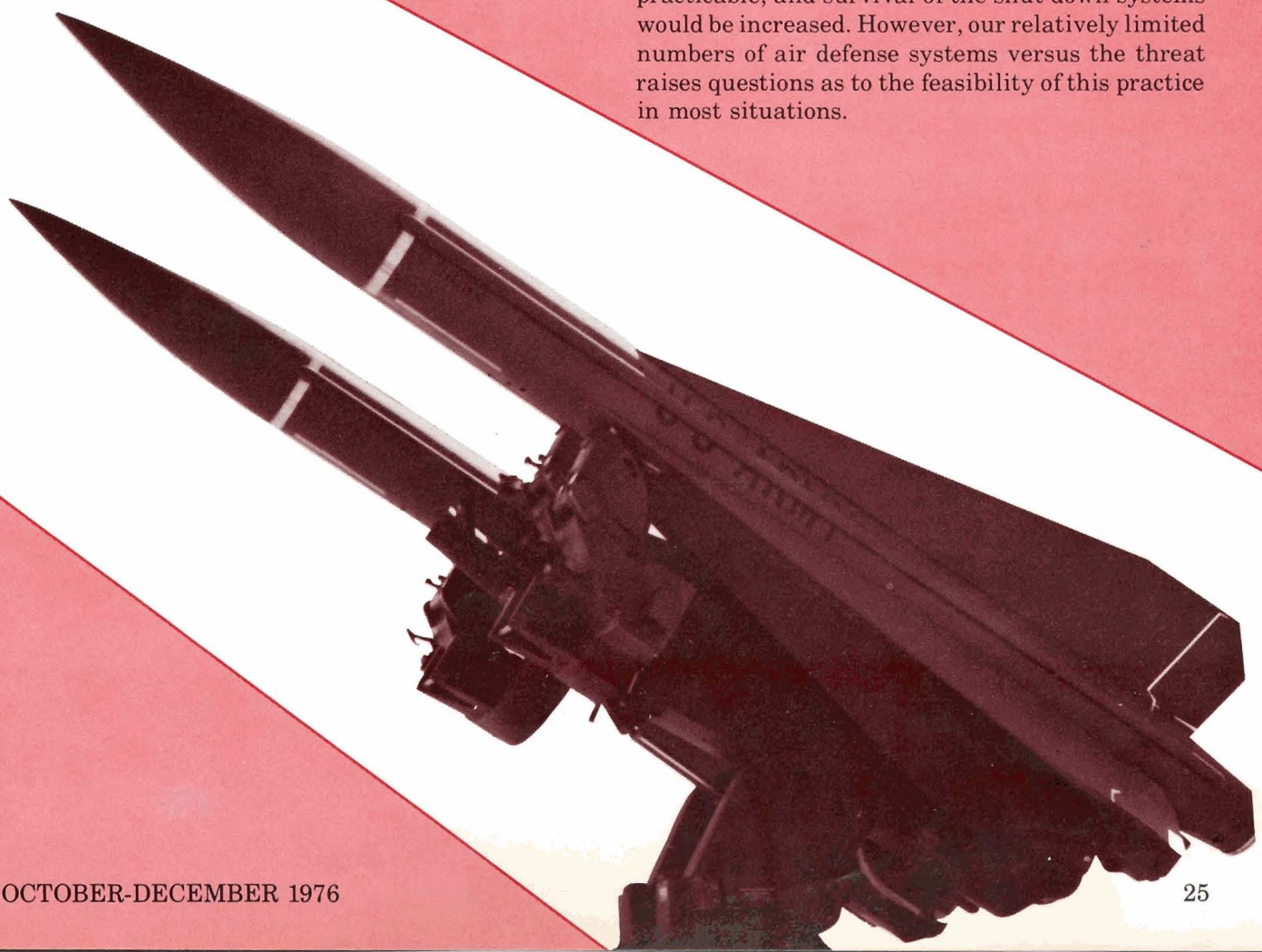
sually or electronically and vulnerable to air and ground attacks.

It is axiomatic that our air defense systems rate the highest possible priority for destruction in the initial attacks. We placed the same priority on Axis air defenses in World War II and more recently on North Vietnamese air defenses. In 1973, the Israelis paid heavily for initially trying to ignore the Egyptian field army air defenses and had to fall back and deal with them effectively before they could get at the Egyptian armor, infantry, and artillery menace.

To compensate for the relative slowness in relocating units and the defense degradations that occur when units move, ADA commanders are forced to pick key terrain and sometimes tend to stay in place to get the job done. This in turn drives up unit vulnerability and, given the high priority for ADA missile site elimination, increases greatly the attrition factors unless something more can be done to better the odds in favor of the air defenders.

Organic survivability measures for air defense missile units are few under the cited parameters. Some available measures that might be considered are:

- A unit could shut down its radars and evade electronic detection. This, of course, blinds the system and it is temporarily useless. If combined with other units having overlapping coverage and mutual support of each other's missiles, it might be practicable, and survival of the shut down systems would be increased. However, our relatively limited numbers of air defense systems versus the threat raises questions as to the feasibility of this practice in most situations.



• A unit could seek terrain that would canalize attacks and thus limit vulnerability, but this sacrifices mutual coverage and may create gaps in the defenses that could be quickly detected and exploited. So once again the limited numbers factor forces us up on the prominent terrain if the job is to be done right.

• A unit could harden its equipment fortifications and plan on fighting the battle from its hardened location. This entails an extraordinary amount of physical labor and additional expense, but it was a modestly attractive solution before the air-delivered ordnance included the TV and laser-guided bombs, and, of course, the nemesis of all air defenders, the air-delivered antiradiation missile (ARM). With those weapons in the inventory, hardening a missile site will still save lives and equipment, but radar antennas may be destroyed and with them the system's capability to shoot down aircraft.

• A unit could leapfrog among a number of prepared positions and keep the enemy guessing as to where it will be when the battle begins. This is an excellent option and merits considerable attention. To be effective, each position must provide excellent radar coverage and mutual support between ADA sites. This option may lose some of its attractiveness because:

— In peacetime, key terrain is not usually available in the quantities needed except at exorbitant cost and, if available, requires expensive access roads and site preparation.

— In wartime, key terrain becomes available but considerable effort may be required to prepare access roads and sites.

Additional means for increasing missile unit survivability while rendering the maximum possible protection to the engaged combat forces have existed for some time in our intellectual repertoire. But it seems that no one in authority has seen fit to fight hard enough for the development of hardware and the personnel staffing necessary to put these means in the hands of our air defenders. It is already long past the time to publicly sound the klaxon for decoy missile sites complete with effective and variable electronic emitters. It is easily within the state of the art to produce decoy missile sites that:

• Are visually realistic.
• Are portable.
• Emit authentic radar, communication, infrared, and generator signatures.
• Are inexpensive.
• Can be manned by as few as one to three persons.

Realistic decoy missile sites available in numbers such as two per actual missile battery could enhance greatly the survival odds for current ADA missile units. Their availability would appreciably increase the enemy targeting problems and force the dedication of additional assets to the flak suppression effort.

What is needed is inexpensive, inflatable decoys with electronic emitters that can be hauled in a single truck and can be set up and operated continuously by no more than three men. Decoy sections should be allocated to the missile battalion S2 section on the basis of two per firing battery. It would then give the battalion S2 control of valuable assets that he, along with the S3, could integrate into the tactical deployment plan. The decoy sites could be put into the operational schedules for:

• Leapfrogging or redeploying missile units.
• Missile unit maintenance periods.
• Radar surveillance.

In corps-size defenses, the air defense plan can be augmented by decoy sections assigned to the ADA group headquarters. In each group headquarters, a platoon of 16 sections (equivalent to 4 missile battalions) could be authorized. The group S2 could then be charged with operating an active four-missile battalion deception plan that would be integrated into the real defense along with the assigned battalion decoys.

Up to now, some ADA S2 officers have been relegated to working on document, personnel, and installation security because they lacked the technological interface needed to get into more productive areas. I refer to ECCM warfare, direct observation and analysis of enemy air tactics and countermeasures, and the means that could be provided by decoy sites for confounding and confusing the enemy attackers. With such systems as the airborne warning and control system (AWACS) and the AN/TSQ-73 Missile Minder, the role of the ADA S2 can take on new dimensions. But the fastest and biggest contribution by ADA S2s lies with the control and management of decoy site assets.

A group S2, with 16 decoy sites at a cost of about 50 men and 20 trucks, could develop a deception plan that would cause the enemy to target and plan for the suppression of four additional ADA missile battalions. Similarly, a battalion S2 could increase his unit's survivability by two-thirds if he had 8 decoy sites to integrate into his unit's deployment plans.

It is recognized that there has been some oversimplification of the problems inherent in fielding a decoy package and in employing it effectively in the

field force environment. This approach was used, however, to focus on the very impressive and rather irrefutable mathematic fundamentals the decoy site option offers. When one considers the cost of an Improved Hawk or Hercules battery and the difficulty of its replacement once knocked out, the price of enhancing survivability is truly negligible by comparison and should be our first and most urgent order of business.

Our Air Force brethren have long since gone to such lengths as providing for defensive systems officers (airborne duties comparable to those proposed for our ADA S2s) who operate ECCM systems and on-board decoys to enhance aircraft, missile, and warhead survivability. Such a packaged systems approach should permeate the future thinking of every responsible ADA officer. And, as we now buy Roland, Patriot, the new ADA gun, etc., a complete countermeasures kit that includes decoys, electronic emitters, and camouflage equipment should be concurrently designed and funded.

ADA missile systems are, pound for pound, among the most expensive and difficult to replace assets in our military inventory. We will be able to afford only a bare minimum of them. In terms of asset survival, it is well worth the added cost to package and insist upon the needed decoys and emitters as an integral part of any new ADA system.

Editor's Note: The need to increase air defense unit survival has long been recognized. Employment of decoys is one of the methods possible to enhance unit survivability, and it is probable that decoys alone are not sufficient. However, recognizing that decoys are needed, the US Army Air Defense School is currently testing prototype active and passive decoys. In addition, TC 44-1-1 ADA Survivability *is in the final stages of processing and should be distributed in February 1977. This training circular will provide guidance to the ADA commander on many of the survival measures that Colonel Coroneos has discussed.*

Colonel Coroneos holds a Bachelor of Science degree in Law and a Master of Arts degree in Diplomatic History from the University of Illinois. A graduate of the Air Force Command and Staff College and the Army War College, he has commanded units ranging from artillery battery to air defense artillery group level. He is now serving as Commander of the United States Military Group in Panama.

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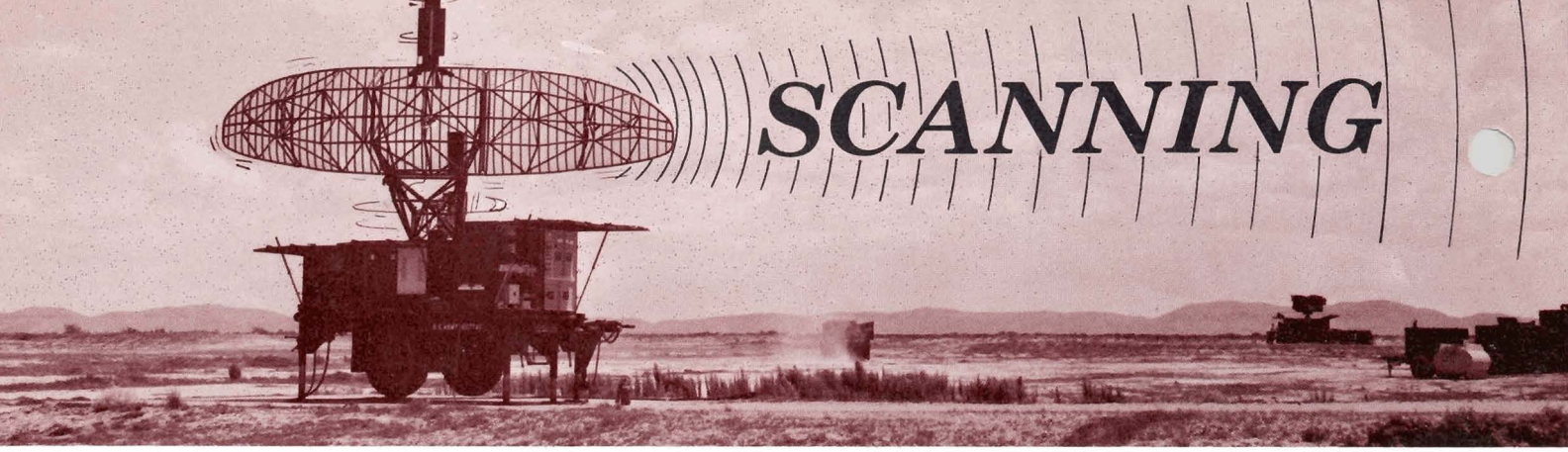


VADS PRODUCT IMPROVEMENT

The Vulcan air defense system (VADS) was first fielded in 1968 in both the self-propelled (M163) and the towed (M167) versions. Now, a VADS Product Improvement Program is under way to increase the overall effectiveness of the system. Modifications will be made by contractor personnel on a worldwide basis. Vulcan systems located at Fort Bliss will be the first to be modified. Modifications are expected to be completed by December 1977. When completed, the self-propelled and towed VADS will be designated as the M163A1 and M167A1, respectively.

Modifications to both M163 and M167 VADS.

• Radar reliability modifications will introduce high reliability components into four of the AN/VPS-2's six units, thus increasing mean time between failures.

• A fiberglass radome will replace the protective "spider" presently on the radar antenna and will protect the feedhorn from weather damage.

• Improved equilibrators will compensate for the mechanical imbalance of the cannon by offsetting the weight of the cannon barrels. The tendency for gun drift will thus be reduced and the power demand on the elevation servos will be decreased.

• One of the two new electrical interlocks will prevent system power from being applied to the M61 lead computing sight when the sight is not mechanically caged. The other will protect the fire control components if the system voltage drops below a critical value.

• The sight current generator will be improved by replacing the servo and potentiometers with solid-state circuitry. Also, the sight current generator's ballistics data cards will no longer have to be changed when firing different types of ammunition. The new sight current generator will need to be adjusted for air density and muzzle velocity only.

• State-of-the-art advances in electronic components and plug-in, type-printed circuit boards are included.

Special Self-Propelled M163 Modifications.

The self-propelled M163 Vulcan modifications will include a new controlled conveyor feed system that will eliminate the need for dummy rounds, thereby increasing available ammunition by 10 percent. A further improvement is the link disposal modification which ejects stripped links through a chute at the top of the M741 vehicle. This will eliminate loose links in the vehicle and exposure of the crew to enemy fire during reloading.

Special M167 Modifications.

A rounds-cycled counter will be added to provide information for round dependent maintenance. Shields will be mounted over the hydraulic emplacement cylinders to prevent their being damaged when used as a step. The M167's auxiliary power unit will be modified to prevent the circuit breaker from tripping due to rough roads when the APU is operating while being towed.

Vehicle Modifications.

Vehicle improvements for the self-propelled Vulcan include an electromechanical interlock to keep the carriage from being driven if the suspension is locked out. This prevents destruction of the hydraulic lockout cylinders. A rubber fuel cell liner has been added to prevent fuel leakage from cracked welds. New test equipment will be made available for the modified VAD systems.

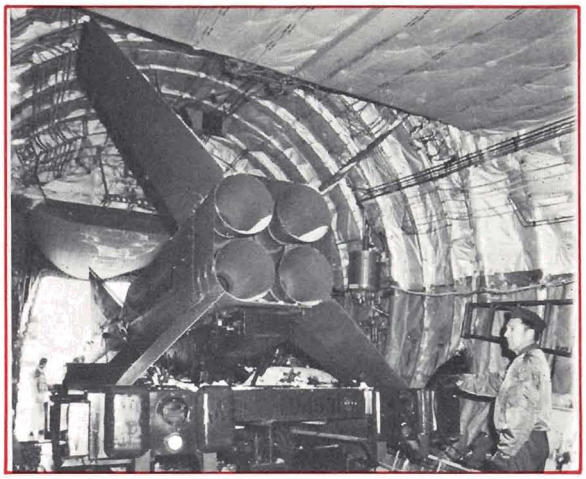
FIELD TRIPS FOR SEAM STUDENTS

Students enrolled in the new Systems Engineering, Analysis, and Management (SEAM) Course, 4F-14F (formerly 4F-1181), now engage in field trips to various scientific and research facilities. The intention is to provide a link-up between the classroom and the world of practical application. An additional benefit is to allow the officer students to see firsthand the magnitude of the effort involved in terms of time and money in developing new technology. Graduates of the 4F-14F Course can expect future assignments in the fields of RDT&E and operations research. As they become involved in weapons effectiveness studies or new weapon systems procurement, they will have a better perspective of the complex process of building and maintaining a modern, well-equipped Army.

The latest field trips have included full-day tours at both the Los Alamos and Sandia Laboratories. The students were briefed on the latest trends in energy research, observed the operation of a linear accelerator, and inspected the world's second largest computer complex. They also toured the engineering test facilities that determine the effects on materiel and complete systems caused by nuclear and nonnuclear occurrences.

Those officers in the grade of 1LT or higher who are interested in the challenges offered by this course should contact Chief, Missile Science Division, AUTOVON 978-2309. Current USAADS training policy in all courses of instruction emphasizes maximum time on equipment, field exercises, and field trips.

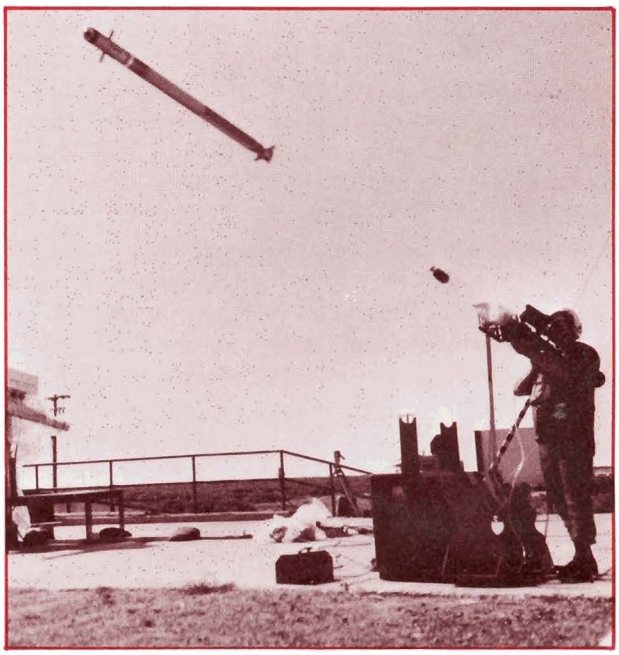
YC-15 AIRLIFTS NIKE HERCULES MISSILE

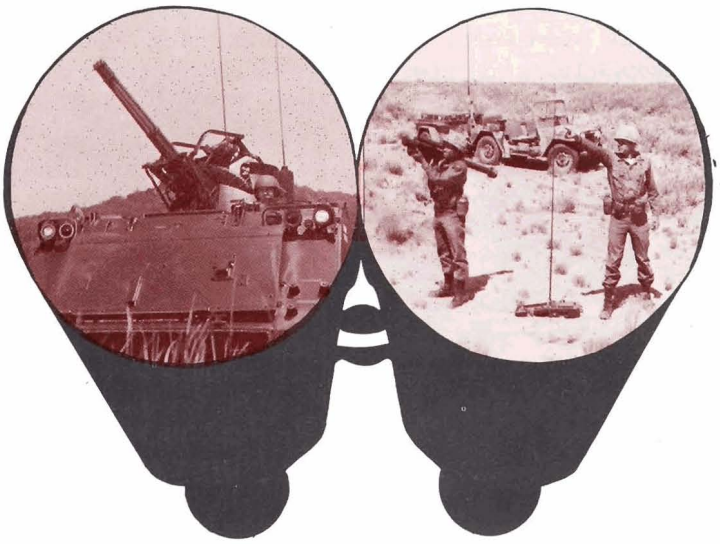


An assembled Nike Hercules missile on a ready-round transporter was recently loaded on the YC-15, prototype advanced medium short takeoff and landing (STOL) transport, at El Paso, Texas, and airlifted to Fort Bragg, NC, in support of a FORSCOM exercise. The airlift demonstrated the air transportability of Nike Hercules components that are integral parts of the USAADS concept of operations for the surface-to-surface role of Nike Hercules. Prior to loading the missile and ready-round transporter, a missile tracking radar and 2½-ton prime mover were loaded on the YC-15 to demonstrate the feasibility of carrying them aboard the aircraft. For a description of the aircraft, see page 40 of this issue. (Photos by SP4 David R. Craig, Jr.)

SOLDIER FIRES THE STINGER

SFC Richard E. Vincell of White Sands Missile Range recently became the first Army gunner to fire the Stinger ground-to-air antiaircraft missile. The Stinger, a shoulder-launched weapon now undergoing testing at the Range, is scheduled to replace the Redeye weapon now in use by US armed forces. The weapon was fired into a stationary target to test its warhead capability.





VIEW from the FIELD

REDEYE/VULCAN IN SUPPORT OF THE TASK FORCE BATTALION

SECOND LIEUTENANT ALLEN J. KIEZER

During ARTEP '76, conducted at Hohenfels Training Area in the Federal Republic of Germany, three air defense proposals were tested. The first proposal tested was Redeye and the Vulcan platoon under operational control of the Vulcan battery commander, supporting a battalion task force that in turn was in direct support of the brigade. In this structure, the battery commander, located at the brigade tactical operations center (TOC), had operational control over both the Redeye and Vulcan elements. Proposals for Vulcan and Redeye employment were sent from the battalion task force air defense officer (Vulcan platoon leader — coordinating with Redeye section leader) to the Vulcan battery commander where they were approved or disapproved and then sent back down to the air defense elements. This procedure, as it might appear, is much too slow to maneuver elements within the battlefield effectively. In many cases, the Vulcan platoon leader and Redeye section leader had to move their elements without the direction of the Vulcan battery commander.

The second proposal was the Vulcan platoon in direct support of the task force and the Redeye section under operational control of the Vulcan platoon leader. The Vulcan platoon leader was the battalion air defense officer. During the problem, the platoon leader split the Redeye section and put two teams under his direct control and left the other team plus the section headquarters to provide air defense coverage for the TOC. The Redeye section leader did not cooperate in the splitting of his Redeye section because it meant losing control of his own elements. A better method, I believe, would have been to collocate the platoon leader and Redeye section leader in the TOC area and coordinate their assets to provide the battalion with a well-integrated air defense plan. The Vulcan platoon leader would have the final say in the air defense employment, but at least coordination between air defense elements would have occurred. When movement was necessary, both leaders could contact their elements and move them to preselected points to continue air defense coverage of the battalion.

The third proposal tested had the Redeye section under operational control of the company team but in support of the battalion as a whole with Vulcan in direct support of the battalion. This was by far the best *working* proposal of the three. The Redeye section leader stayed at the TOC and moved his elements very effectively when the tactical situation dictated. The Vulcan platoon leader did not stay at the TOC and consequently had, in many cases, a more difficult control problem.

Having discussed the three methods tested, I would like now to propose what I think is the most effective way Vulcan and Redeye can support the highly mobile task force battalion. What I propose is

dependent upon one Vulcan platoon being in direct support of a task force (TF) battalion and the battalion having its normal Redeye section. The Vulcan platoon leader and Redeye section leader should first coordinate and analyze the tactical situation.

Tactical Situation — Defense

When the TF battalion is in the defense, the priority of the air defense elements will probably be to support the company teams as well as the TOC and trains areas. The trains and TOC area are relatively static and can be covered by air defense elements without a great deal of difficulty. However, a problem arises in providing the company teams air defense protection as the tactical situation changes. If the Vulcan platoon leader and Redeye section leader are both located at the TOC, they can get a good overall picture of the changing tactical situation. They should preselect by map reconnaissance good air defense positions to the front of the FEBA as well as to the rear. When the enemy attacks, the platoon leader and section leader can send air defense elements to new locations, continually providing good air defense support of the battalion. In practice, the team or squad must either begin movement when enemy contact is successful or when friendly elements begin movement. It is merely up to the team or squad leader to call the section or platoon leader and ask him where to move next. The platoon leader will pick one of the preselected points and merely say to the team, "Go to position 23."

Defensive Employment Guidelines

If the terrain permits, Vulcan squads should be placed on or within 500 meters of the FEBA. This gives Vulcan 700-1,200 meters of early engagement against aircraft attacking to the front or flanks. Redeye, on the other hand, should be deployed 500-1,000 meters behind the FEBA to protect the flanks and rear from air attack. This gives the Redeye teams crossover point coverage well in front of the FEBA. The reason Redeye is deployed farther to the rear is two-fold: (1) Redeye has a much longer range than the Vulcan and can provide good air defense coverage without being on or near the FEBA; (2) Redeye also has limited self-defense capability against ground elements and should be repositioned before enemy forces are too close.

Offensive Operations

Redeye and Vulcan can also provide air defense coverage while the task force maneuver element begins the offensive. One good method that Vulcan uses is that of providing air defense coverage through collocation with the overwatch element. Vulcan can also provide air defense coverage by the use of preselected points along the route of attack. In both cases, the Vulcan squads *must* be within 1,200 meters of the asset to provide any air defense coverage at all. Redeye should be prepositioned much as in the defense. Redeye teams should have overlapping fire with Vulcan as well as other Redeye teams. Again, the Vulcan is primarily responsible for the air defense coverage to the front of the task force, whereas the Redeye teams are primarily concerned with the flanks and rear. In both offensive and defensive operations, the section leader and platoon leader must have control of the teams to continually provide a well integrated air defense plan. The preselection of points for new firing locations is almost essential to an efficient operation in both the offense and defense.

Problems Inherent in Redeye/Vulcan Employment

- If the Redeye section leader and Vulcan platoon leader are collocated, how are the squads and teams going to be resupplied? The section sergeant and platoon sergeant both need jeeps with an AN/VRC-47. If both the leaders and sergeants have vehicles and radios, the leaders can control the overall tactical situation while the sergeants resupply the squads and teams. In addition, if one of the leaders cannot contact a squad or team by radio, his sergeant can relay a message, being in the general vicinity of these elements.
- In almost every tested battalion, the TOC did not support the Redeye section. Air defense is a *must* for survival, and S-3s should begin incorporating assigned air defense units into their plans.
- TF commanders and team commanders often forget about air defense elements when the battle begins. Commanders must remember to use *all* their assets, including air defense.
- When the Vulcan platoon leader supports a TF he becomes the air defense officer for that unit. He must be careful in his employment so that both Vulcan and Redeye elements are employed in a well-integrated manner. Do not split the Redeye section into 2 or 3 separate elements. Let the section leader control his elements through the guidance and coordination of the platoon leader.
- As long as there are radios there will be communications problems. That is why it is so important that the Redeye section sergeant is out with the teams supervising their employment and movement. If the section leader cannot contact one of his teams directly, he can relay his message through the section sergeant.

The foregoing comments and conclusions are based upon my observations of the Redeye/Vulcan employment during ARTEP '76. They are offered to stimulate thinking in the area of Redeye/Vulcan employment with battalion-size task forces.

LIEUTENANT KIEZER IS CURRENTLY ASSIGNED TO C BATTERY, 3D BATTALION, 61ST AIR DEFENSE ARTILLERY.

ENLISTED CAREER NEWS

MALE E-5 DRILL SERGEANT DUTY

Some Army E-5s will get a surprise when they find that they are on the way to becoming Drill Sergeants. Male E-5s in six different career management fields (CMFs) will be reassigned involuntarily on an as needed basis.

The CMFs involved in the reassignments are: CMF 16-air defense, CMF 11-infantry-armor, CMF 12-engineer, CMF 13-field artillery (cannon), CMF 15-field artillery (missiles and rockets), and CMF 17-combat surveillance and target acquisition.

In the past, the Army has relied on volunteers for the Drill Sergeants program for males. Females have been selected on an involuntary basis for some time.

NCOs who serve as Drill Sergeant receive an extra $50 pay each month. The normal tour length is 2 years from the date of graduation from Drill Sergeants School. However, individuals in the program may extend for an additional 1 year period. Details are spelled out in AR 614-200, paragraph 15.

Those soldiers selected for the involuntary reassignment must be recommended by a commander (LTC or above) and must have a minimum of 4 years time in service. In addition, they must have scored at least 100 on their MOS test and have completed a basic NCO course (BNCOC) or primary NCO course (PNCOC). Graduates from NCO academies are eligible without having attended the BNCOC or PNCOC until September 1977.

OP/INT TRAINING PROGRAM

An Operations/Intelligence NCO/Specialist Extension Training Program, directed by Commander, TRADOC, is now under development. Operations/intelligence tasks common to Infantry, Armor, Field Artillery, and Air Defense Artillery are being developed in training lessons and subcourses by a civilian contractor. Combat arms schools will develop branch/MOS-unique tasks to complete required training packages. The program will be administered by the Army Correspondence Course Program Directorate, Fort Eustis, VA. Current plans call for the program to be available in September 1977.

NORMAL TOURS APPLY FOR OVERSEA SOC REUPS

Queries from the field indicate that some soldiers in oversea commands are confused about the 3-month involuntary extension of oversea tour and the CONUS station of choice reenlistment option. Some soldiers think they must serve the total 39 months before they are eligible for the CONUS option. Not true. According to DA personnel officials, soldiers with less than 6 years of service for pay purposes at ETS may reenlist for the option and depart the oversea command on the original DEROS (36 months) if they are within 3 months of ETS. The 3-month involuntary extension does not apply. The soldier, E-6 or below, with more than 6 years for pay at ETS, may also take the option if he has completed the normal 36-month oversea tour.

EXTENSION TO END

DA has announced action for the elimination of the involuntary extension of oversea tours. The elimination program will not become immediately effective but will be implemented on a phased basis to maintain oversea strength and obtain maximum benef t of available funds.

This tour length cut was made possible by the House-Senate Conference Committee's approval of the $638 million Army PCS Appropriation Bill. The amount is sufficient to begin the elimination of the involuntary tour extension in FY 77.

SMOS TESTING POLICY CLARIFIED

The recent decision to end competition for E-5 and E-6 promotions in a secondary MOS isn't as restrictive as it appears.

First, the March 1 policy change doesn't affect soldiers in the controlled secondary MOS program (see DA Circular 611-40).

Secondly, any soldier with strong, valid reasons for seeking promotion in an MOS other than his primary may request a change of primary MOS by applying formally through channels to the appropriate career division at MILPERCEN. If the request is approved and the soldier is otherwise eligible, he may be recommended for promotion in the newly awarded primary MOS.

Lastly, a soldier who attained a valid recommended list status in a secondary MOS before March 1 is entitled to retain that status indefinitely. If he is subsequently promoted in the SMOS, it automatically becomes his primary.

E-2 HIKES SLOWED FOR TOTAL FORCE

Promotion of slick-sleeve soldiers in Army and Reserve components has been altered by two recent policy changes. Time-in-service (TIS) required for promotion to E-2 in the Active Army since 1 October 76 is 6 months.

The slowdown in hikes to E-2 is necessary to bring authorized E-2 grade structure in line with Department of Defense authorizations. Reserve component commanders were told 1 May to stop promoting their soldiers to E-2 at the 4-month TIS mark. Now, soldiers in the Army National Guard and Reserve must complete basic training (BT) or basic combat training (BCT) and have 4 months TIS before they may be considered for promotion to E-2.

Also, Reserve component soldiers cannot begin counting TIS for promotion to E-2 until they begin their initial active duty training (IADT). In the past, Army National Guard and USAR soldiers were eligible to be promoted to E-2 4 months after enlisting in the Guard or Reserve. Time spent waiting to begin IADT no longer counts for computing promotion eligibility to E-2. However, the waiting period counts for pay and other benefits.

Since 1 October, Army National Guard and USAR privates have had to meet the same 6 months TIS requirement for promotion to E-2 as required of soldiers in the active Army.

NEW PERSONNEL ASSISTANCE POINT

MILPERCEN has opened its fourth personnel assistance point (PAP) to assist soldiers traveling to and from oversea assignments. Established at the Seattle-Tacoma International Airport (SEATAC), the Army's newest PAP provides personnel assistance to soldiers traveling between CONUS, Korea, and Alaska. The five-man PAP team can extend or grant emergency leave, replace lost orders or ID cards, and modify travel orders if necessary. The PAP commander also has the authority to administer Article 15s to soldiers who miss port calls through negligence. In addition to the SEATAC site, MILPERCEN has PAPS at Travis AFB, California; McGuire AFB, New Jersey; and Charleston AFB, South Carolina.

STRIPE SWITCH

The Enlisted Personnel Management System (EPMS) will soon be changing some hard stripe grades to specialist and specialist grades to hard stripe to give soldiers better career progression. In addition, these changes will conform with a revised Standards of Grade Authorization (SGA).

The SGA, which is set by law, does not allow both NCO and specialist ranks in the same MOS and skill level. This will cause the lateral NCO/specialist conversions.

The main factor in determining whether NCOs or specialists should be authorized is the number of positions in the MOS and skill level that require leadership, supervisory, or managerial responsibilities.

Conversions will be based on Army-wide structure evaluations. Evaluations are not a reflection of the soldier's performance, nor are they a factor in his or her professional development.

Exceptions to the SGAs requirements are E-4s whose MOS are under EPMS. They may be appointed corporals even though PMOS structures do not include NCOs in grade E-4 at the soldier's skill level. In this case, the soldier must have served successfully in the NCO position for at least 60 days, have the recommendation of his or her immediate commander, and meet the other requirements outlined in paragraph 7-35, AR 600-200, which spells out the policies and procedures pertaining to lateral appointments and will be revised later to reflect policies that pertain to the conversion of personnel under EPMS.

WHAT DO YOU DO NOW,

LIEUTENANT?

Prepared by Tactics Department, USAADS

SITUATION

You are the Redeye section leader of a Redeye section in Task Force 2-92 Armor. The task force consists of a headquarters element, a combat support company, three tank/mechanized infantry teams, an attached SP 155-mm field artillery battery, and a combat engineer platoon. Each tank/mechanized team has two tanks and one mechanized infantry platoon. You have five Redeye teams organic to your section plus one team from the field artillery battery that has been attached to your section for command and control, giving you a total of six teams. The armor task force is part of a larger element that has been given the mission of the encircling force in the division's current pursuit operation. The mission of the encircling force is to envelop the fleeing force, cut its escape route, and (in conjunction with the rest of the division acting as the direct pressure force) attack to destroy the fleeing enemy force. The task force is to seize two key bridges in the enemy line of retreat.

The task force commander gives the following intelligence briefing: Since we will be pursuing a disorganized enemy force, only light enemy resistance is expected initially. The exact location and enemy strength are not known. The bridges might be more heavily defended. Enemy air threat will probably consist mainly of helicopters using rockets and antitank guided missiles. High-performance air threat is present but considered minimal. The air defense warning is RED and weapons control status is WEAPONS TIGHT.

Since speed is of the greatest importance and only light enemy resistance is expected enroute to the objective, the task force commander decides to move his elements using the traveling technique, but he will switch to traveling overwatch if slight resistance is met. He is moving his companies in column as depicted in Figure 1.

The terrain along the route consists of gently rolling hills with woods and trees restricting fields of fire.

As the Redeye section leader, you should now be reviewing the employment guidelines to determine how you will position your Redeye teams to support a traveling or traveling overwatch operation.

EMPLOYMENT GUIDELINES

- Maintain coverage forward of the maneuver elements insuring early Redeye engagement.
- Weight the front and rear of the column and space the remaining teams equally throughout.
- Provide for overlapping coverage between teams.
- Provide for the teams' survivability.

In most situations these guidelines can be met by employing the Redeye teams in the defense of a traveling column, that is, weighting the front and rear and equally spacing throughout the rest of the column with the remaining teams. To insure survivability, the lead team should be behind the lead platoon and the trail team should not be with the last vehicle.

PROBLEM

What are your actions?
Where do you place your teams?
Can the jeeps keep up?

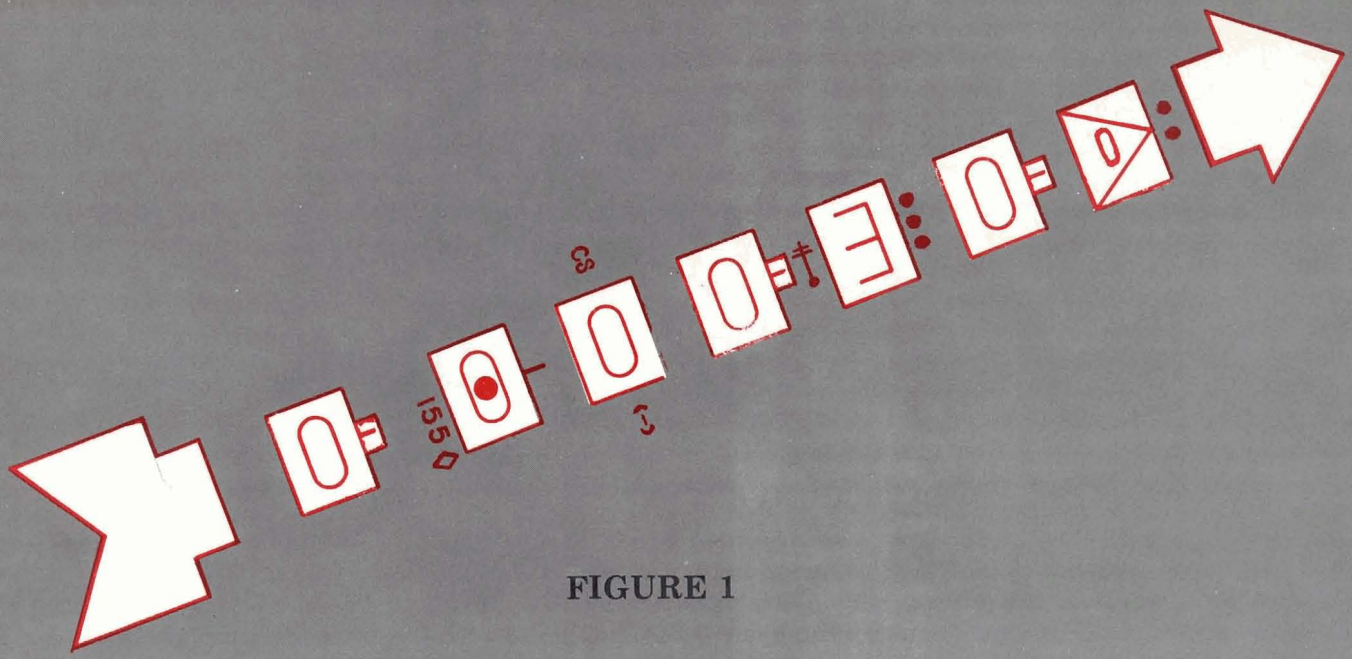


FIGURE 1

SOLUTION

Since your mission is to provide air defense for the maneuver force, you must take action to insure that your teams are situated in accordance with the employment guidelines. One thing you should realize is that your jeeps will probably not be able to keep up with the tracked vehicles moving cross country. Therefore, you should make provisions for your teams to ride with the different units within the column. The mechanized infantry platoons, antitank section, mortar platoon, combat engineers, and field artillery battery all have M113s (APC) or M557s that could accommodate the Redeye teams and some of their basic load. The teams would be required to use their AN/GRC-160 as an AN/PRC-77. You, as section leader, would need to work through the Task Force S-3 to coordinate with the various units for transportation of your teams. Remembering to weight the front and rear, you should put a team with the antitank section and the combat engineer platoon, and then a team should be placed with the trail company team and field artillery battery. The two remaining teams should be spaced equally throughout the rest of the column insuring overlapping coverage, which means the teams shouldn't be farther apart than 3 km. Therefore, one team should be placed with the combat support company and the other with the second tank/mech team. See Figure 2.

If the column came under air attack, the units would disperse and engage the enemy aircraft with individual weapons and machineguns, and the Redeye teams would dismount and engage with their missiles.

With proper planning and the employment guidelines, you, as a Redeye section leader, can provide effective air defense for this operation or any other you may be assigned.

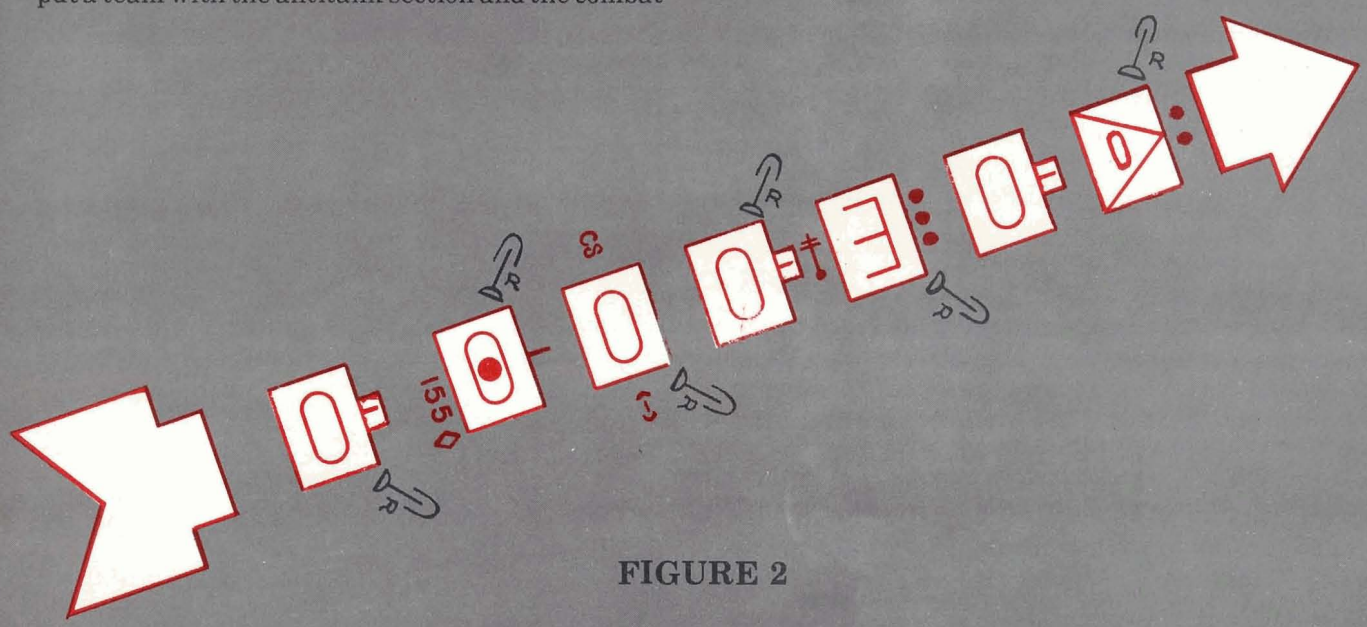


FIGURE 2

BARS to STARS

OPMD UPDATE

OMPF CONVERSION TO MICROFICHE

Conversion continues at MILPERCEN of all official military personnel files (OMPF) from hard copy paper documents to convenient microfilm sheets called microfiche. The conversion process should be completed by late 1979.

About a third of all warrant officer files are now on microfiche under the OMPF conversion that began in January 1976. All 06 records have been converted, and conversion of remaining officer records is scheduled for completion by September 1977. Conversion of enlisted soldiers' records began in early September at the Enlisted Records and Evaluation Center (EREC), Fort Benjamin Harrison, Indiana, and the project is scheduled for completion in about 3 years.

Conversion to microfiche files permits up to 98 individual documents from a soldier's OMPF — including photographs — to be microfilmed and arranged in seven horizontal rows and 14 vertical columns on a single 4x6-inch film sheet. As many film sheets as needed are used to reproduce the entire file. Before each official file is converted, all documents contained in the OMPF are thoroughly reviewed to insure that only authorized documents are microfilmed.

The benefits of microfilmed records already have been made evident to personnel who have had the opportunity to review a microfiche OMPF rather than contending with a bulky file of papers. Once the conversion process is completed, soldiers will be able to review their OMPFs without having to travel to MILPERCEN in Alexandria, Virginia; Enlisted Records and Evaluation Center; or the Reserve Component Personnel and Administration Center in St. Louis, Missouri. This will result in more efficient review procedures and will save time and money for both the soldier and the Army.

With microfilm files, the soldier will have the advantage of multiple copies of an OMPF readily being available to support authorized personnel actions requiring HQDA approval. Duplicate copies of microfiche OMPFs already have been used simultaneously by HQDA selection boards in a few instances. In the past, competition for the single official paper file occurred when more than one selection board, for example, required all or part of a soldier's records at the same time. Under the microfilm system, the master file never leaves the custodian. This facilitates updating when additional documents are submitted.

Members of this year's RA colonel promotion selection board for the first time will use microfiche OMPFs rather than paper documents. As file conversion progresses, other boards will be using microfiche records to make promotion selections, RA and school determinations, etc. Eventually, all DA selection boards will use microfiche files.

The microfiche system is viewed as an evolutionary and improved method of records administration and maintenance. It offers significant improvements and benefits for all records users — particularly the individual soldier.

OFFICER EDUCATION

Department of the Army recently approved three recommendations that will significantly alter education of Army officers under the Officer Personnel Management System. The recommendations, made by HQ TRADOC will put all officer basic courses under a common core curriculum. Appropriate specialty training will follow.

Ranger training will be available to combat arms officers, engineer and signal corps officers who are eligible for assignment to combat units, officers scheduled for Ranger assignments, and ROTC and USMA cadets who are taking voluntary precommissioning training.

Airborne training will be available only for officers whose next assignments are to airborne units or for voluntary precommissioning training for ROTC and USMA cadets.

Implementation of the changes began July 1976.

SENIOR WO PROMOTION SELECTION REVISED

Revised selection procedures for warrant officer promotion boards should result in more warrants being selected for CW3 and CW4.

In the past, the top two warrant grades have been limited to about 35 percent of the warrants on active duty. Over the next 3 years — beginning with the latest boards' selections — the number of senior warrants will be hiked to 40 percent of the warrant officer corps. Promotion boards now can select more warrant officers for the top two grades to make up the 5 percent difference. This approach should improve last year's first-time-considered selection rates of 60 percent for CW3 and 51 percent for CW4.

In addition to grade strength distribution changes, promotion boards are using a variable secondary zone selection rate. The Secretary of the Army's letter of instruction to the boards gives them the option of making between 2.5 and 7.5 percent of their selections from the secondary zone. This procedure will have no effect on the overall selection rate but could further increase the number of promotions from the primary zone. In the past, boards have stayed close to the maximum 7.5 percent mark.

The increased primary zone selection rates should be helpful in managing the careers of younger warrants—such as aviators—who may be vulnerable to promotion nonselection and forced separation before completing 20 years active federal service.

Most of the warrant officer corps is made up of former NCOs whose prior service makes it likely they'll complete 20 years of active federal service before facing possible forced separation. But aviators comprise 40 percent of the force, most of whom entered active duty as warrants, and may not be protected by service tenure.

Thus, low selection rates experienced in recent years could have caused the future loss of quality warrants due to nonselection for promotion. The new selection procedures should reduce the likelihood of such losses.

WARRANT OFFICER DIVISION POINTS OF CONTACT

PERSONNEL ACTIONS (221-7845)	PROFESSIONAL DEVELOPMENT (221-7844)	WEAPONS MAINTENANCE (221-7838)
CPT Tom Banyard	MAJ Tom Orlowski	CW4 Charlie Bush
CW4 Chuck Fisher	CW4 John Vleck	
CW4 John Valaer	CW4 Ellis Walker	
CW3 Bob Wood		

SENIOR AIR DEFENSE ARTILLERY COMMANDERS UPDATE

COL Merle D. Starr
USA ADA BCT Brigade

COL Eugene Fox
10th ADA Group

LTC Martin G. Olson
1st BCT Battalion

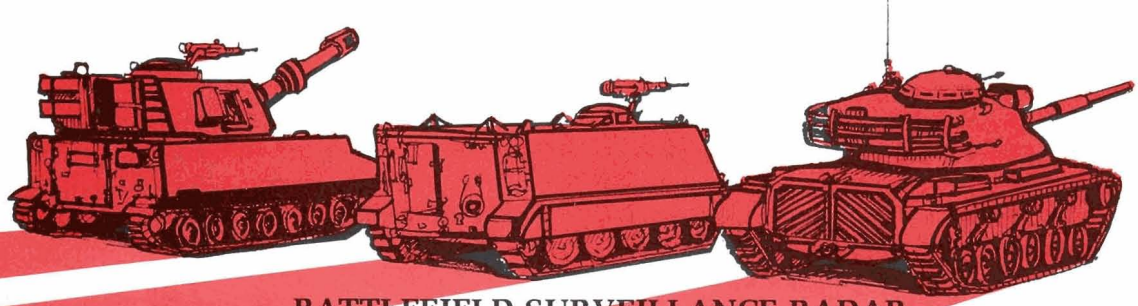
LTC Frank V. Lindstrom
2d Battalion, 5th ADA (C/V)

LTC Robert J. Lander
2d Battalion, 61st ADA (C/V)

LTC Ernest H. Tobin
2d BCT Battalion

LTC Richard E. Minor
1st Battalion, 7th ADA

COMBINED ARMS CORNER



BATTLEFIELD SURVEILLANCE RADAR

The recent addition of the pintle mount adapter to the AN/PPS-5B battlefield surveillance radar permits easy operation from a jeep. The .50-caliber machinegun is removed from the M-4 mount and the receiver transmitter unit (using the pintle mount adapter) inserted in its place.

The AN/PPS-5B, originally designed in the 1960-1963 period as a man-packed battlefield surveillance radar, is still doing worldwide duty in that capacity. In Southeast Asia the AN/PPS-5 was put to many uses and turned in an excellent record. Its first deployment was along the DMZ where it was used for general surveillance functions. At artillery bases it was used for perimeter defense and to provide target coordinates to the field artillery battery for direction of fire against approaching enemy patrols. It was also man-packed by foot patrols to forward areas for the acquisition of data on enemy troop movements.

Experimental models in a jeep-mounted configuration and in a 360° scan configuration were first field tested in Southeast Asia.

Since then, interest in greater mobility/transportability for the AN/PPS-5 has increased steadily. By rapidly transporting the AN/PPS-5, with its performance capability, from one location to another, and requiring only a two- or three-man team, the need for a string of fixed installations, each with its own crew, is eliminated. This concept is particularly applicable along remote international border areas. Since most remote areas are not too accessible to large vehicles, the jeep appears to be the optimum vehicle. It travels at much higher speeds than the larger vehicles over rough terrain, and the AN/PPS-5 is a very light load for the jeep.

AN/PPS-5B Battlefield Surveillance Radar mounted on a standard M-4 Mount installed in an M151A1 vehicle.

FIREFINDER

The new indirect fire weapons locating system has been named FIREFINDER. The system is a major breakthrough in the problem of locating enemy mortars and artillery.

The FIREFINDER system consists of an operation shelter that can be used with either of two different radar sensor antennas. One sensor will be used for long-range artillery location from behind the forward edge of the battle area. The other, a smaller antenna, will locate enemy mortars in forward battle areas.

FIREFINDER actually combines two radar subsystems — artillery locating (AN/TPQ-37) and mortar locating (AN/TPQ-36). Both systems use electronic scanning, sophisticated signal processing, and computer-aided analysis to detect and track projectiles without being affected by radar returns from birds, airplanes, and sky and ground clutter. The speed of the electronic processing normally allows the system to locate a hostile weapon before the fired round has landed.

Army authorization for limited production of the artillery locator radar subsystem is expected late this year. Having begun in 1972, development and testing of the mortar locating radar will continue this year with production set for late 1977.

CHRYSLER WINS MAIN BATTLE TANK CONTRACT

Chrysler Corporation has won the contest against General Motors (see p. 42, Jan-Mar 76 ***AD Magazine***) for the contract to build the new XM-1. The technology being used in the XM-1 presents a substantial edge over anything the US has seen in Russian armor, and is tentatively believed to be as good as the German Leopard II tank being tested by the US.

The new "Abrams" tank — named after the late Army Chief of Staff, Creighton Abrams — is and should continue to be the finest main battle tank in the world, superior to anything that our adversaries have at the present time or will have for possibly 20 years to come.

The 58-ton tank is a step forward in technology, principally in the armor system, fire control, and ability to shoot on the move. Employing an aircraft-style gas turbine engine, the XM-1 tank travels at 45 mph on hard surfaces, 35 mph cross-country, and accelerates from 0 to 20 mph in 6 seconds. The "Abrams" tank can cross over 49-inch vertical obstacles and 9-foot trenches. The 1,500-horsepower turbine has a number of outstanding improvements in maintenance features,

including 30 percent fewer parts, needs no oil changes, and can travel a minimum of 12,000 miles without overhaul. The engine should be quieter, less damage prone, and cheaper to operate than previous power plants. The tank also runs on any kind of gasoline or diesel fuel.

The special laminated steel alloy armor system will be impenetrable to present antitank missiles.

The XM-1 will be deployed with a turret able to use a 120-mm or 105-mm gun, but the first XM-1s will be equipped with 105-mm weapons.

Production of the XM-1 is expected to begin in late 1979 or early 1980.

FLEXIBILITY FOR ROCKET FUZING

Rocket fuzing has often been a limiting factor in the tactics employed by Army aviators. Until recently, the fuze/warhead combination had to be selected prior to the aviator's encounter with his target. With today's modern arsenal of weapons, the use of less than optimum scenarios cannot only endanger the aviator but simultaneously reduce his ability to deliver optimum lethality.

The objective is to allow the pilot to select the fuzing mode as different targets of opportunity are encountered. Selection is accomplished by communicating with one of two fuzes:

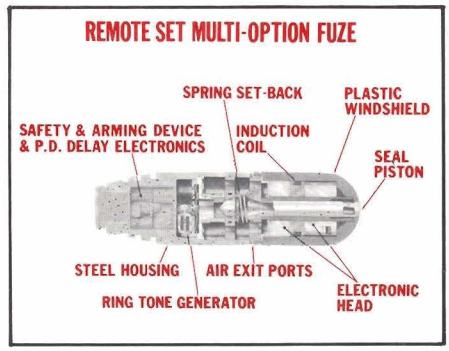
- A time fuze that is capable of being set from 2 to 60 seconds for subammunition and flechette rounds (fig 1).
- A multioption fuze for HE rounds (fig 2).

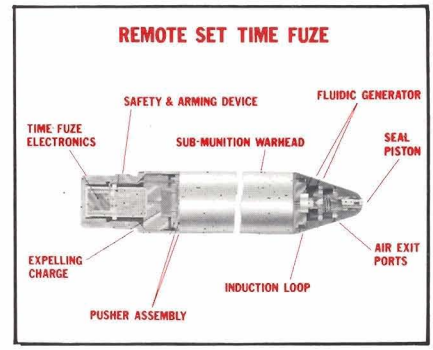
The multioption fuze increases the effectiveness of HE warheads in that the round can be set in flight for proximity (height of burst above ground), point detonating (PD) upon impact, or delay after impact settable from 1 to 200 milliseconds. This means that the optimum fuze/warhead combination can be selected as the target is encountered rather than preselecting the fuze when the rockets are loaded prior to aircraft takeoff.

The Army's Harry Diamond Laboratories has developed a hard-wire data link system applicable to both fixed-wing and rotary-wing aircraft. The development of this system stems from an anticipated increase in the use of cargo-carrying rounds and from a desire to take advantage of improved rangefinders and fire control systems that can provide a continuous update of the optimum time for fuze function.

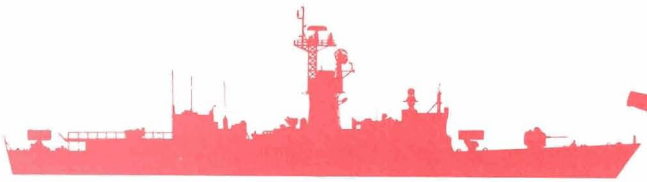
The remote set concept is to transmit data to a rocket immediately prior to firing of the round. The data can be used to control the fuze function mode and/or an electronic time setting remotely.

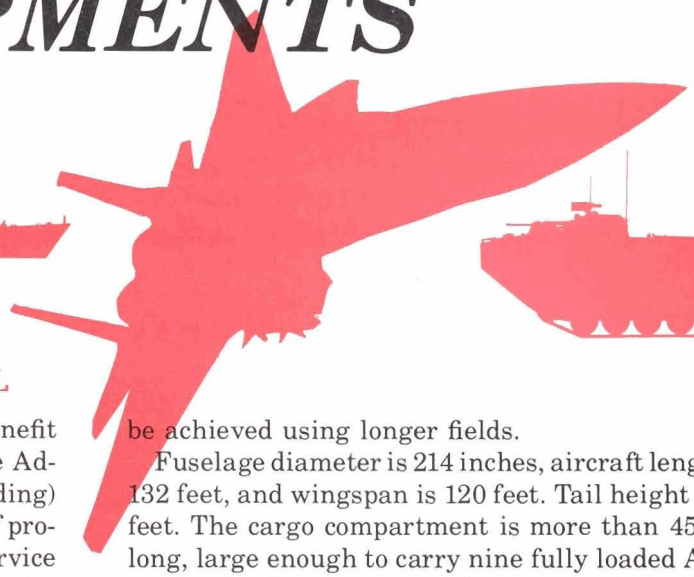
From an operational viewpoint, the remote set concept will eliminate the multiple connections to each rocket pod now required of ground personnel.





DEVELOPMENTS





USAF ADVANCED MEDIUM STOL

In the near future, the Army will reap the benefit of a new Air Force transport plane. Called the Advanced Medium STOL (short takeoff and landing) Transport (AMST), the plane will be capable of providing much better transport and supply service than any transport aircraft in the present inventory. Both McDonnell Douglas Corporation and Boeing Aerospace Company have built prototypes that are currently being tested.

The YC-14 — Boeing's entrant — is a high-wing, two-engine jet transport with a large cargo capacity and the ability to fly in and out of short fields. It can lift 27,000 pounds of payload off a 2,000-foot field or carry 69,000 pounds to and from a 4,100-foot field and still be capable of flying at jet speeds with jet efficiency. It employs a concept called upper surface blowing, using the thrust from the craft's two engines to blow air over the wing and flaps, creating power lift.

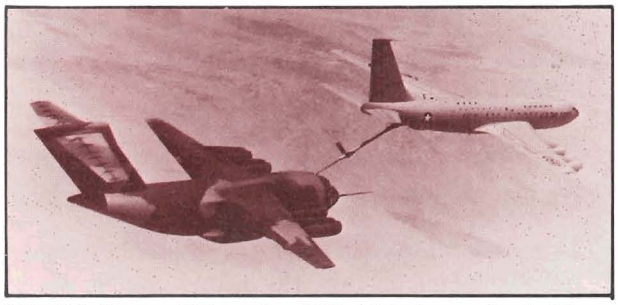
The airplane has a gross takeoff weight of approximately 170,000 pounds for the STOL design mission, although a considerably higher weight could be achieved using longer fields.

Fuselage diameter is 214 inches, aircraft length is 132 feet, and wingspan is 120 feet. Tail height is 48 feet. The cargo compartment is more than 45 feet long, large enough to carry nine fully loaded Army jeeps, plus the personnel who would ride in them.

The YC-15 — McDonnell Douglas' entrant — is also a high-wing type but has four engines and employs a unique externally blown flap power lift system to shorten the distance needed for takeoff and landing. The plane has operated from 2,000-foot runways and has been brought to a stop after touch down in as little as 700 feet. It can carry 155-mm SP howitzers, 8-inch SP howitzers, mechanized infantry combat vehicles, Goer wrecker trucks, and the UTTAS helicopter.

With payloads that these aircraft are capable of delivering to short landing strips near forward areas of combat, the Army's strike capability will be greatly improved. More vital equipment delivered sooner can mean battles won that might otherwise be in jeopardy.

The Boeing YC-14



The McDonnell Douglas YC-15 being refueled by an Air Force KC-135 tanker.

USAF ADA THREAT TRAINING

The USAF is conducting a series of field exercises at Nellis Air Force Base, Nevada, designated as "Red Flag," that are designed to provide tactical air crews realistic training in simulated ground-to-air hostile threat environment.

Air Force units are rotated through Nellis in a manner similar to the Army Short Notice Annual Practice (SNAP) program. While at Nellis, each unit is assigned a mission (e.g., interdiction, defense suppression, or close air support) that requires unit aircraft to fly against several simulated foreign-made SAM/AAA systems. In addition to the simulated ADA sites, the Nellis range has gun cameras, captive missiles, and air combat maneuvering in-

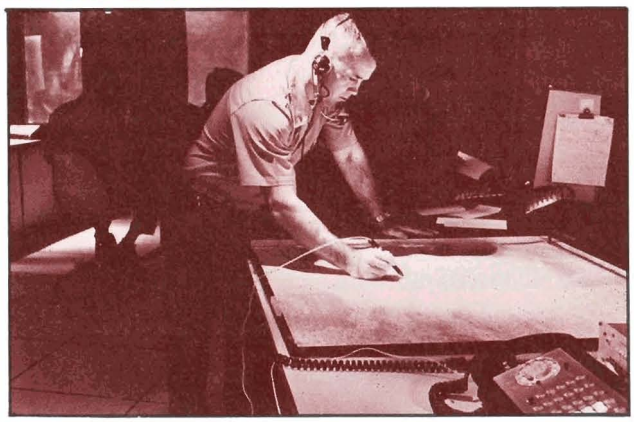
strumentation — almost everything but live air-to-air munitions.

Friendly flight profiles are recorded on remote TV cameras mounted on or near the simulated SAM or AAA gun. After each mission, the air crew is debriefed and given a rough assessment of the effectiveness of the mission and chances of crew/aircraft survival. The video tapes taken from the simulated ADA site cameras are played for all air crew members during the critique held at the end of each day's operations.

Participating air crews, many of whom had flown against enemy AAA or SAM sites in Southeast Asia, report that the training is exceptionally realistic and generates high enthusiasm from commanders and participants.

MARINE CORPS CONTROL SYSTEM

A US Marine tactician keeps in touch with a mock battlefield and relays simulated combat data from a map overlay through a light pencil to a computer. The action scene is the MTACCS (Marine Tactical Command and Control Systems) test bed at Camp Pendleton, California. MTACCS is a Marine data processing system concept (implemented by Hughes Aircraft Company) to automatically receive, process, distribute, and display information relating to the planning and control of amphibious landings and subsequent operations.



US NAVY NIGHT TARGETING SYSTEM

The US Navy has ordered into production a combination laser and infrared system for its Grumman A-6E Intruder aircraft that will enable air crews to locate and attack ground targets on the blackest of nights almost as easily as in full daylight. Pilots and bombardier-navigators who have flown with the system in nighttime tests have reported receiving television-quality pictures on their cockpit screens in which people were clearly visible on the ground.

The system, called TRAM (target recognition and attack multisensor), is believed to be the world's first fully integrated night attack system. It is capable of delivering a variety of laser-guided and conventional weapons. It is the only attack system that successfully integrates a forward-looking infrared (FLIR) sensor, a laser designator-ranger, and a laser receiver into a precision-stabilized turret. The FLIR is the first one designed with an optical zoom capability that enables the pilot and bombardier to keep a target continuously in view.

Because the FLIR forms an image from the heat radiated by objects in view, it can operate as well in total darkness as in daylight and also can see through bad weather. A ship can be seen on a stormy night or an oil depot can be spotted on land with the amount of fuel in each tank clearly visible because of temperature differences.

The system met or exceeded all specifications in Navy flight test and evaluation trials completed recently at the Patuxent River Naval Air Test Center, MD, and the Naval Weapons Center, China Lake, CA.

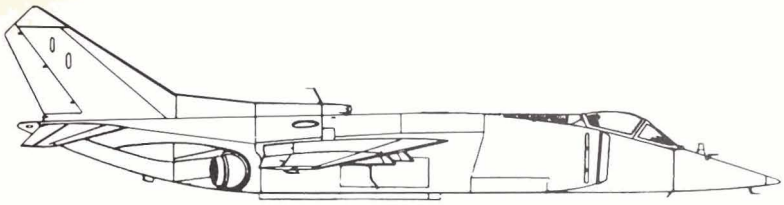
The TRAM, bore-sighted and operating in conjunction with the aircraft's radar, is believed to make the Intruder the only all-weather, electro-optical attack aircraft in the world.

In operation, the bombardier-navigator —

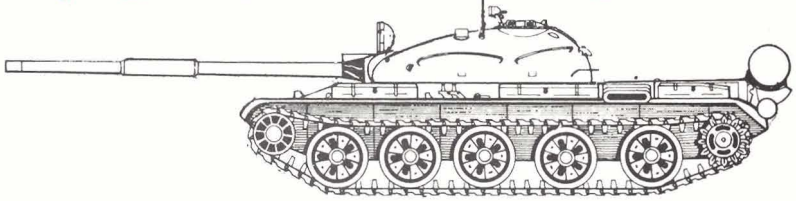
- Turns on his radar search set until he picks up the potential target, which appears as a blip on the radar screen.
- Then switches from radar tracking to the bore-sighted FLIR system, which displays the target's IR image on a TV-like screen.
- Hits the zoom switch, which brings the image close-up.
- Flips on the laser ranger, also bore-sighted, and aims the laser beam at his mark to provide a pathway along which a laser-sensing bomb travels to the target.
- Releases the bomb and flies away, escaping before the weapon hits the target.

TRAM's precision-stabilized turret permits tracking throughout a bombing run and even provides a "look back" capability to guide weapons while the aircraft flies away.

Then the crew can summon up an "instant replay" of the action from stored tape, just like a TV football replay, and make a decision whether another attack is required.



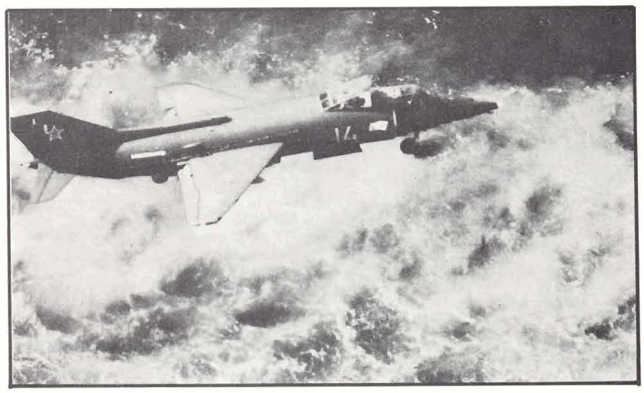
INTELLIGENCEWATCH

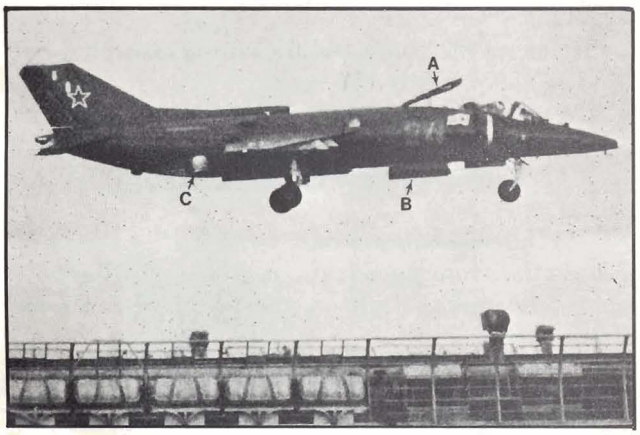


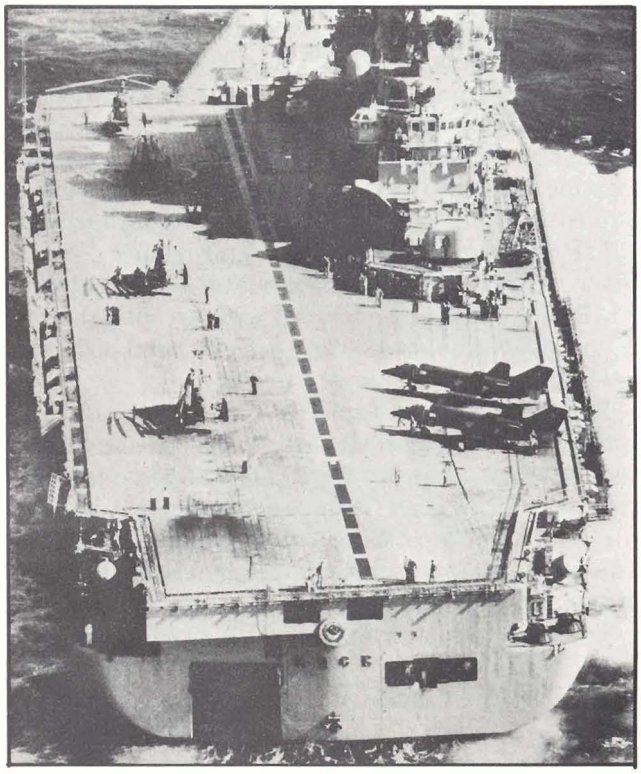
NEW SOVIET V/STOL FIGHTER

The Yak-36 (FORGER) is a new V/STOL strike fighter designed for antisubmarine warfare and strike/reconnaissance. At right, it approaches the flight deck of the Kiev, Russia's new 39,000-ton aircraft carrier. The stern view of the carrier (lower right) shows the 600-foot flight deck with four Ka-25 HORMONE helicopters and two FORGERS (wings folded) on the parking apron. Blast marks on the deck were made by the V/STOL aircraft during STOL takeoff. The picture below shows the lift-plus-lift cruise configuration of the FORGER as it hovers above the flight deck of the Kiev. The inlet (A) and outlet doors (B) for the two vertically disposed lift engines (mounted in tandem just aft of the cockpit) are shown extended. The twin swivelling nozzles (C) of the vectored thrust engine (just aft of the wing trailing-edge) are angled slightly forward in the hover. Detailed information on the Yak-36 armament is not yet available due to the newness of the aircraft. However, it is known to carry GSH-23 gun pods and up to 1,000-lb bombs. Pictures shown here were taken during recent maneuvers in the Mediterranean.

The United States' equivalent of the FORGER is the Hawker-Siddeley HARRIER, which is produced in England. Recently, McDonnell Douglas was contracted to produce an American version called the AV-8B HARRIER, which the Navy wants in adequate numbers for the purpose of keeping wartime shipping lanes open. The Navy has authorized the Marine Corps 350 HARRIERS and is urging rapid development of the 260 Model V/STOL, which will have a speed of Mach 0.85 when operational in 1981.

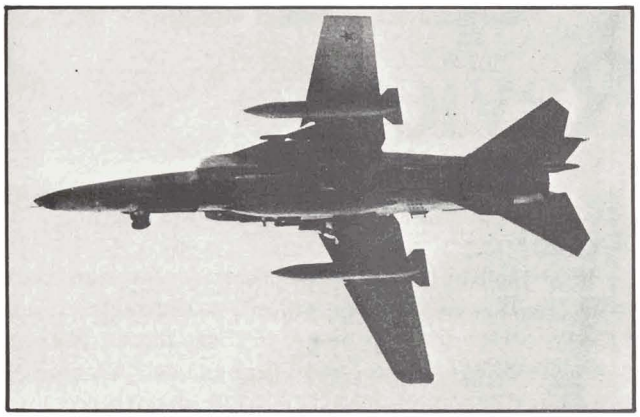


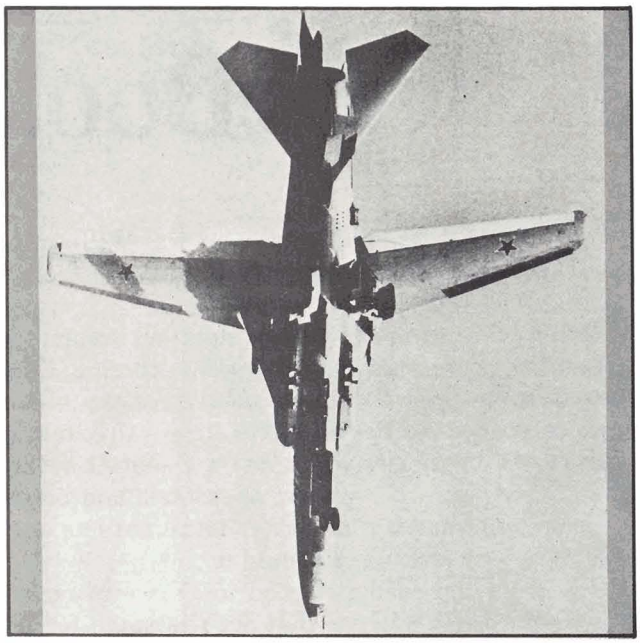




Photos by AVIATION WEEK AND SPACE TECHNOLOGY

FLOGGER D IN EAST GERMANY

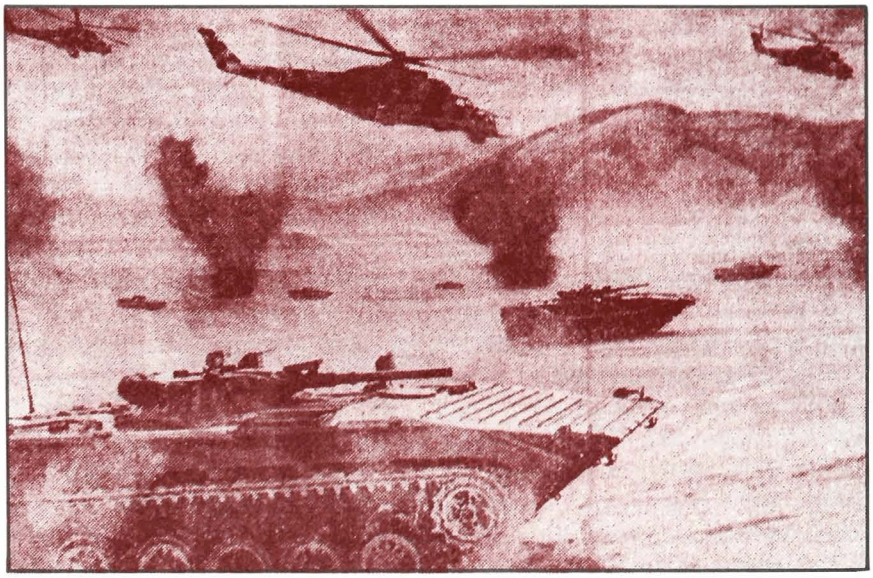




AVIATION WEEK AND SPACE TECHNOLOGY

The FLOGGER D is the attack version of the Soviet MiG-23 aircraft operating in East Germany. There are now three versions of the FLOGGER in operation: attack (FLOGGER D), interceptor/air superiority (FLOGGER B), and a two-place trainer (FLOGGER C). Long-range fuel tanks for ferry flights can be seen on the FLOGGER D (above left). The FLOGGER D is a considerably modified version of the MiG-23. Larger engine intakes are evident and a camera or laser range finder has been added under the nose, covered by a small sloping window. Armament generally includes a six-barrel-23-mm Gatling-type gun and ground attack loads of four 1,100-lb bombs, four UB-16-57 rocket pods, or tactical nuclear weapons. The FLOGGER D is presently deployed only in the Soviet Air Force. It could replace the SU-7 as the main Soviet strike fighter. An estimated 1,000 MiG-23s of all types are currently in service. The FLOGGER may eventually replace more than 5,000 older Soviet aircraft.

POSSIBLE HIND VARIANT



The following caption concerning the above photograph appeared in the 11 March 1976 issue of the Russian publication, *Red Star*: *"The aviators in the combat helicopter unit . . . successfully meet socialist duties. From flight to flight they persistently perfect flying training, learn to carry out missions under modern battlefield conditions. Every flying day is preceded by painstaking ground training. Crews try to perfect the combat power capabilities of the helicopter."*

The helicopters appear to be a variant of the Mi-24 HIND and the personnel carriers are Soviet BMP mechanized infantry combat vehicles.

AIR DEFENSE
Book Review

A SOLDIER REPORTS, by General William C. Westmoreland, Doubleday; 425 pages, Illustrated, $12.95.

After presenting a brief but detailed account of his military life from West Point days to 1963, General Westmoreland plunges into the story of his experiences in the Vietnam War. The entire story is exceptionally interesting, told in a matter-of-fact fashion replete with quotes, anecdotes, and battle descriptions that lay the tragic truth bare as only the man who knew it all could do.

He gives the reader a good insight into recent historical developments that set the stage for insurgency by the North Vietnamese, including a description of how the intricate insurgency forces were structured and how they operated.

When he entered the war in 1964 to become Vietnam Field Commander, it was a time of escalated insurgency activity, punctuated by widespread incidents of terrorism by the Viet Cong, which he labeled as an infrastructure or shadow government.

Early in his assignment, he travelled throughout South Vietnam to learn about the country and its people, a society of social fragmentation with a 2,000-year heritage of subjugation, occupation, rebellion, division, and internal disorder. The reader benefits from this experience as he describes the geography, culture, religions, and ethnic groups of the country.

The author reports that his mission of executing the war was from the beginning fraught with friction between military leaders and a generally hostile press, the latter often causing difficulty and embarrassment through inaccurate reporting. And the great military complications confronting the Army, Navy, and Air Force were often aggravated by demands or limitations imposed by Washington. Great diplomacy on his part, sometimes firmness and sometimes caution, were required in dealing with civilian leaders. Indeed, unreasonable demands by some of those leaders caused Westmoreland to observe:

"However desirable the American system of civilian control of the military, it was a mistake to permit appointive civilian officials lacking military experience and knowledge of military history and oblivious to the lessons of Communist diplomatic machinations to wield undue influence in the decision-making process. Overall control of the military is one thing; shackling professional military men with restrictions in professional matters imposed by civilians who lack military understanding is another."

As the commitment of American forces increased after the Bay of Tonkin incident, so did restrictions by civilian leaders on the use of those forces. In that connection, Westmoreland emphasizes: "Washington policy decisions forced us to fight with but one hand." Examples of that policy were "Tit for Tat" reprisal air strikes, wherein Americans were allowed to act only in response to an enemy aggressive act and only to an extent on parity with what the enemy had done; and "Graduated Response," which placed limitations on the frequency and extent of bombing the enemy. This policy was a weak stand in the eyes of the North Vietnamese and encouraged them to continue the war that America was trying to end. As the war dragged on, the American public became more and more disenchanted with our involvement.

The North Vietnamese Tet offensive is described in detail, and it was this extensive battle that fired American resentment to the point of violent demonstrations against the war. Still, more US troops were committed, and US forces later took the offensive.

The North Vietnamese were finally brought to the conference table but, as Westmoreland points out, they continued to fight and kill. Even though US troop strength eventually reached 549,000, it was not until President Nixon authorized mining Haiphong Harbor and bombing military targets in North Vietnam that the enemy saw the wisdom of serious negotiations and an armistice was signed, followed by US evacuation.

Before long, North Vietnam violated all armistice agreements except the release of American prisoners of war. Abandoned, South Vietnam soon fell to the overwhelming Communist forces.

The author takes the position that it remains for history to record whether a war in which 2,594,000 Americans served and 46,399 were killed in action was a waste. But he does say of South Vietnam, "After long years of support and vast expenditure of lives and funds, the US in the end abandoned South Vietnam. There is no other way to put it."

Probably nothing else ever written about the Vietnam War will be as thorough and as accented with factual incidents as *A Soldier Reports*.

With insurgency having emerged as the prominent style of warfare that it has, the book should be on all required reading lists for officers and senior noncommissioned officers.

A SOLDIER REPORTS GENERAL WESTMORELAND

The Editor Comments

The annual readership survey results are in and have been evaluated. We sincerely thank you for your cooperation in the survey.

We distributed 10,230 questionnaires with our April-June issue and approximately five percent of those were returned to us. We feel that these survey forms were from our most interested readers and, therefore, provide a good insight into the thinking of our target audience.

Of those who responded, 73 percent are Active duty, 5 percent Reserves, 8 percent National Guard, 5 percent retired, and 5 percent others. The grade structure of the respondents is 67 percent commissioned officers, 3 percent warrant officers, 20 percent NCOs and other enlisted, 7 percent DA civilians, and 4 percent other civilians. The ranks ranged from privates to colonels. Those responding are assigned to Redeye sections (6 percent), C/V units (10 percent), Hawk units (11 percent), Nike Hercules units (5 percent), schools and ROTC (20 percent), with the remainder assigned to staff and other positions. Of those responding, 46 percent have baccalaureate degrees, 20 percent have graduate degrees, and 20 percent are high school graduates or equivalent level.

We distribute over 10,000 copies via free distribution to units and about 90 to readers with paid subscriptions. After reading ***AIR DEFENSE Magazine,*** 40 percent keep it for reference and the remainder pass it on.

Forty percent indicated an interest in contributing to the magazine. (Those who want to submit items should review "The Editor Comments" in the July-September issue for helpful hints.)

Thirty-six percent of our respondents read all of the material in the magazine and 43 percent read most of the content, with 19 percent reading selected items only. Fifty-two percent find the content "highly useful" and 42 percent find the material "moderately useful." Since 79 percent of the readers are reading more than half of the magazine and 52 percent find the content to be highly useful, it is clear that ***AIR DEFENSE*** is headed in the right direction.

The order of standard features most read is first "Scanning," followed by "Combined Arms Corner," "Developments," "Intercept Point," "Engagement Zone," "Bars to Stars," and "Enlisted Career News."

The subjects that should be given more emphasis, in order of preference, are ADA tactics, foreign armies and equipment, innovations in ADA, future concepts, and career information and guidance. Regarding the graphics, layout, and composition of the magazine, 81 percent said it was good and that they like it as is.

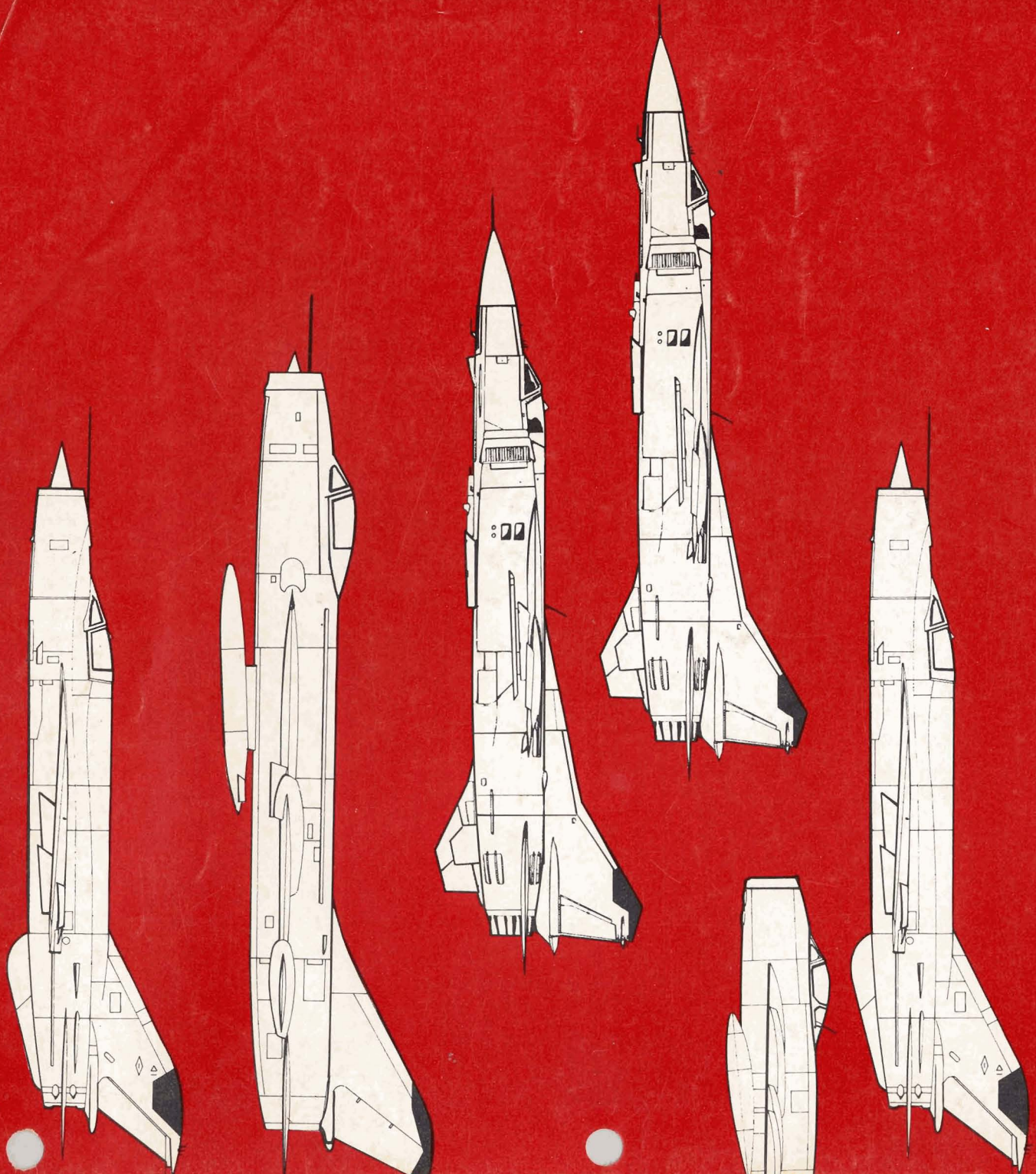
Perhaps the most gratifying survey result for our staff was to learn that 52 percent of our readers think ***AIR DEFENSE Magazine*** is as good as other military publications and a whopping 45 percent think we are ***better*** than the others!

Following are comments frequently repeated by readers with our responses:

- Print more on tactical employment of Redeye. The "What Do You Do Now, Lieutenant?" article in this issue has been written on Redeye tactics and more are planned for future issues.
- More material should be written about Reserve and National Guard roles in ADA. We are including "The Guard Takes AME" in this issue as a starter, but remember, we need input from National Guard and Reserve units if we are to continue to respond.
- Use more colors. We would like to use more colors, but under DA guidelines we are authorized only two colors per issue, one of which must be black.
- Include more information on foreign weapons. In response to this frequent request, we have added a new department to the magazine—"INTELLIGENCE-WATCH" (see page 42). The first installment of INTELLIGENCEWATCH accents this issue's Soviet aircraft theme; however, in the future we will report on a wide variety of foreign equipment including air defense, armor, artillery, and aviation. You can look forward to photos of and information about the weapons of our Allies as well as those of potential adversaries.

We asked if ***AIR DEFENSE Magazine*** is making progress in providing a forum for all air defenders. The answer was a heartening 91 percent "yes."

Results of the survey clearly indicate that our readers are excited about the improved format and quality of ***AIR DEFENSE.*** Our staff will continue to respond to your needs by providing the best publication possible. This issue's poster inclosure, "Soviet and Warsaw Pact Forward Area Aircraft," is yet another example of innovations we are using to give you useful material and "food for thought."

So, thanks again for your support and encouraging remarks. We are looking forward to the input from you 40 percent who want to contribute to the continuing growth of ***AIR DEFENSE Magazine.***

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