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The Army's Navigation and Control Systems (NAVCON)

SPECIAL ISSUE '78

ARMY AVIATION

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The NAVCON (Navigation and Control) Aug-Sept. issue is the fifth of six 1978 special issues devoted to a single theme. With 75 of the issue's 104 pages tied to NAVCON, COL Roy White, the NAVCON PM, who developed the editorial plan, and "Sherm" DuBOIS, who implemented it, have put together a most comprehensive editorial package for your information.

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GEN. ROGERS

MILPERCEN to review three aviator career alternatives

ARMY CHIEF OF STAFF DIRECTS MILPERCEN TO REMEDY A PROJECTED SHORTAGE IN COMPANY GRADE AVIATORS

In a mid-August memorandum, the Army announced that it would undertake a review having far-reaching impact on Army Aviators.

Army Chief of Staff **Bernard W. Rogers** has directed Dept. of the Army and MILPERCEN staffers to examine three alternatives to the plan currently in effect. Objective: Find the career plan that will be best for the Army and for the Army Aviators.

An imbalance from '66-'70

The projected shortage of company grade aviators and the overage of field grade aviators is an immediate concern. This imbalance stems from the large number of Army pilots who were trained to meet peak Vietnam requirements during the 1966-1970 period.

In the later phasedown, the Army reduced its primary pilot training greatly to offset an anticipated excess of aviators. At the same time, many company grade aviators left the Army, while others received subsequent promotions to major.

The current doctrine of employing combat aviation units much like combat arms maneuver units is also impacting on the problem since this concept requires the heavy use of company grade aviators in the combat units.

Several remedies to the problem are being considered by the Army. The first involves discontinuance of the current policy requiring commissioned officers to serve 24-60 months with their basic branch before they may attend primary flight training.

This means that some lieutenants may go to flight school immediately after they complete their basic course.

However it does **not** mean that officers with more active service will be precluded from attending. The specifics of this change of policy should be decided and announced within the next several months. (Ed. Note: A key MILPERCEN official has been invited to make a Friday, Oct. 13 presentation to attendees at AAAA's National Convention in Arlington, Va.)

Reassignments a possibility

There are short-term solutions to this problem which may result in selective grade substitutions in order to fulfill requirements. If this situation occurs, it will be necessary in FY 79 to assign some majors to aviation positions in CONUS that are held currently by company grade officers.

These assignments would be accomplished under the close supervision of the Commander of the Military Personnel Center with the full cooperation of installation and unit commanders.

In a recent update of the aviation situation, **General Rogers** emphasized his commitment to do a better job for Army Aviators. He also charged Army personnel managers to ensure that the needs of the Army are carefully balanced with the needs of aviators as actions are taken to correct current problems. ★

ACES' CLUB STANDINGS

In enrolling five new members in the AAAA, some 60-odd members have qualified for distinctive "Aces Club" Certificates confirming their 'kills.' Here are the July 31 leaders:

Ms. Sylvia Barcak, Corpus Christi. 74
Mrs. Mildred Stanton, Desoto, MO. . . . 51
Ms. Sandra Strub, Corpus Christi. 48
CSM Alan Owens, Ft. Campbell. 46
Clarence E. Key, Iran. 37

Leapfrog.

Under modern tactical conditions, the key to ground defense is mobility and flexibility . . . demands uniquely met by the versatile CH-47 Chinook helicopter. Regardless of the condition of terrain—jammed highways, damage to roads, rail lines, or bridges—the Chinook has demonstrated its ability to leapfrog firepower, materials and troops to critical positions. It resupplies ammunition and fuel. It keeps artillery, armor and armed helicopters fully effective. It recovers equipment and evacuates wounded. To meet and counter a lightning thrust, the Chinook is an indispensable tool of the ground commander . . . an absolute necessity in tactical and logistical planning. To stay a jump ahead.

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- It is invulnerable to 7.62 mm fire.
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And when things get rough, this is the kind of aircraft any soldier wants to fly or fly in. Sikorsky Aircraft, Main Street, Stratford, CT 06602.

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UNITED TECHNOLOGIES


UNITED STATES ARMY

An extract of a letter written by LTG Edward C. Meyer, Deputy Chief of Staff for Opns & Plans, as published in the Congressional Record, July 11, 1978

Why the Army Needs 16 Additional CH-47C Helicopters in FY 79

IN response to recent questions concerning the CH-47 and the implementation of the Aviation Requirements for the Combat Structure of the Army (ARCSA III), the following explanation on the approved initiatives for the medium lift helicopter fleet and the implementation schedule were provided the Congress. The content of this article was inserted into the **Congressional Record.**

THERE ARE three major initiatives which directly affect the CH-47. First, to provide savings in personnel overhead and to achieve the employment potential of a self-supporting platoon of eight helicopters away from its parent unit, the Army is increasing the number of aircraft in the CH-47 company from 16 to 24.

SECOND, to properly support forward deployed forces in NATO, the Army will deploy three additional CH-47 companies, for a total of six, to the Federal Republic of Germany.

THIRD, the plan will place the preponderance of all CH-47 units into the Active Force, about 76 percent, in order to be available for rapid deployment to forward areas and to provide a rotation base for overseas units. The original plan, completed in the fall of 1977, prescribed that all of these actions would begin in fiscal year 1979 and be completed by the end of fiscal year 1983.

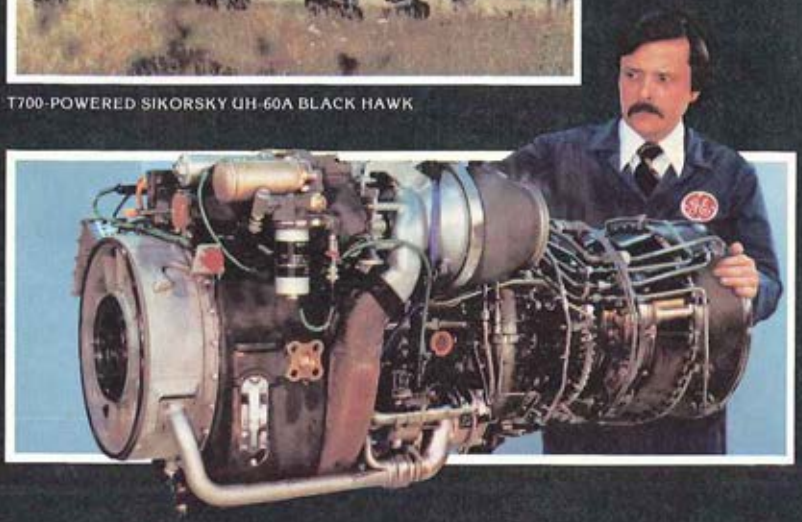
SINCE THEN, the Army has completed three actions, the Officer Aviator Special Task Force (STF), the 1978 U.S. Army Worldwide Aviation Logistics Conference (WALC), and Review of the Aviation Structure through 1984. Each of these reviews surfaced difficulties in immediate implementation of the CH-47 initiatives. The Officer Aviator STF showed continued reliance should be placed on the Reserve Components; the WALC indicated a worldwide shortage in the CH-47C helicopter inventory required to support the plan; and, modifications to the force structure are required because of forecast shortages of aviators to fulfill requirements and the worldwide commitments of the medium lift helicopter fleet.

CONSEQUENTLY, there have been changes made to our original plan for buildup of the CH-47 medium lift helicopter force in U.S. Army Europe (USAREUR). The Army will provide one company in FY 80 and two more in FY 83. Current plans will increase the CH-47 Chinook helicopter resources in USAREUR to 158 by FY 85, which is a delay of approximately one year from the previous planned year. However, these companies will have sixteen (16) helicopters in each company until FY 85 when they will be increased to 24 CH-47C helicopters per company.

(THE NEED/Cont. on Page 14)

Black Hawk Power

T700-POWERED SIKORSKY UH-60A BLACK HAWK



The T700: Now being delivered to meet the needs of the modern Army

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GENERAL ELECTRIC

Plan to attend the AAAA's 20th National Convention in Arlington, Va. at Stouffer's National Center Hotel during 12-15 October 1978

Thursday, Oct. 12 Business-Social Program

1430-1630	AAAA National Executive Board Quarterly Business Meeting.
1800-2100	Early Birds' Reception. Cash Bar and Snacks.

Friday, Oct. 13 Professional-Social Program

(Program, Speakers, and Times Subject to Change)

0900-0905	Welcome by LTG Robert R. Williams, Ret., AAAA President.
0915-0945	AAAA General Membership Business Meeting; Elections.
0945-1015	Program Break .
1015-1130	AAAA General Membership Meeting. Open Discussion with Delegate and General Member Floor Proposals.
1030-1200	AAAA Ladies' Brunch. (By ticket.)
1130-1300	Open Luncheon Period.

FIRST SESSION - AAAA PROFESSIONAL PRESENTATIONS
(Open to Convention Registrants)

1300-1305	Introduction of AAAA Professional Sessions by BG Carl H. McNair,Jr., Army Aviation Officer, DA & Chairman, AAAA Presentations Subcommittee, 1978 AAAA Convention.
1300-1330	"Interoperability." The Honorable Walter B. LaBerge, Under Secretary of the Army.
1330-1500	Allied Panel. (Representatives of France, Germany, Iran, Italy, and the United Kingdom).
1500-1530	Coffee Break. Exhibit Hall. (Sponsored).
1515-1630	AAAA Professional Presentations. (Open to Non-Registrants.)

SECOND SESSION - AAAA PROFESSIONAL PRESENTATIONS
(This Session Open to Non-Registrants)

1530-1630	Personnel Panel. Major General Joseph P. Kingston, Assistant Deputy Chief of Staff for Personnel, DA.
1700-1830	1978 Cub Club Reunion.
1900-2030	AAAA President's Reception. (By ticket.)

Sat., Oct. 14 Professional-Social Program

THIRD SESSION - AAAA PROFESSIONAL PRESENTATIONS
(Open to Convention Registrants)

0900-0930	Keynote Address - "USAREUR Update." General George S. Blanchard, Commander-in-Chief, U.S. Army, Europe.
0930-0950	"Hardware."Major General Story C. Stevens, Commander, U.S., Army Aviation Research & Development Command.
0950-1020	Coffee Break. Exhibit Hall. (Sponsored.)

FOURTH SESSION - AAAA PROFESSIONAL PRESENTATIONS
(Open to Convention Registrants)

1020-1040	"ARCSA USAREUR Update." Brigadier General Carl H. McNair, Jr., Army Aviation Officer-Dept. of the Army.
1040-1100	Tactics. Major General James C. Smith, Commander, U.S. Army Aviation Center & Fort Rucker.
1100-1120	"Aviation Support." Major General Richard H. Thompson, Commander, U.S. Army, Troop Support and Aviation Readiness Command
1120-1200	Q & A with all Third and Fourth Session Presenters. Brig. Gen. McNair, Moderator.
1200-1230	Luncheon Reception. Cash Bar.
1230-1400	AAAA Luncheon. Recognition of "Air Traffic Controller of the Year," the "Outstanding ATC Unit," outgoing AAAA Board members, and "Outstanding Chapter of the Year,"

FIFTH SESSION - AAAA PROFESSIONAL PRESENTATIONS

1400-1420	"REFORGER 1978-1979." General Robert M. Shoemaker, Commander, U.S. Army Forces Command.
1420-1440	"Organization." Major General James H. Merryman, U.S. Army Training & Doctrine Command.
1440-1500	Joint Air Attack Team Tactics, TAC/TRADOC Presenters.
1500-1530	Q & A with all Fifth Session Presenters.
1900-2000	AAAA Awards Dinner Reception. Formal. (By ticket).
2000-0100	1978 AAAA Awards Dinner-Dance. (By ticket).

Sunday, Oct.15 Business-Social Program

1000-1100	AAAA National Executive Board Business Meeting.
1100-1300	AAAA Diehards' Brunch. Informal. (By ticket).

NOTE: The "presenters" listed represent the invitee list as at Friday, Aug. 11.

Advance Registration Form for AAAA's 20th National Convention in 12-15 October

STOUFFER'S NATIONAL CENTER HOTEL — THURSDAY, 12 OCTOBER THROUGH SUNDAY, 15 OCTOBER 1978

I plan to attend the functions of the 1978 AAAA NATIONAL CONVENTION indicated below and have enclosed a check made payable to "AAAA" to cover the costs of my attendance and function tickets. I understand that I may receive a full refund through 5 October.

1978 AAAA NATIONAL CONVENTION FUNCTION	MILITARY DELEGATE	CIVILIAN DELEGATE	MILITARY MEMBER	CIVILIAN MEMBER	NON-MEMBER	
REGISTRATION (NECESSARY FOR PROFESSIONAL SESSIONS)	$6.00	$14.00	$10.00	$18.00	$30.00*	.....
FRIDAY, OCT. 13, 1978 PRESIDENT'S RECEPTION (INFORMAL) 1900-2030 HOURS	$5.00	$10.00	$7.00	$12.00	NOT APPLI-CABLE*	.....
SATURDAY, OCT. 14, 1978 AAAA LUNCHEON 1130-1400 HOURS	$8.00	$14.00	$12.00	$16.00	NOT APPLI-CABLE*	.....
SATURDAY, OCT. 14, 1978 AAAA RECEPTION AND AWARDS DINNER-DANCE (FORMAL) 1900-0100 HOURS	$12.00	$24.00	$23.00	$35.00	NOT APPLI-CABLE*	.....
SUNDAY, OCT. 15, 1978 AAAA DIEHARDS' RECEPTION AND GETAWAY BRUNCH (INFORMAL). 1100-1300	$5.00	$8.00	$7.00	$12.00	NOT APPLI-CABLE*	.....
TOTAL - ALL FUNCTIONS	$36.00	$70.00	$59.00	$93.00	$30.00*	.....
FRIDAY, OCT. 13, 1978 AAAA LADIES' BRUNCH 1030-1200 HOURS	$6.00	$6.00	$6.00	$6.00	NOT APPLI-CABLE*	.....

Name ..... **Rank/Grade** .....

Unit or Firm .....

Address .....

City ..... **State** ..... **ZIP** .....

NOTE: "Military Member" Fees apply to active U.S. Army, Retired, Reserve Component, and DAC personnel, except those retired military, Reserve Component, or retired DAC in the employ of defense contractors or suppliers who are to register and attend functions at the "Civilian Member" rate. **Wives' tickets** may be purchased at the "Military Member" fees, and wives are not required to pay a "Registration Fee." Make checks payable to "AAAA."

***Includes $12.00 First-Year** AAAA Membership Dues with the New Member Registrant to then pay the appropriate Military Member or Civilian Member "Function Fees" shown in the table.

Bell's AH-1S modernized Cobra is combat ready... NOW!

The most advanced aircraft technology available is incorporated in Bell's AH-1S. Firepower versatility, battlefield flexibility, compact size, survivability and desirable pilot handling qualities are some of its important features. But the most outstanding feature is the fact that it's in production and deployed in combat-ready units with contingency plans for world-wide engagement ... NOW!

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Army Aviation Association of America
October 12-15, 1978
Military: Single, $27.00 — Double, $32.00
Civilian: Single, $33.00 — Double, $40.00

Please Print

Name ..... (Last) (First)

Address.....

City..... State..... ZIP.....

Arrival Date ..... (Day of Week) (Month) (Date)

Departure Date ..... (Day of Week) (Month) (Date)

Please reserve ..... room(s) for ..... persons

NAMES OF PERSONS SHARING ACCOMMODATIONS

.....

.....

FIRST NIGHT DEPOSIT OR COMPANY GUARANTEE REQUIRED FOR ANY ARRIVAL AFTER 6 P.M.

GUARANTEE INFORMATION (Please Print)

Firm Name .....

Address.....

City..... State..... ZIP.....

The FY 79 Need for Add'l CH-47's (Cont.)

THE CH-47C is a critical item in worldwide Army combat readiness pending the introduction of the CH-47D helicopter through the CH-47 modernization program. The current inventory of CH-47 helicopters falls short of the required 482 and includes only 210 CH-47C helicopters which can meet the required operational capability of lifting 15,000 pounds at 4,000 feet altitude while operating at 95° F conditions. During the years 1978-1983, a maximum of 55% of unit aircraft will meet the performance requirement of the required operational capability.

SHOULD PROCUREMENT for the 16 CH-47C helicopters be approved, the Army may be able to build-up the CH-47 unit structure in USAREUR earlier and achieve the personnel savings and operational advantages inherent in the 24 helicopter CH-47C company. The CH-47C helicopter is a critical asset to the Army in providing responsive and flexible combat and logistical support on any future battlefield. It's essential that the asset posture of the CH-47 helicopters be maintained.

THIS REQUESTED PROCUREMENT would also help maintain worldwide Army combat readiness as some 51 early nonstandard and nondeployable CH-47A model helicopters are phased out as they reach their 20-year lift and as aircraft are inducted into the CH-47 modernization program beginning in FY 81.

AIRCRAFT DELIVERED under this FY 79 procurement could be expected to operate in the Army helicopter fleet approximately ten years before remanufacture to the CH-47D configuration. ★

We made the unbeatable Titan APU even better for the CH47D Chinook.

Helicopters need an APU they can trust. Because you never know where they'll take off from next.

That's why not one of the thousands of production U.S. military cargo helicopters has ever flown with any turbine APU other than our *Titan*® APU.

And the modernized CH47D Chinooks will take to the air with an improved *Titan* APU. With both hydraulic and generator drive plus the very latest in state-of-the-art electronic sequencing.

Which proves that in APU's we'll make the best better for you.

Of course, reliability is just one reason so many helicopters use our APU. It's also lighter than competitive units. Its ability to cope with sand, dust and salt spray is combat proven. And its life cycle costs are low.

If you're in the market for an APU, write Solar Turbines International, an Operating Group of International Harvester, Dept. A-168, San Diego, CA 92138. We'll tell you about the best APU you can buy. And why it's even better now.

SOLAR TURBINES INTERNATIONAL

In his first open letter to aviators and crewmen worldwide, Brig. Gen. Carl H. McNair, Jr., the new Army Aviation Officer in ODCSOPS, DA, says . . .

I'd like to hear from you!

After 23 years of close association with Army Aviation at every level from an isolated flight detachment in MAAG Taiwan to commander of an aviation brigade, I am indeed honored to have now been selected to serve as the Department of the Army Aviation Officer in ODCSOPS.

Today's Army is an exciting place to be — unprecedented challenge and opportunity coupled with the self-satisfaction of contributing to the national defense. Mission, training, new equipment, and new organizations are all dynamic ingredients.

The **Rogers** and the **Howze Boards,** and the other key milestones in the annals of Army Aviation history are behind us, and in 1978, aviation is more an integral part of the Army force than ever before. A full partner in the combined arms team, aviation contributes significantly in the third dimension to the fundamental Army mission - to move, shoot, and communicate.

It is the firepower and mobility combat multiplier that assists today's Army in meeting the growing threat. We in aviation must continue to optimize our systems and our units for maximum return in the conduct of the land battle for that is our ultimate mission.

As the focal point for aviation matters in the Headquarters, I am in daily contact with the key staff elements involved in our aviation programs, and consequently would like to hear from you on those matters which concern you or which you feel may deserve clarification or alternative consideration.

These could range from personnel matters to logistics or communications; and if we cannot act on them, we can certainly channel your concerns, innovations, or ideas to the proper authority.

"Today's Army is an exciting place to be — unprecedented challenge and opportunity coupled with the self-satisfaction of contributing to the national defense."

Likewise, I would like to use this column as an unofficial medium for a periodic update for you on major aviation actions at the DA level.

The results of ARCSA III and its implementation are now widely known as are the findings of the Specialty Code 15 Management Study which were published in a recent issue.

Beyond this, however, and as recently announced by the Chief of Staff, we are studying alternative OPMS career patterns for commissioned aviators. Consideration is being given to permitting commissioned officers direct entry into flight training following the basic course without a 24-60 month branch assignment.

This action could assist in relieving our near-term shortage of company grade aviators. Aviators so trained could then rotate to a branch material assignment immediately before or after the advanced course.

Results of this effort should be known in September and will be promptly disseminated. In addition, the **AAAA National Convention** in October will include an Aviation Personnel Panel, chaired by the Assistant Deputy Chief of Staff for Personnel. The panel will discuss career patterns, OPMS, and other pertinent matters of interest to all aviation personnel.

Speaking of the **AAAA Convention,** this is the twentieth annual national meeting and promises to be a banner year. The professional program should be one of the best in recent years with something for everyone. Many distinguished speakers will

BRIG. GEN. McNAIR

be featured, including **General George S. Blanchard,** CINCUSAREUR, who will provide a USAREUR update.

Other presentations range from tactics, hardware, organization, and logistics to joint testing programs with the Air Force, all focusing on the convention theme, **"Army Aviation on the NATO Horizon."**

In closing, let me reiterate my personal pride in and professional dedication to the Army, Aviation, and you — the people who are the heart of our aviation effort.

I look forward to working with you and for you as Deputy Director of Requirements and Army Aviation Officer, and ask for your continued support of our total Army mission. ★

International Sport Aviation and Politics Don't Mix!

by Vic Powell, Executive Director, NAA

THE **National Aeronautic Ass'n (NAA)** sponsored and sanctioned the United States Team in the **Third World Helicopter Championships** held in Vitebsk, USSR, July 31 through August 4, 1978.

TEAM MEMBERS were selected earlier this year and underwent extensive training at the Bell Helicopter plant in Ft. Worth. Six male and five female members — three of whom were military members — constituted the U.S. Team.

WE WERE ESPECIALLY disappointed and disheartened recently when the Carter administration injected politics into this NAA-sanctioned U.S. Team (by preventing the military members from) attending the **Third World Helicopter Championships.**

IT IS IMPORTANT to point out that the U.S. government bore no expense in preparing for U.S. participation in this event, in transporting the members to the Championships, or in underwriting their attendance at the competitions.

THE NAA takes pride in the fact that members of all official U.S. **sport aviation teams** are volunteers. They compete against teams of foreign nations whose members are heavily subsidized by their governments. This fact often makes the competition tough for teams from the United States, but U.S. teams have performed very well in international competitions and the United States is the one to beat.

THE AMOUNT of volunteer time by persons across the country in support of the teams has been heartening. People from all walks of life have come together to offer their help, and to do what they can to ensure that the team had the necessary equipment and funds to attend.

THIS IS OFTEN accomplished at considerable personal sacrifice by the team member, the sponsors, and the supporters. They believe, however, that it's necessary and worthwhile. The effort has been enormous — the results satisfying.

ALL OF THIS is done totally outside of the U.S. government. No tax dollars have been expended in behalf of U.S. teams; no government personnel have been assigned to the effort.

NAA MEMBERS believe this is the way it should be. It can provide a considerable psychological boost to our team members who know they're backed by the people of this nation, and not some government agency.

WINNING AN OFFICIAL international aviation championship has both a direct and indirect impact on U.S. industry. Equipment used by those who capture winning positions in competition will usually become a demanded item, and the manufacturer can enjoy a worldwide market for the product.

BUT THE international psychological impact of the winning team can also be profound. A **win** can help a mind-set regarding how the winning nation's aviation industry as a whole is perceived. In this regard a win by a team not directly associated with a particular aviation industry can have an impact on how that industry's products are regarded abroad. In this sense **sport aviation** can be very helpful to the entire aviation industry.

ONE WOULD THINK, therefore, that the government would be cognizant of this situation and would provide any help possible. Indeed, this is the basis of the substantial support many foreign sport aviation teams receive.

THAT IS WHY we were especially disappointed at the injection of politics into this matter, for the three military members of our 11-member team had proven themselves to be leading pilots on the team. Their experience, and individual abili-

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Flying nap-of-the-earth demands heads-up attention. Fewer knobs to twist and displays to read means the pilot can keep his eyes outside the cockpit and on the objective.

When the Army asked for simplified cockpits, Grumman went to seasoned Army pilots and molded an Integrated Avionic Control System precisely to their needs.

The result... ten separate navigation and communication controls combined into a single unit... positioned and displayed to gain extra split seconds for greater concentration outside the cockpit.

A system designed by pilots for pilots.

Designing cockpits and integrating avionics are just two of the things we do best. Ask the people who drive F-14s, Hawkeyes, and Gulfstreams.

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Int'l Sport Aviation and Politics!

ty and expertise, were decided assets, and we looked forward to providing stiff competition to the country that we regarded as a tough competitor, the Soviet Union.

THE U.S. TEAM was equipped with a most up-to-date helicopter for the competition, the Bell **JetRanger.** The team trained extensively at the Bell plant flying the competition course. Under the leadership of coach **Harry Gilliand,** team manager **Frank Cantwell,** senior delegate **Joseph Mashman,** and support personnel, the team developed great spirit with a positive attitude and a desire to win.

THE CARTER ADMINISTRATION reportedly desired to send a message to the Soviet Union regarding administration displeasure with a variety of developments with the USSR. It cancelled some export sales to the Russians, eliminated funding for travel to conferences held in the USSR, made oil equipment sales subject to the U.S. Export Control Act, expressed itself in the media regarding its views toward the Soviet Union, and even went so far as to keep three individual military members of the U.S. Helicopter Team from attending a sport aviation championship by removing them from the team.

THE MILITARY members obeyed orders and did not attend the competitions. They received word that they were not to participate while the U.S. team was undergoing last minute training in West Germany.

THE CARTER ADMINISTRATION knew who the military members were because the NAA had chosen to advise the State Department of the names of the team members, and the date and location of the world championships, as we attempt to do with all the U.S. (sport aviation) teams.

THIS IS THE FIRST U.S. governmental interference with an American team in recent memory. We do not dispute the government's right to control its employees, but we regard it as a heavy-handed action by the Federal government against a private organization attempting to meet the lawful purposes to which it subscribes, and from which the country benefits.

THE FIRST GOAL of the **Federation Aeronautique Internationale,** the world body for sport aviation and in which the NAA serves as the United States' exclusive representative, is "making evident the essentially international spirit of aeronautics as a powerful instrument for bringing all people closer, regardless of any political or racial consideration."

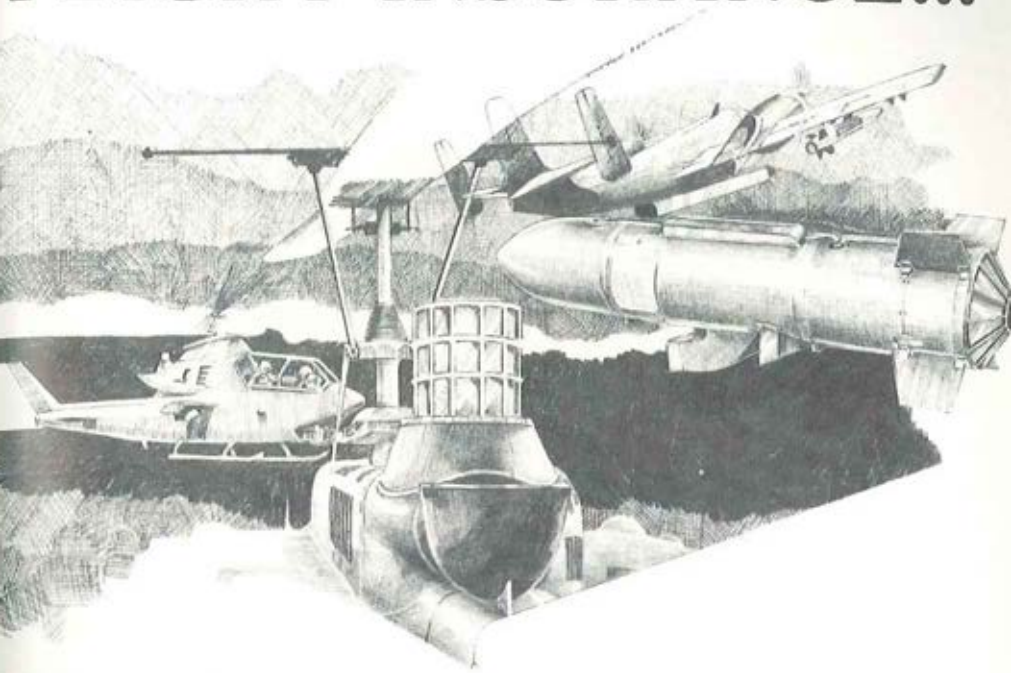
THIS IS A GOAL with which the Carter administration, with its emphasis on human rights and morality, ought to find agreement. Regrettably, they chose to insert politics in an activity and organization that is working to keep political interference out.

POLITICS and international championship aviation do not mix. It was true in 1905 when the FAI was formed; it is just as true today. The United States was one of the five nations that originally joined to form the FAI.

FOR THE Carter administration to have taken its action against the U.S. Helicopter Team is an international embarrassment of this nation.

AS INDIVIDUALS, the members of NAA are sympathetic to the cause of human rights throughout the world, but I wonder if the message, as interpreted by the Russians, was one the administration sought. The administration's action has lead to providing the Soviet Union with an international propaganda tool

FLIGHT INSURANCE...



Sanders' Infrared Countermeasures Systems

Sanders' Infrared Countermeasures (IRCM) offer flight insurance that can't be bought over the counter. These systems increase aircraft survivability in a hostile environment, thereby increasing mission effectiveness. Systems such as the AN/ALQ-147 for fixed wing aircraft like the OV-1D and AN/ALQ-144 for helicopters such as the AH-1S feature proven performance, high reliability and simple maintenance. Both have been fully flight qualified.

For further information, call or write:

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Int'l Sport Aviation and Politics!

that will undoubtedly be used all over the world.

THE U.S. TEAM members worked hard and invested their own as well as donated money to field the finest helicopter team the U.S. has ever had. The evidence of the excellence of the team is shown by the relative closeness of the score. The **Soviet Union's pilots** captured top individual pilot awards and won First Place in the team standings, being ahead of the **U.S.** by 313 points out of a total of 3,298 — only 10%.

IF THE ENTIRE U.S. team had been allowed to participate, the U.S. (entry) would have been considerably stronger.

THE EYES OF THE WORLD will not know that the Carter administration prevented our most promising pilots from participating; they will only see that the **Soviet Union** was the best, and we were second. Few will remember that the U.S. government lowered the U.S. prospects of winning the **Third World Championship** by forcing the withdrawal of the team's most effective competitors.

SPEAKING FOR our members, those who donated to the team, and the citizens who supported the team, NAA extends thanks to the dedicated team members and the entire U.S. delegation who attended the championships and who fought hard to win this event. They faced formidable odds in attempting to abide by the goals of the FAI, competing against the Soviet and other national teams, and meeting with their own government's interference.

NAA IS PROUD to stand by our U.S. team; they battled well. And we are proud of all those people who made it possible for the U.S. team to attend the World Championships.

—**Vic Powell**

LETTERS TO THE EDITOR—LETTERS TO THE EDITOR—LETTERS TO THE EDITOR

OFFICER "PROFESSIONALS"

Sir:

I think the "Who's Who in Army Aviation" is a terrific idea. However, after over seven years as a member of AAAA, I'm personally chagrined that I'm not considered a "professional."

Commissioned officers, as well as Warrant Officers, lose track of their contemporaries through the years, yet the proposed roster contains no provisions for commissioned aviators.

I realize that not all AAAA members can be considered as "flight professionals." Yet as an aviation commander, I resent the implication that commissioned aviators cannot be "flight professionals."

Future slights of this magnitude will render my association with AAAA an unjustifiable expense without benefit. When bantering around the term, "professional," I suggest you consider the possible response from large groups who are not included in the term.

MAJ EDWARD J.W. O'BRIEN
D Co, 8th Aviation Bn (Combat)
APO New York 09185

(Ed. Note: We're both flattered and disturbed ... flattered that the writer obviously finds the coming "AWO Roster" both desirable and useful, and disturbed that he would think we'd overlook the several thousand commissioned officer/aviator members of AAAA, or consider them any less professional than their warrant flight counterparts.

Our 1979 editorial plan calls for alternate month centerfold rosters of each major segment of AAAA membership. The 1978 "SPOOF Roster" for AAAA's retired members is already behind us; the "Who's Who" for our CWO/WO members will go to press in late September, and the "DACK PACK" for AAAA's DAC members is scheduled for Feb., 1979 Other member segments will follow later in '79. Stay with us, Major.)

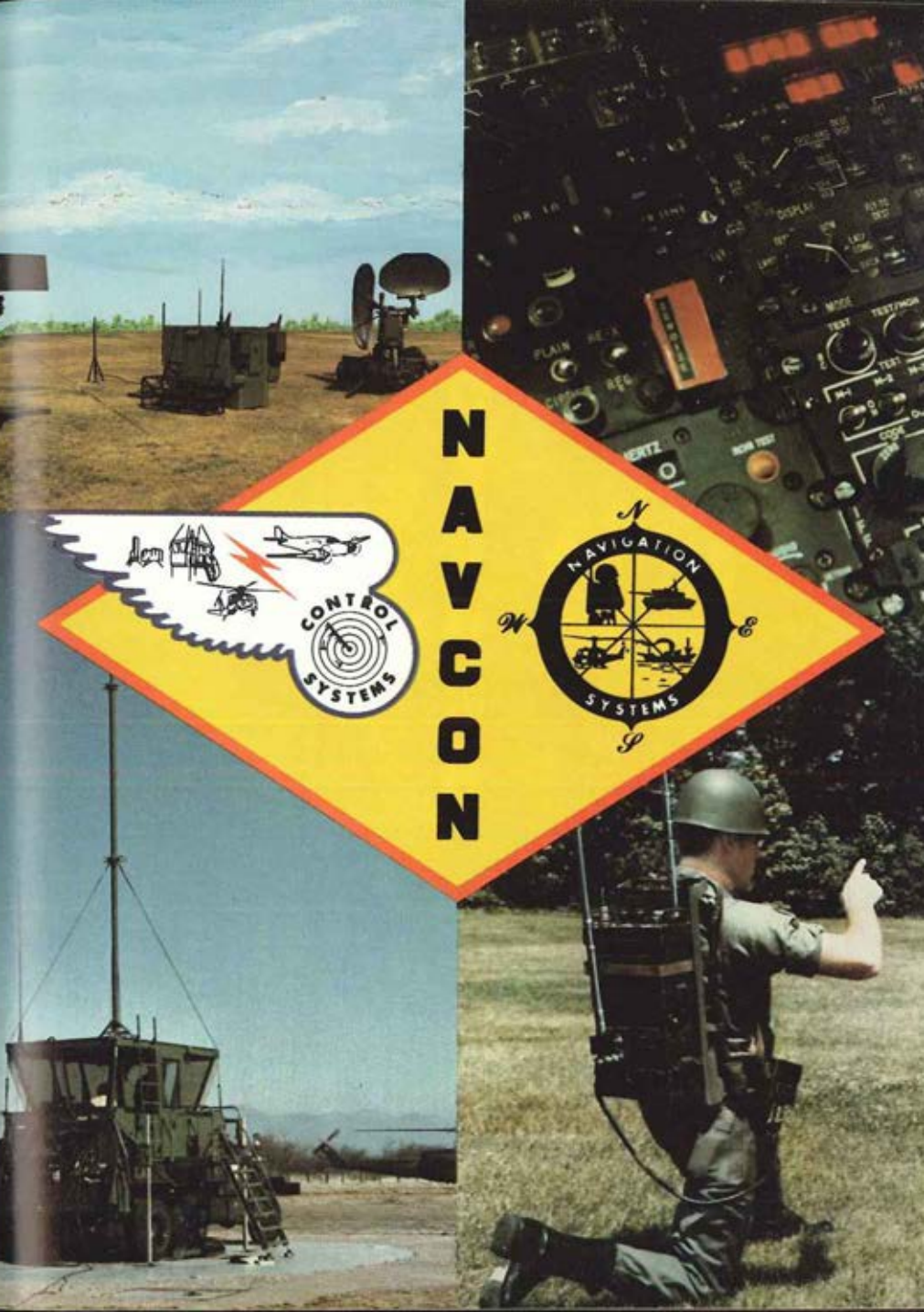
A SENSELESS PUBLICATION

Sir:

I'm sure you only intend to provide a service to people who want it. However, I'd like to bring to your attention the value a publication, such as your proposed "Who's Who," would have to our enemies.

You'll notice our opposite numbers have nothing like this to give information to our side. I don't feel I'm crying "Wolf" but our senseless publication of this sort of in-

(LETTERS TO THE EDITOR/Continued on Page 70)


NAVCON
CONTROL SYSTEMS
NAVIGATION SYSTEMS
N
W
E
S

DEPARTMENT OF THE ARMY
HQ, US ARMY AVIATION RESEARCH AND DEVELOPMENT COMMAND
P O BOX 209, ST. LOUIS, MO 63166

US ARMY AVIATION RESEARCH AND DEVELOPMENT COMMAND
Commanding General

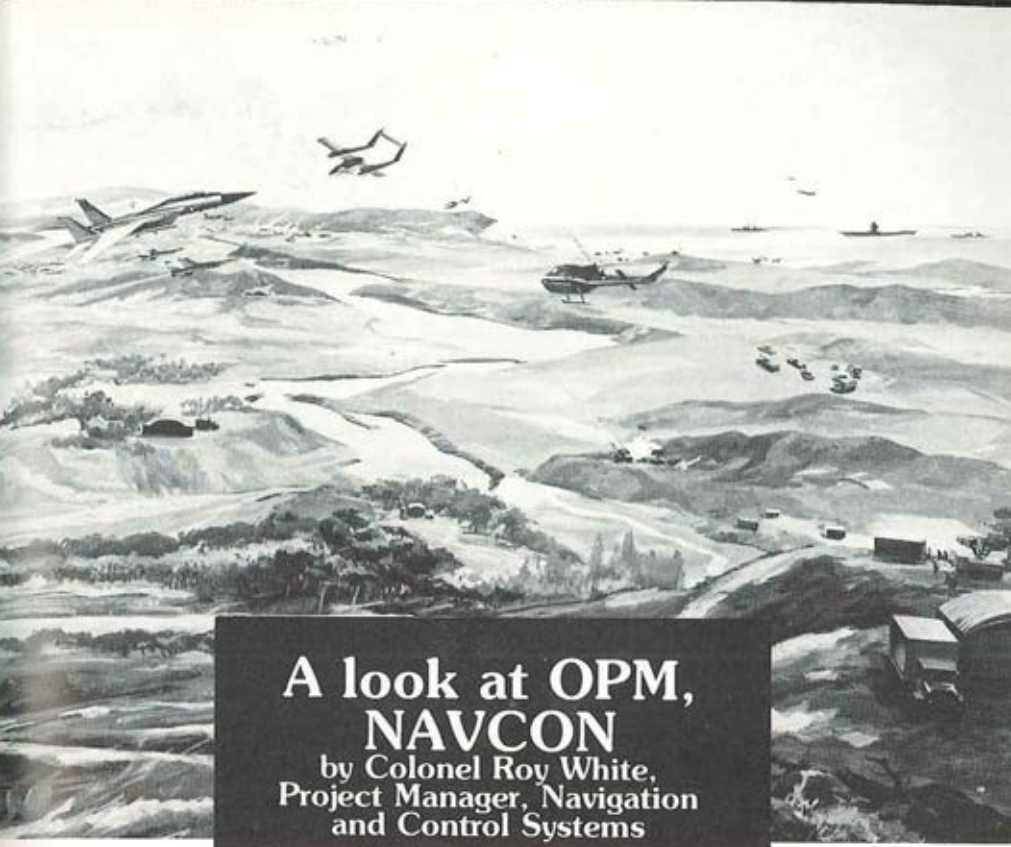
The success and responsiveness of Army aviation in meeting specific mission assignments is dependent not only upon the airframe, the weapons systems, and crew training, but also on the avionics systems designated for each aircraft. These systems permit Army aircraft to accurately navigate to the objective area and, after completing the mission, to return to home base safely, regardless of visibility conditions during any part of the mission.

It is, therefore, most fitting that the Navigation and Air Traffic Control Systems being developed or improved under the management purview of Project Manager NAVCON at Ft. Monmouth, New Jersey, are highlighted in this issue of the AAAA Magazine.

The ability of the Army to "win the first battle" depends highly on these capabilities.

Story C. Stevens

STORY C. STEVENS
Major General, USA
Commanding



A look at OPM, NAVCON

by Colonel Roy White, Project Manager, Navigation and Control Systems

IN 1967-1968 the Commander of the U.S. Army Materiel Command (AMC) established Product Managers for both Positioning and Navigation Systems (PANS) and Air Traffic Management Systems (ATMS).

A great many things were going on in both areas, but there was no focal point in the Army to pull all the loose ends together.

In late 1969, these two offices were merged to form the Navigation/Control Systems (NAVCON) Project Management Office, which

is the Army's repository for Positioning, Navigation, and Tactical Air Traffic Mangagement expertise.

The merger brought together a combination of some 15 tasks and about 74 separate requirements to cover those tasks. NAVCON and the user, **U.S. Army Combat Development Command (CDC)** — (now the **U.S. Army Training and Doctrine Command) (TRADOC)** — set about to consolidate these requirements into the two Materiel Needs (ATMS and PANS) which were approved in 1972.

Since its inception in 1960, NAVCON has fielded the AN/ARN-103 Micro TACAN, the AN/ASN-86 Inertial Navigation System, and most recently, the AN/TRN-30 Low Frequency Beacon. About to be fielded are the AN/PSN-6 LORAN Manpack, AN/TSW-7A Control Tower, and the AN/ASN-128 Lightweight Doppler Navigation System.

COLONEL ROY WHITE, Project Manager, Navigation & Control Systems (NAVCON)

An AVRADCOM organization

As shown in the photochart appearing in the centerfold, NAVCON is assigned to the **USA Aviation Research and Development Command (AVRADCOM)** in St. Louis, Missouri, but is physically located at Fort Monmouth, New Jersey, and is co-located with the Avionics Research and Development Activity, formerly the Avionics Laboratory.

The NAVCON Project Manager's Office is organized to manage the development of navigation and ATC systems through the development and fielding phases of the life cycle.

In addition to Army programs, the DOD has assigned the Army as the lead service for the development of the Tactical Microwave Landing

NAVCON SERVES THE USER. IT GETS THEM TO WHERE THEY WANT TO GO; ITS LANDING SYSTEMS PERMIT SAFE RECOVERY.

System, part of the National Microwave Landing System. Within the Army, I have been given that management responsibility.

Once the Project Manager is confident that the hardware development and logistics support are adequate to provide the soldier with the best and most reliable piece of equipment, the system is transitioned to a Readiness Command such as **U.S. Army Communications Electronics Materiel Readiness Command (CERCOM)**.

NAVCON tasks cited

NAVCON currently manages several separate but related tasks which include:

POS/NAV

AN/PSN-6 LORAN Manpack Navigator

●

AN/ASN-132 Lightweight Inertial Navigator

●

AN/ASN-128 Lightweight Doppler Navigator

●

AN/VSN( ) Combat Vehicle Heading Reference Unit

AIR TRAFFIC CONTROL:

AN/TSW-7A Air Traffic Control Central

●

AN/TSQ-97 Manportable Air Traffic Control Facility

●

AN/TSQ-71A/TPN-18 Landing Control Central

●

AN/TSC-61B Flight Coordination Central

●

AN/TRN-30 Non-Directional Beacon

●

Joint Tactical Microwave Landing System

●

Air Traffic Management Enroute Facility (ATMS Enroute)

In addition to articles that will appear on the tasks already mentioned, you will find articles about future ATC equipment, such as the **Very Lightweight Air Traffic Management Equipment (VLATME)**, and future POS/NAV systems, such as the **Global Positioning System (GPS)**. ★

The Navigation and ATC Technology at AVRADA

BY COLONEL DARWIN A. PETERSEN, Commander
U.S. Army Aviation Research & Development Activity

NAVIGATION and Control are two of the primary concerns of the **U.S. Army Avionics Research and Development Activity (AVRADA),** Ft. Monmouth, NJ.

Two of our six technical divisions are dedicated solely to those concerns, namely, the Navigation Division and the Air Traffic Management Division.

AVRADA, under the aegis of the **Aviation Research and Development Command** in St. Louis, MO, is the Army's representative responsible for keeping up with the rapidly advancing technology in the avionics area. Our job is to apply this technology in line with the Army's current and future needs in developing equipment to meet these needs.

The ultimate thrust

The future for Army Aviation is the ability to operate at very low altitudes in all conditions. We must be able to do this in the high threat environment of the modern battlefield while still insuring some measure of safety and survivability to aircraft and crew. This then is the ultimate thrust of all of our efforts.

Two very important aspects of our efforts are the ability to manage and control our aircraft in this high threat environment, and the ability to navigate successfully at the very low altitudes dictated therein.

In the Air Traffic Management area a portion of our effort is directed at overcoming technical barriers to successful modern battlefield operations. These barriers include terrain masking of communications and radar signals; electronic counter-measures which include location, interception, and jamming of our signals; limited space and payload of Army rotary wing aircraft; very large numbers of Army aircraft, which can lead to high costs in equipping each aircraft with new hardware; and the often low reliability of some electronic systems.

Another significant area of effort for AVRADA is providing technical support to others, in this case, the NAVCON PM. Approximately 40% of the Air Traffic Management Division's manpower effort is in support of NAVCON programs.

Examples of NAVCON programs on which the Air Traffic Management Division provides technical support are the **AN/TSW-7A 3-Man Control Tower, AN/TSQ-97 Man-Portable VFR Facility,** and the **Microwave Landing System (MLS).**

An "in house" program

The TSQ-97 is an example of a system that was conceived, designed, fabricated, and tested in house at AVRADA for NAVCON. On the other hand, the TSW-7A is an adaptation of an Air Force transportable control tower to meet specific Army tactical requirements.

The **Microwave Landing System (MLS)** provides a good example of the evolution of a system from concept work at AVRADA to management by the NAVCON PM. In the 1968-69 time frame, a special study group was convened by the FAA to study new landing guidance systems. AVRADA's Air Traffic Management Division participated in the technical end of that study.

The MLS program was initiated by the FAA as a result of that study. Each military service had a supporting program for its respective needs, with AVRADA serving as the Army's cognizant activity. Under AVRADA, the MLS program progressed from a Phase I paper study through Phase II feasibility testing to Phase III

prototype development, where PM NAVCON picked it up.

Another example of this type of program is the **Very Lightweight Air Traffic Management Equipment (VLATME).** VLATME is a family of equipment designed to give field commanders an effective method of managing aircraft under their command in highly mobile situations. This program, now in the exploratory development stage, originated at the Air Traffic Management Division of AVRADA. If VLATME continues through the life cycle as planned, it may eventually come under NAVCON's direction.

The Navigation Division is the other major source of technology in the realm of navigation and control. The direction in navigation technology is toward developing and improved heading reference, gaining a three-dimensional positioning capability, frequent and precise positioning update, and, as always, reduced weight and cost. All of these things are made more difficult by the requirements of Nap-of-the-Earth (NOE) flight.

An evolutionary approach

The approach to these developments is evolutionary. Our goal is to increase navigational capabilities and reliability through evolution of low-cost, lightweight sensor/processor/display building blocks using new radiation, magnetic, inertial sensor, and microelectronic techniques. These advancements will be incorporated as product improvements to Army aircraft navigation systems.

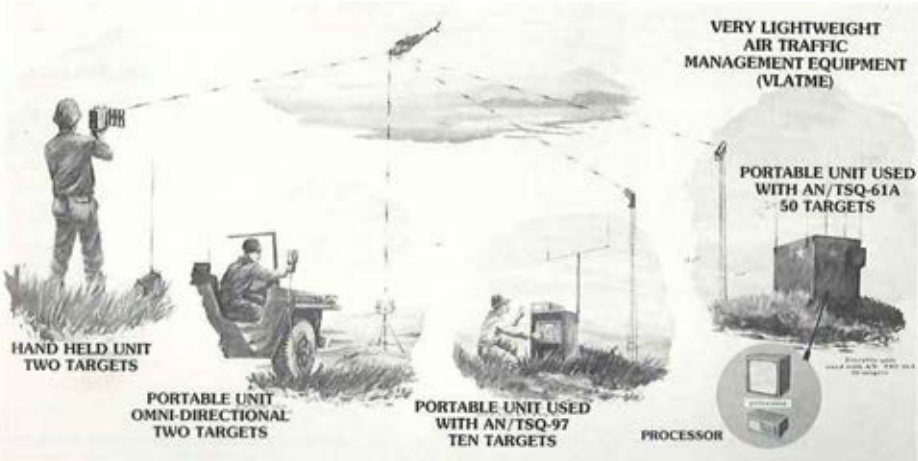
The **AN/ASN-43 Heading Reference Unit** is a good example of a product improvement on an existing piece of equipment. The ASN-43 has been used in Army aircraft since the 1960's. However, under NOE conditions, heading errors as high as 25° occurred using the old ASN-43. Through the use of microcomputer technology, we have been able to eliminate some of the ASN-43's moving parts, and thus increase its accuracy at NOE as much as threefold.

Compass calibration quickened

An additional benefit of the AN/ASN-43 improvement is that aircraft compass calibration, a job once requiring as much as six hours to complete, can be done in as little as 45 minutes. This program, because it employs an existing piece of equipment, has the potential to save the Army several million dollars over the cost of developing new hardware.

Another significant navigation program is **Position Update.** Several avenues of approach are being investigated to solve this problem. A technical barrier in this case is that any technique to update Doppler Navigation Position, and limit its error cumulation, requires position correction from some other source.

The other sources being investigated include **Global Positioning System (GPS), Posi-**



IMPROVED AN/ASN-43 COMPASS SYSTEM

tion Locating Reporting System (PLRS), Joint Tactical Information Distribution System (JTIDS); some form of map correlation; or some form of natural or man-made beacon identification and sighting. This "other source" position must be assessed, processed, and fed to the Doppler in a form compatible with its operation. These functions are to be designed into and performed by a Hybrid Navigation Computer.

Support to PM NAVCON

Aside from its own programs and support to other customers, the Navigation Division has 20% of its manpower working in direct support of PM NAVCON's programs. Examples of the supported programs are the **AN/ASN-128 Lightweight Doppler Navigation System (LDNS),** the **AN/ASN-132 Inertial Navigation System,** and the **PSN-6 Manpack Loran.**

Goal: 24-hour operations

This, then, gives you a quick overview on how the Avionics technical arm supports the intensive management of the Project Manager for Navigation Control (NAVCON). Our primary goal is to give the Army the capability to operate nap-of-the-earth during night and adverse weather at a cost that the Army can afford. ★


NAVCON
CONTROL SYSTEMS

The Last Twenty Years in Air Traffic Control

BY COLONEL CLINTON B. DEHRKOOP, Commander
U.S. Army Air Traffic Control Activity, Ft. Huachuca, Ariz.

ARMY AIR TRAFFIC CONTROL (ATC) has not always been as we know it today nor is it to remain the way we know it today.

Prior to 1973, ATC as a system had a fragmented organizational structure assigned to the many operating Army airfields throughout the world. Effectiveness was adversely affected by the varied policies and procedures, resulting in non-standard facilities and a proliferation of obsolete equipment. Facilities were operated and maintained by personnel who had no cohesive career development program; ATC was considered by most as a deadend career.

In 1958, the Army began sending its personnel to Keesler AFB, MI, for controller training. As the needs for **Ground Controlled Approach (GCA)** radar controllers increased, additional trainees were channeled to the Navy School at Glynco, GA in 1964. In 1966, the Army received permission to send instructors to the Keesler School to train Army radar controllers.

ATC School began in 1969

This continued until 1969 when the Army started its own air traffic control school at Fort Rucker, AL. In 1971 the most sophisticated radar simulator of its type was introduced into the school, which allowed for maximum realism and training for student controllers. The Army also conducted a GCA radar school in Vietnam during the late '60s to enhance controller effectiveness in the combat zone. Today, all formal Army ATC training is accomplished at the Fort Rucker facility.

The ATC school at Fort Rucker is considered second to none. Improvements are continually being made to enhance the training facilities and orientation which will provide soldier controllers better equipped to handle the ever increasing demands of crowded terminals and airways in peacetime and qualify them as professional controllers for the combat Army.

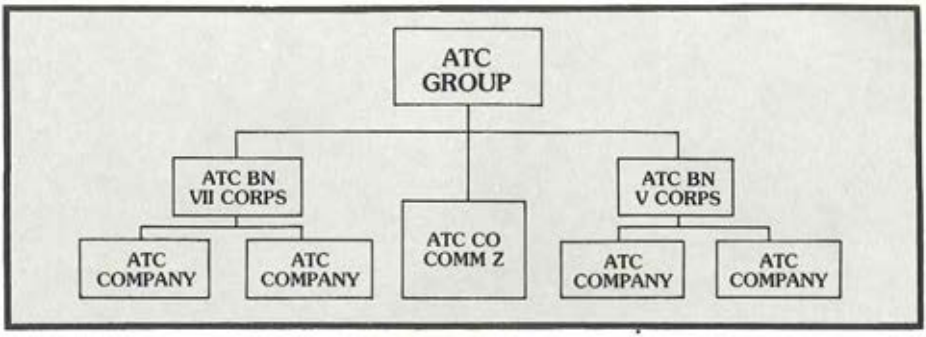
Following a study in 1972, the Chief of Staff of the Army directed that centralized management be applied to the air traffic control system and the functional responsibility be placed under one command. On July 1, 1973, the mission for providing centralized management of all ATC systems and operations and maintenance of fixed-base air traffic control was assigned to the Army Communications Command, which designated the **U.S. Army Air Traffic Control Activity (USAATCA)** as its executive agent.

Worldwide modernization

Immediately an extensive program was started to provide and expedite interim improvements in fixed-base communications facilities and develop long range plans and programs for modernization of equipment and facilities worldwide. Emphasis also was placed on air traffic control facility operation and training procedures to provide the operation and maintenance necessary for an effective and responsive ATC system.

Policies and procedures were implemented that had profound effect on the way all controllers were trained at facility level. Modernization, standardization, and quality control of ATC operation and training became a worldwide objective. The streamlining and clarification of policies and procedural directives, with meticulous attention to personnel and procedural directives, along with meticulous attention to personnel assignments began to create a cohesive personnel development system.

In facilities around the globe, the interim improvements to facilities used to provide ATC



service were completed by the end of calendar year 1977. These improvements were directed primarily at replacing obsolete ATC communications radios with new solid state equipment, overhauling control equipment, rewiring and standardizing installations, and providing more effective maintenance. New structures were built or remodeled where essential to mission accomplishment and within the prevailing budget restraints.

New equipment being installed

Current plans and programs for the continued modernization of facilities and equipment in the fixed-base areas include replacement of the Terminal VHF Omni-Range with new solid state equipment which is scheduled for installation at 29 locations in FY 78-79. New control towers are now being constructed at two Army airfields and five relocatable tower cabs have been installed, with several additional towers currently in various stages of design and approval.

The communications control equipment is scheduled for replacement with a new state-of-the-art communications control system; installations are scheuled to start in 2d Quarter, FY 80. Replacement of the present non-directional beacons with solid state equipment and provisioning of new monitor equipment also is scheduled to start in FY 80.

Plans continue for product improvement of the AN/FPN-40 GCA radar to improve performance and extend its useful life until fielding of the National Microwave Landing Systems is completed in the mid to late 1980's. Numerous other programs designed to enhance effectiveness and promote efficiency of Army ATC are presently being implemented or formulated to meet the mission requirements of Army aviators.

Tactical ATC equipments available today essentially are those developed under Quick Reaction programs in the mid 1960's. Programs are on-going to improve or replace all of these systems to provide the field Army with modern equipment to support training and deployment requirements.

During the early days of the Vietnam conflict, the Army found it necessary to employ contract civilian air traffic controllers to provide ATC service and initiate a number of Quick Reaction programs to provide the required tactical equipment. The Vietnam conflict clearly established the importance and dependence of the modern Army on aviation support. This dependence generated a concurrent requirement for an effective and responsive ATC system to meet Army Aviation needs.

Tactical needs being met

In the future, equipment like the GCA radar that was introduced in the late fifties and modified in the sixties, will be replaced by a product-improved, solid state, modular unit in a transportable version to meet the needs of the tactical environment. Non-directional beacons that date back twenty-five years are being replaced with highly reliable equipment, nearly maintenance free to provide the Army with tactical airways systems.

This Army system will be installed, operated, and managed, for the user - Army Aviation - by tactical ATC units assigned to an ATC group at theater level. This new organization will provide the necessary interface and coordination with other ATC operators and managers in the theater at all levels from the division main airfield/

We speak we

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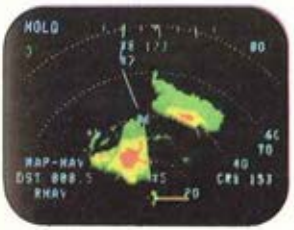


ather radar.

The Last 20 Years in ATC

heliport through the COMMZ.

The U.S. Army Air Traffic Control Activity is establishing an automated system which will provide a better management tool for personnel staffing, certification, ratings, and other essential information. Every ATC facility, plus those staff positions which have ATC personnel, are included in the system, bringing centralized management of ATC closer to total reality.

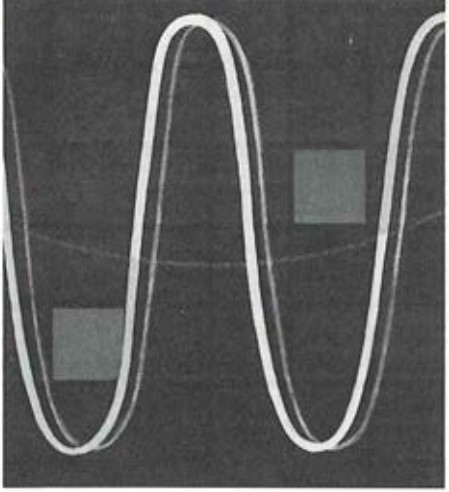
Publications under revision

The publications that cover facility operations, management, training, and rating are being completely revised to include the reserve components and to align Army air traffic control with the Federal Aviation Administration, Air Force, and Navy, while still meeting the mission requirements of the Army.

"The Army Air Traffic Control Activity, within the Army Communications Command has been applying maximum effort to provide the best trained controller and ATC systems to meet the ever expanding needs of the Army. Part of that effort to improve the Army ATC function is to optimize the operational and maintenance organization structure. A typical concept for the future is shown in the figure. There still is a long way to go, but the road ahead looks much easier to travel than that which has already been traveled." ★

JUST FOR DAC'S!

Planning ahead, our February 15, 1979 issue of ARMY AVIATION will devote its 16- to 20-page centerfold section to the more than 700 Department of the Army Civilians (DAC's) who are members of the Army Aviation Ass'n (AAAA). The 1979 "DACK PACK" will be the first of our annual February issues to provide pertinent professional and personal data on these key Army Aviation personnel. An information questionnaire will be mailed Oct. 1 to all DAC members of record. □



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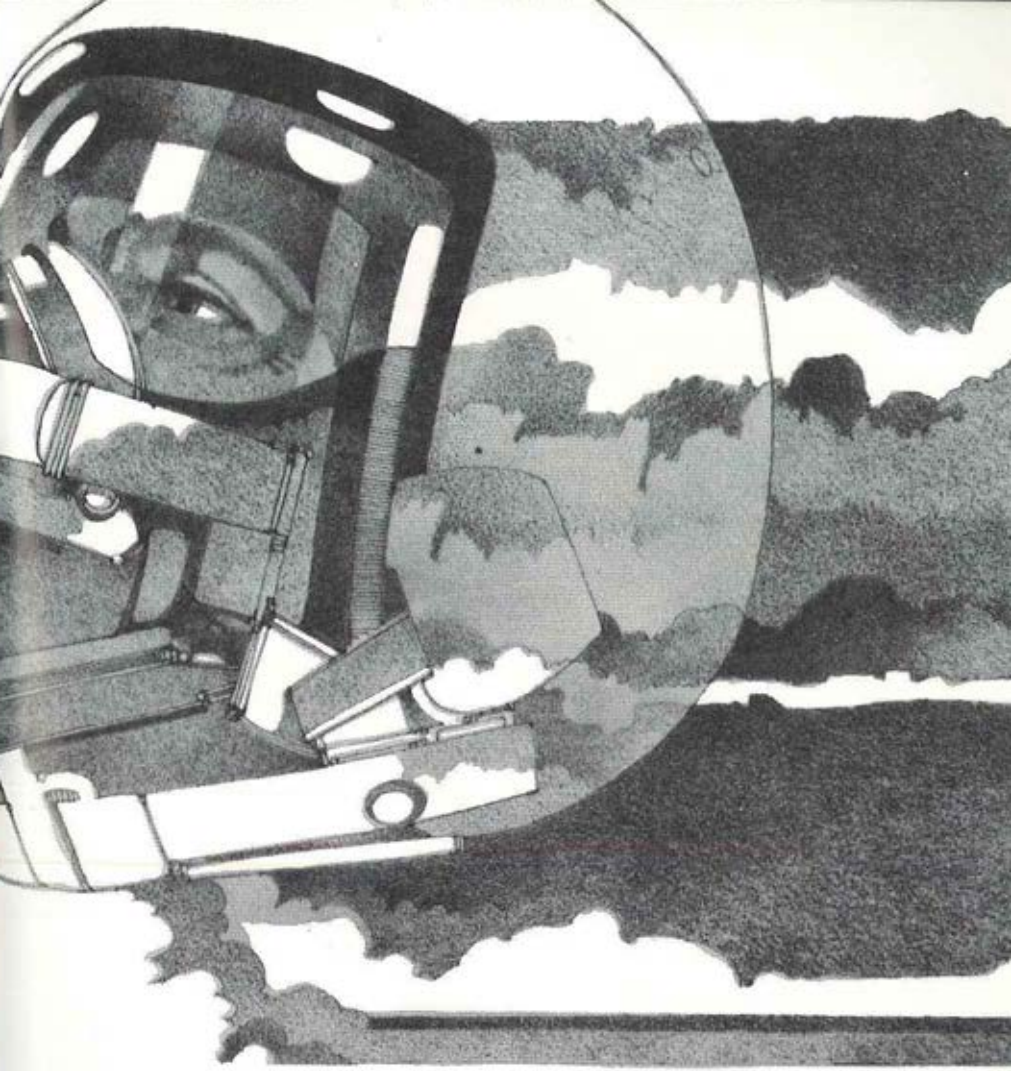

Growth capability? A reprogrammable coupler/computer with plug-in cards enables control and display for virtually any combination of avionics, current or future. Add microwave landing system, chaff dispensers, weapons management. Add instrument landing systems, performance monitors, ECM/ESM systems. Add doppler, GPS, OMEGA, Inertial and RNAV.

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For details, contact Collins Government Avionics Division, Rockwell International, Cedar Rapids, Iowa 52406. 319/395-4412.

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The Army ATC Concept & NAVCON ATC Programs

BY M.S. "SHERM" DUBOIS,
Chief, Technical Management Division, NAVCON PM Office

TO place NAVCON's ATC projects into perspective requires some insight of the Army's air traffic control problem and the overall philosophy applied to handle the problem.

Air traffic control activity can be broadly divided into support of terminal operations requiring such items as landing aids and control towers, and support of enroute flight operations requiring such items as radio beacons and flight coordination centers. Facilities, equipment, and personnel functions to support terminal and enroute flight operations vary widely depending upon the location and purpose of the mission aircraft.

For instance, Army aircraft utilizing civil airports and a few major DOD airfields are equipped with standard **Instrument Landing Systems (ILS)** avionics. In most other fixed military airfields, training facilities and major operational airfields, **Ground Control Approach (GCA)** radar is used to assist in landings during periods of poor visibility so no special avionics is required. Army aircraft, when utilizing the national air space in peacetime, must operate with the same FAA traffic control rules and clear through the same facilities as civil aviation.

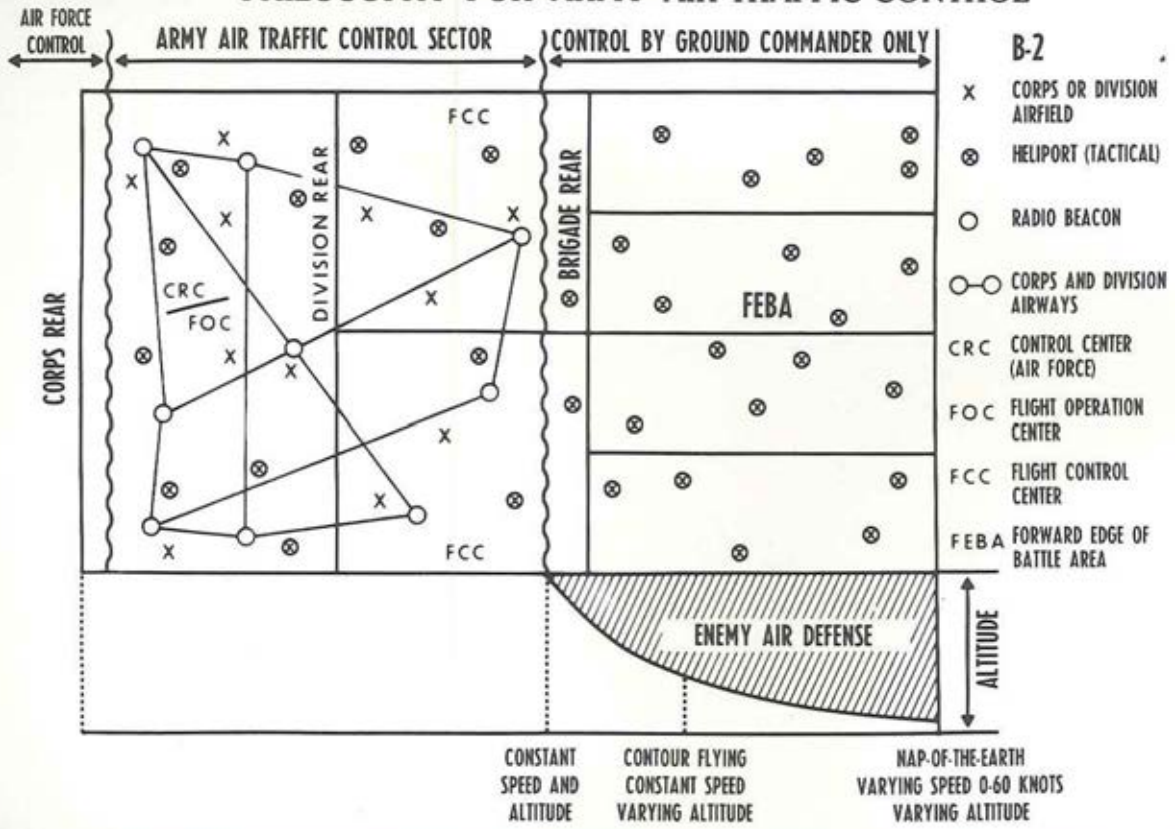
The current ATC philosophy

In a combat theater there is a necessity for military control of air traffic integral to the military operation underway. The chart on the next page depicts the current philosophy for Army air traffic control. The principal features of this concept are:

- Interface with the Air Force is at the corps rear area and above the deployment area, in which the Army controls all air traffic below an agreed upon altitude and forward of the corps rear, and the Air Force controls all air traffic above this altitude and behind the corps rear.
- The interface contact point is at the **AF Control and Reporting Center/Army Flight Operations Center (CRC/FOC)**, which is usually collocated near the rear of the corps area.
- The FOC is the primary enroute air traffic control facility for the control of Army air traffic in the rear area.
- **Flight Coordination Centers (FCC's)** are enroute traffic control facilities which extend the enroute control throughout the corps and division rear areas. In the division area the FCC serves as a communications link between the terminal facilities of the division airfields, other nearby airfields, division tactical operations centers, other FCC's and the corps FOC.
- Forward of a line established near the brigade rear, all air traffic control is the direct responsibility of the ground commander. Aircraft in his area are treated as another type weapon and capability at his command.
- As shown in the **"ATC Philosophy"** chart on the next page the altitude above terrain becomes limited as aircraft move toward the FEBA because of enemy air defense capability. Thus, the need for and desirability of air traffic control is limited.
- In the forward areas, tactical ATC teams provide advisory service, non-directional beacon capability, and terminal air traffic support at heliports and temporary landing areas used for medical evacuations, resupply refueling points, and command posts.

NAVCON is developing new systems and improving existing systems — **Product Improvement Programs (PIP's)** to meet the Army's operational needs. NAVCON's current develop-

PHILOSOPHY FOR ARMY AIR TRAFFIC CONTROL



ATC Concept and Programs

operational needs. NAVCON's current development programs include facilities to provide terminal and enroute capabilities to meet these mission requirements.

The ATC mission requirement for development of systems by NAVCON is guided by the users statement of operational need. Included in the current development mission are the facilities required to provide the following capabilities which are described in this issue:

TERMINAL EQUIPMENT

Towers

AN/TSW-7A Air Traffic Control Central

AN/TSQ-97 Manportable Air Traffic Control Facility

IFR Landing Systems

AN/TSQ-71A GCA

Joint Tactical Microwave Landing System

Terminal Beacon

AN/TRN-30(V)2

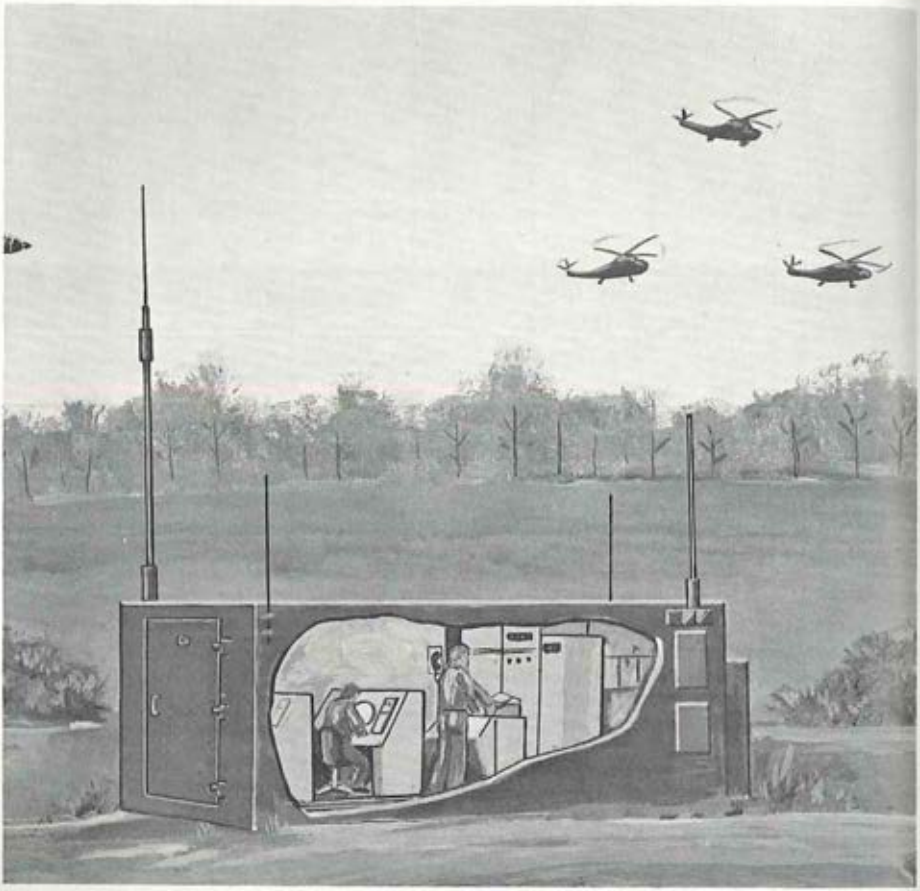
ENROUTE EQUIPMENT

Flight Coordination Centers (FCC)

AN/TSC-61B

Non-Directional Radio Beacons

AN/TRN-30(V)1



Just around the corner: The Army's Air Traffic Control Central!

BY ROBERT WILLIAMS, PROJECT LEADER, AN/TSW-7A

THE ATMS Materiel Need document previously mentioned includes the requirement for tactical air traffic control towers capable of supporting Visual Flight Rules (VFR) air activity at corps, division and brigade airfields.

Air Traffic Control Central (ATCC)

The AN/TSW-7A meets these requirements by providing a capability to communicate with aircraft and the mobility required in a tactical environment.

Consideration for the tactical requirements of the three organizational levels mentioned above has led to the evolution of two separate air traffic control facilities, the AN/TSQ-97 and the AN/TSW-7A.

The AN/TSQ-97 (which is described in another article) is a man-transportable facility suited to brigade needs, while the AN/TSW-7A is a complete glass-enclosed shelter intended to meet the needs of division and corps airfields.

The AN/TSW-7A is a lightweight air and ground transportable system that provides the capability for visual air traffic control (ATC) over aircraft on the ground and in the air within a designated control zone. It is used where fixed control tower facilities are unavailable or inadequate.

Control is accomplished through the use of radio communications, and to a lesser extent, by a lightgun. The ATCC is composed of a shelter, radio sets (VHF/AM, VHF/FM, UHF/AM, and HF-SSB), generator set, and antenna group.

Intershelter communications facilities are available to coordinate air traffic flow with other control towers and enroute facilities, and ground control approach facilities. Airfield lighting systems may be controlled by the ATCC.

FIGURE 1—THREE-MAN AIR TRAFFIC CONTROL CENTRAL, AN/TSW-7A

which has several deficiencies.

The AN/TSQ-70A, however, accommodates two men and only one of the two controllers has airfield visibility. The second operator assists in maintenance of flight strips, monitoring of meteorological equipment, and coordination of ground communications.

For some time, Army doctrine has recognized the need for a three-man tower in high density air traffic situations. In 1970, the Air Force developed the AN/TSW-7 three-man air traffic control tower facility through a contract

ROBERT WILLIAMS, PROJECT LEADER, AN/TSM-7A AIR TRAFFIC CONTROL CENTRAL

itial operation in as little as 20 minutes and put into full operation in as little as one hour. Radio range (G/A) is currently planned for up to 40 nautical miles.

Program Description

The present **AN/TSW-7A Air Traffic Control Central (Figure 1** opp.) is an evolutionary development of militarized transportable control towers. It will replace the two-man AN/TSQ-70A tower (see previous page) currently in use which has several deficiencies.

The AN/TSQ-70A, however, accommodates two men and only one of the two controllers has airfield visibility. The second operator assists in maintenance of flight strips, monitoring of meteorological equipment, and coordination of ground communications.

For some time, Army doctrine has recognized the need for a three-man tower in high density air traffic situations. In 1970, the Air Force developed the AN/TSW-7 three-man air traffic control tower facility through a contract with RCA Aerospace Systems. A total of 33 systems were built for use in the United States, Europe, and the Far East.

Army action authorized

In 1971, after cost and technical studies were made of candidate systems, NAVCON was authorized by the Army to start engineering development of a three-position tower capitalizing on the Air Force development efforts. The Army version was nomenclatured AN/TSW-7A.

The development entailed utilization of the basic AN/TSW-7, incorporation of Army state-of-the-art transceivers, modification to incorporate other standard Army ancillary items, and deletion of the radio direction finder used by the Air Force.

Extensive contractor and government testing of the two Engineering Development models proved that the AN/TSW-7A met the requirements of the ATMS Materiel Need and the Development Specifications. Several potential design deficiencies were noted for which corrections were incorporated in a Low Rate Initial Production contract for two new equipments awarded to RCA in 1976.

These equipments are completing development and operations testing in FY-78 and will be fielded in the 1st quarter of FY-79. ★

AN/TSW-7A

The AN/TSW-7A satisfies the Army's requirement for a tactical, mobile air traffic control system. First article tests have been completed successfully, and the system is now undergoing Army operational testing.

SYSTEM FEATURES

- **Mobility**—Air transportable and on the air one hour after arrival at bare base
- **Flexibility** — HF/VHF (AM/FM) and UHF communications, with full VFR control in terminal area
- **Adaptability** — From the arctic to the tropics

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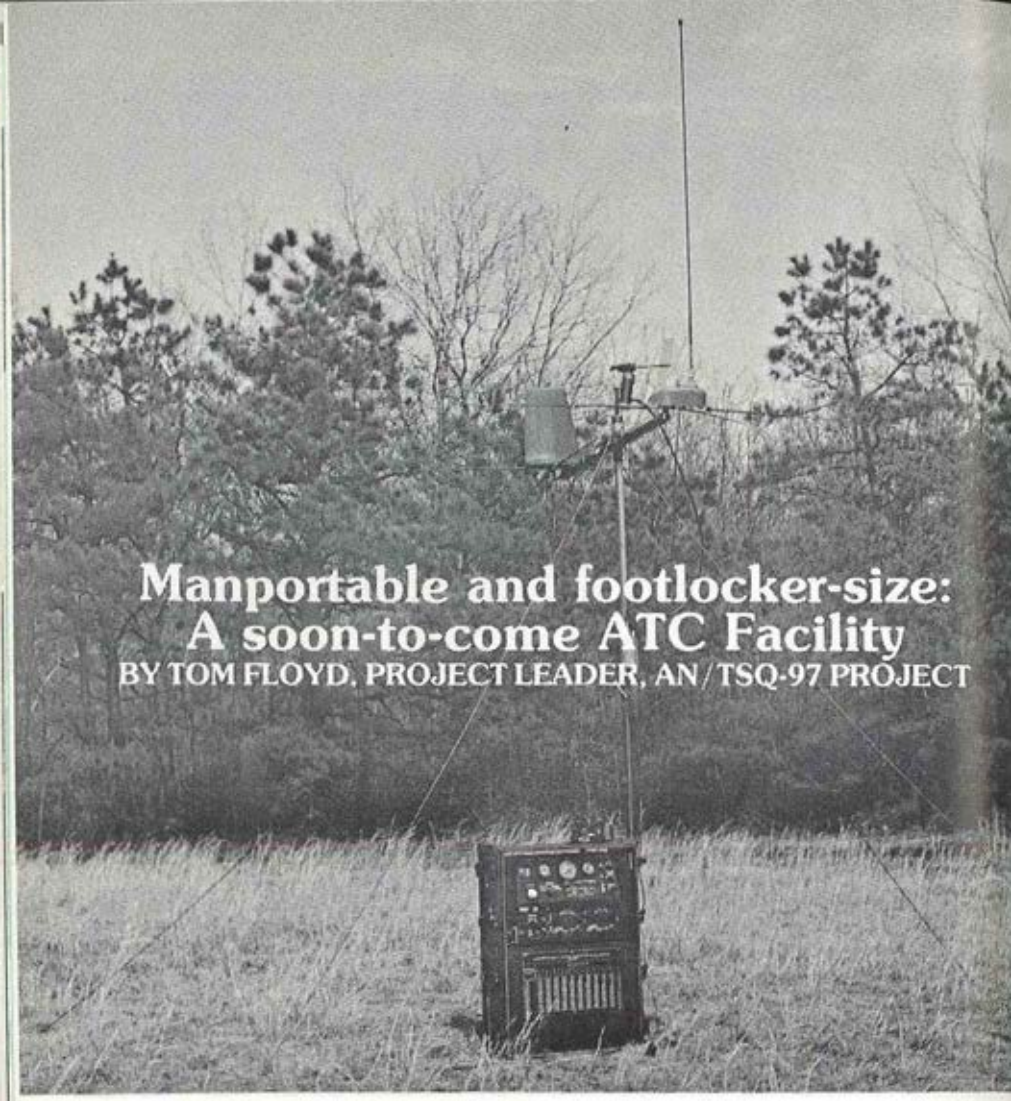


Manportable and footlocker-size: A soon-to-come ATC Facility

BY TOM FLOYD, PROJECT LEADER, AN/TSQ-97 PROJECT

THE need for a small, lightweight, manportable Air Traffic Control Facility became evident during operations in Vietnam.

The control towers in used at that time could not respond to quick reaction airmobile operations. Tactical commanders needed a small ATC System that could be easily transported, emplaced, and put in operation in minutes.

The AN/TSQ-97 **Air Traffic Control Facility** began with this need. In August of 1969, the Development Requirement for a man-transportable foot locker-size visual flight rule control package was approved.

This requirement was subsequently included

in the DA approved requirement document for the **Air Traffic Management Systems (ATMS).** The AN/TSQ-97 system is one of three Air Traffic Control subsystems in the Army ATMS.

Description:

The AN/TSQ-97 is a single operator, man-portable, footlocker-size communications/meteorological control facility that can be emplaced at small Army tactical airfields and helipads to provide VFR air traffic control local advisory services to Army aircraft.

It consists of three radio transceivers which operate in the VHF/FM, VHF/AM, and UHF/AM frequency bands; wind measuring detector; altimeter; sling psychrometer; density altitude computer; and a clock. See **Fig. 1** (opposite page) and **Fig. 2.** The set-up time for the AN/TSQ-97 is no more than twelve minutes.

Design, Development, Acceptance:

In 1971 the design of a system using existing airborne radios was determined to be the best technical approach for the **air traffic control facility.** During the early phase of the program, two versions of the facilities were prototyped. Based on overall mission capability, the size and weight of the system were the key factors considered in the selection of the final design.

The configuration employing the **Standard Lightweight Avionics Equipment (SLAE)** radios was selected as the basis for the design. The program proceeded with the design, engineering and fabrication of eleven engineering development models.

Testing:

During May 1973, ten models underwent Development Test II and Operational Test II.

As a result of the Development Acceptance in Process Review held during March 1974, the program proceeded into the Low Rate Initial Production and was Type Classified Standard.

Utilization of ED Assets:

In keeping with PM NAVCON policy, the **engineering development (ED)** models have been provided on a loan basis to tactical units. The AN/TSQ-97 is currently in pilot production, to proof a data package, at the U.S. Naval Avionics Center, Indianapolis, Indiana. ★

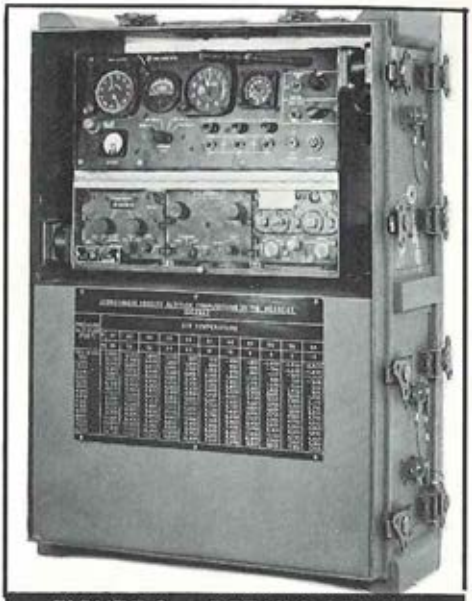
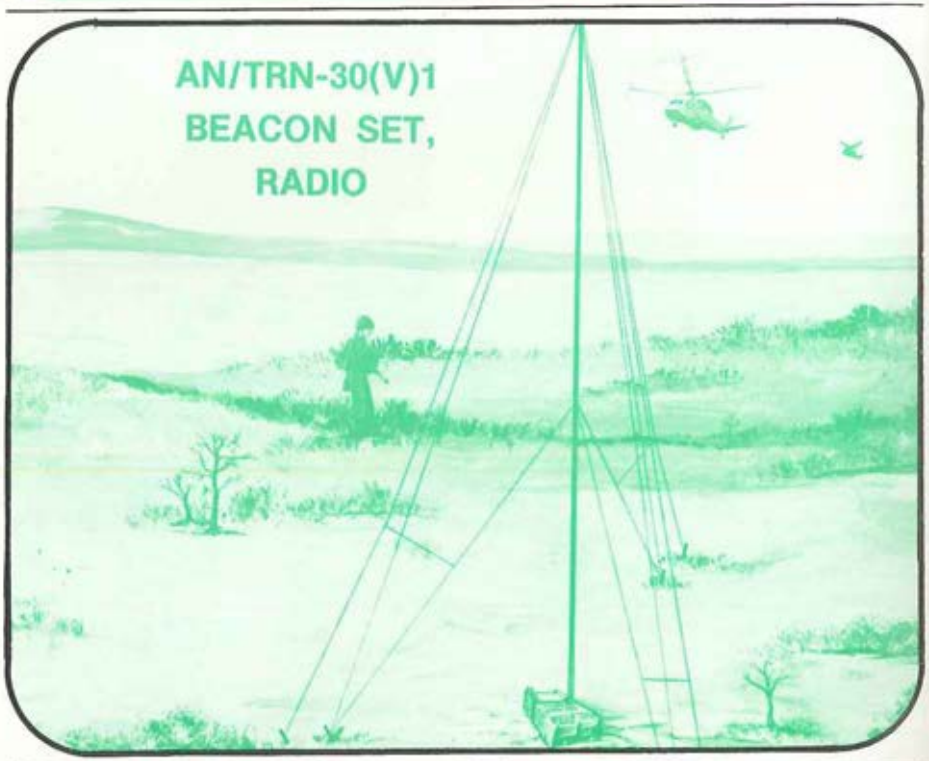


FIGURE 2 — DETAILS OF THE CONTROL MONITOR CONSOLE IN THE AN/TSQ-97 FACILITY.

TOM FLOYD, PROJECT LEADER, AN/TSQ-97 AIR TRAFFIC CONTROL FACILITY

Now being deployed: a 39-lb. non-directional beacon!

BY CHARLES W. HAMILTON,
PROJECT LEADER, AN/TRN-30



IN order to facilitate terminal and enroute point-to-point navigation, Army Aviation requires nondirectional radio beacons. In the tactical arena these beacons must be sited and operated in remote areas, at Army airfields, and throughout the Army area.

Army Aviation users of the beacons include regular forces operating in a conventional warfare role as well as special forces in unconventional warfare or counterinsurgency operations.

Until recently, the transportability — and, thus, the mobility of the beacons in Army inventory — placed severe constraints upon the locations in which the beacons could be set up and

upon tactical operations required by aviation units. The beacons previously held in Army inventory included the AN/TRN-25 and the AN/GRN-6, both of which used vacuum tubes, were large and were unreliable.

Since these systems have proven over the years to be unsuitable for tactical operations, a new requirement was developed which defined two new beacons designated as the AN/TRN-30(V)1 **(Figure 1)** and the AN/TRN-30(V)2 **(Figure 2)**. The requirement stated that these equipments should be capable of meeting operational requirements for a small lightweight manportable beacon and a compact tactical/semi-fixed air transportable beacon.

Furthermore, this equipment is required to be deployable in either the manportable or tactical/semi-fixed configuration in remote locations and in any difficult geographical area to assist aircraft in performing direct support missions. The planned concept of employment for these beacons indicates that they will be utilized by the elements of the Field Army, to establish landing and drop zones.

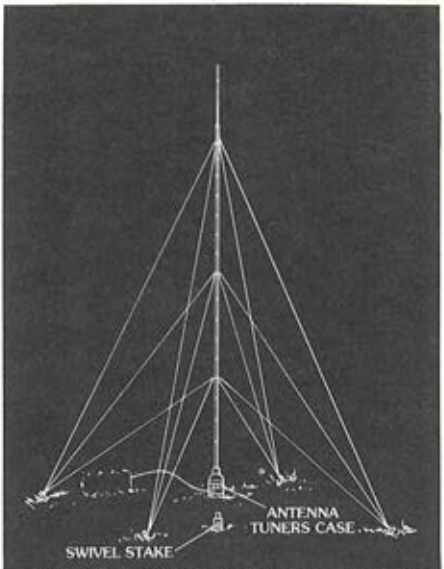
In addition, they will be used as terminal and point-to-point navigational aids to assist in the delivery or recovery of personnel, equipment, and supplies. The beacon(s) may also be used as an approach aid for an ADF approach.

Many trained in usage

The manportable equipment will be operated by personnel who have other primary duties. Examples: The crew chief of a helicopter may be trained to establish the equipment for use as a navigational aid; any member of a ground combat team may be trained to use the manportable equipment. Communications personnel in Army combat, combat support, or combat service support units may be trained to emplace the beacon in either the manportable or tactical /semi-fixed configuration.

The development of the AN/TRN-30 was initiated during FY-69 by PM NAVCON under a contract with Gould NAVCOM Systems Division of El Monte, CA. Development and testing was completed and the equipment accepted as Standard in October 1972.

The 39-pound AN/TRN-30(V)1 **(Figure 1)** was developed to replace the AN/TRN-25 **(Figure 2)** which, although in the Army inventory, is a commercial item weighing 375 pounds.



AN/GRN-6 RADIO BEACON SET

IN ADDITION TO OTHER SHORTCOMINGS, THE PREVIOUS AN/TRN-25 NON-DIRECTIONAL RADIO BEACON SHOWN HERE WEIGHED 335 POUNDS MORE THAN THE NEW 39-POUND AN/TRN-30 (V)1 BEACON.

CHARLES W. HAMILTON, PROJECT LEADER, AN/TRN-30 NON-DIRECTIONAL RADIO BEACONS, OPM NAVCON

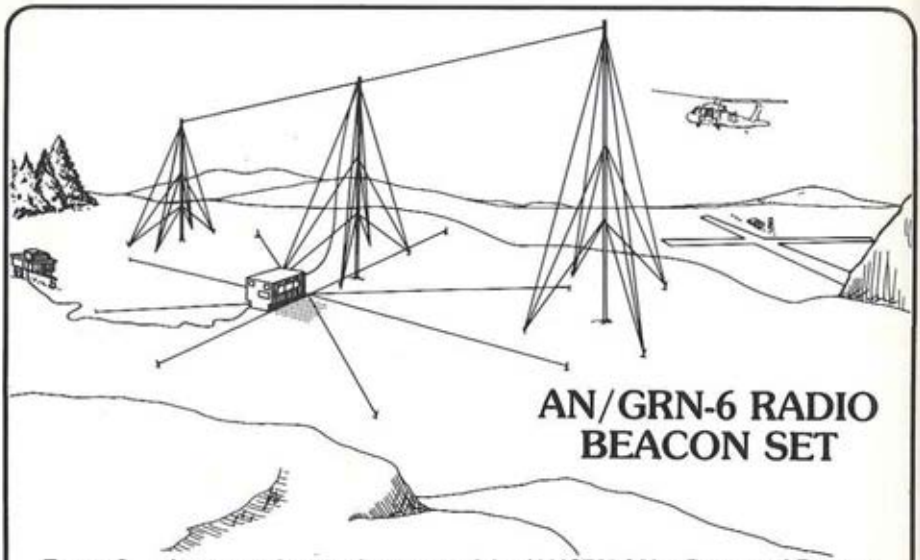


Figure 3 – As seen in this artist's concept of the AN/GRN-6 Non-Directional Beacon, the size, transportability, and complexity of this system installation pointed out the need for the AN/TRN-30(V)2 for tactical semi-fixed operations. The AN/GRN-6 system shown above weighs at least 1,100 pounds more than the new AN/TRN-30(V)2.

The AN/TRN-30(V)2 was developed to replace the AN/GRN-6 Beacon which is heavy (1,500 pounds without power source) and is transportable in a ¾ ton truck. The AN/TRN-30(V)2 which weighs 400 pounds is lightweight by comparison.

Both versions of the AN/TRN-30 are solid state and omni-directional, and are channeled in 0.5 kHz steps to operate in the frequency range of 200 to 535 kHz. In addition, the AN/TRN-30(V)1 operates between 1605 and 1750 kHz. The beacons provide a homing signal to Army aircraft containing standard **automatic direction finding equipment (ADF)** such as the AN/ARN-59, AN/ARN-83, and AN/ARN-89.

Deployment of the AN/TRN-30 began in November 1977 by the NAVCON new equipment deployment team in the coordination with the **New Equipment Training (NET)** team of the **U.S. Army Communications and Electronics Materiel Readiness Command (CERCOM)**.

The AN/TRN-30 beacons are currently being utilized by tactical units, but pending Army reorganizations will place most of the **Air Traffic Control (ATC)** mission under the direct control of the **U.S. Army Communications Command (USACC)**. ★

Throughout this Aug-Sept. issue, the reader will find many acronyms – the "vegetable soup" that is accepted military jargon. We've culled this issue, and have defined the many NAVCON Issue acronyms for you . . .

NAVCON Alphabet Soup

AATCA–US Army Air Traffic Control Activity; Aug-Sep 78/32.

ADDS–Army Data Distribbution System; Aug-Sep 78/72, 93.

ADF–Automatic Direction Finding; Aug-Sep 78/49.

ARTADS–Army Tactical Data Systems; Aug-Sep 78/85, 89.

ATC–Air Traffic Control; Aug-Sep 78/32, 40, 43, 49.

ATCC–Air Traffic Control Central; Aug-Sep 78/43.

ATCF–Air Traffic Control Facility; Aug-Sep 78/46.

ATMS–Air Traffic Management Systems; Aug-Sep 78/26, 43, 46.

ATMS Enroute–Air Traffic Management Enroute Facility; Aug-Sep 78/26.

AVRADA–US Army Avionics Research & Development Activity; Aug-Sep 78/28.

AVRADCOM–US Army Aviation Research and Development Command; Aug-Sep 78/26.

CDU–Computer Display Unit; Aug-Sep 78/78.

CERCOM–US Army Communications Electronics Materiel Readiness Command; Aug-Sep 78/26, 49.

CRC–Control and Reporting Center; Aug-Sep 78/40.

CRC/FOC–Control & Reporting Center/Flight Operations Center; Aug-Sep 78/40, 56.

DME–Distance Measuring Equipment; Aug-Sep 78/59.

DTUPC–Design-to-Unit-Production-Cost; Aug-Sep 78/ 78.

ED–Engineering Development; Aug-Sep 78/46, 78.

FCC–Flight Coordination Central; Aug-Sep 78/56.

FEBA–Forward Edge of the Battle Area; Aug-Sep 78/40.

FM–Frequency Modulated; Aug-Sep 78/56.

FOC–Flight Operations Center; Aug-Sep 78/40.

GCA–Ground Controlled Apporach; Aug-Sep 78/32, 40, 59, 63.

GPS–Global Positioning System; Aug-Sep 78/26, 28, 72, 93, 95.

IACS–Integrated Avionics Control System; Aug-Sep 78/72, 78, 85.

ICAO–International Civil Aviation Organization; Aug-Sep 78/59.

ICNI–Integrated Communications Navigation Idenification System; Aug-Sep 78/93.

IFF–Identification Friend or Foe; Aug-Sep 78/63.

INS–Inertial Navigation System; Aug-Sep 78/85.

IINS–Integrated Inertial Navigation System; Aug-Sep 78/72, 85, 95.

ILS–Instrument Landing Systems; Aug-Sep 78/40, 59.

IMC–Instrument Meteorological Conditions; Aug-Sep 78/59.

IOC–Initial Operational Capability; Aug-Sep 78/95.

JPO–Joint Program Office; Aug-Sep 78/95.

JTIDS–Joint Tactical Information Distribution System; Aug-Sep 78/28, 72, 93.

JTLMS–Joint Tactical Microwave Landing System; Aug-Sep 78/26, 40, 59.

LDNS–Lightweight Doppler Navigation System; Aug-Sep 78/28, 72, 78*, 95.

LOP–Lines of Position; Aug-Sep 78/89.

LORAN–Long Range Navigation System; Aug-Sep 78/72, 89.

(ALPHABET SOUP/Cont. on Page 54)

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Alphabet Soup!
NAVCON Acronyms

LVNS—Land Vehicle Navigation System; Aug-Sep 78/72.

MGRS—Military Grid Reference System; Aug Sep 78/89.

MLS—Microwave Landing System; Aug-Sep 78/28, 59.

MTBF—Mean-Time-Between-Failures; Aug-Sep 78/63, 78.

NAVAID—Navigation Aide; Aug-Sep 78/43.

NAVCON—Navigation/Control Systems; Aug-Sept 78/26, 78, 95.

NET—New Equipment Training; Aug-Sep 78/49.

NETT—New Equipment Training Team; Aug-Sep 78/49.

NMLS—National Microwave Landing System; Aug-Sep 78/59.

NOE—Nap-of-the-Earth; Aug-Sep 78/78.

NPU—Navigation Processor Unit; Aug-Sep. 78/85.

O&O—Operational & Organizational; Aug-Sep 78/72.

PADS—Position and Azimuth Determining System; Aug-Sep 78/72.

PANS—Positioning & Navigation Systems; Aug-Sep 78/26.

PAR—Precision Approach Radar; Aug-Sep 78/63.

PIP—Product Improvement Program; Aug-Sep 78/40.

PLRS—Position Locating Reporting System; Aug-Sep 78/28, 72, 93.

PMDS—Projected Map Display System; Aug-Sep 78/72, 78.

POS/NAV—Position and Navigation; Aug-Sep 78/72, 89, 93.

RIW—Reliability Improvement Warranty; Aug-Sep 78/78, 85.

RSI—Rationalization, Standardization, and Interoperability; Aug-Sep 78/93.

SAMSO—Space and Missile System Organization; Aug-Sep 78/95.

SIAGL—Survey Instrument Azimuth Gyroscopic Lightweight; Aug-Sep 78/72.

SLAE—Standard Lightweight Avionics Equipment; Aug-Sep 78/46.

TDMA—Time Division Multiple Access Techniques; Aug-Sep 78/93.

TRADOC—US Army Training & Doctrine Command; Aug-Sep 78/26.

TRITAC—Tri-Services Joint Tactical Communications System; Aug-Sep 78/89.

TSM—TRADOC System Manager; Aug-Sep 78/72.

USACC—US Army Communications Command; Aug-Sep 78/49.

UTM—Universal Transverse Mercator; Aug-Sep 78/89.

VLATME—Very Lightweight Air Traffic Management Equipment; Aug-Sep 78/26, 28

*Illustration.

■■The SUNCOAST CHAPTER of the AAAA was reactivated on June 15 with ceremonies held at the MacDill AFB, FL Officers' Open Mess. Shown l-r are the Chapter's newly-elected Officers: COL Joe Campbell, VP, Memb Enrol; MAJ Tom Shaver, Sec-Trea; LTC Bill Tedesco, Ret., SrVP; BG Harold I. Small, Pres; and COL Bill Giese, VP, Programming. The Chapter, which covers the entire West Coast of Florida, is seeking new members who may not be aware of plans for a BIG September meeting in the St. Petersburg Beach resort area.

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*Nat'l Office will request add'l information.

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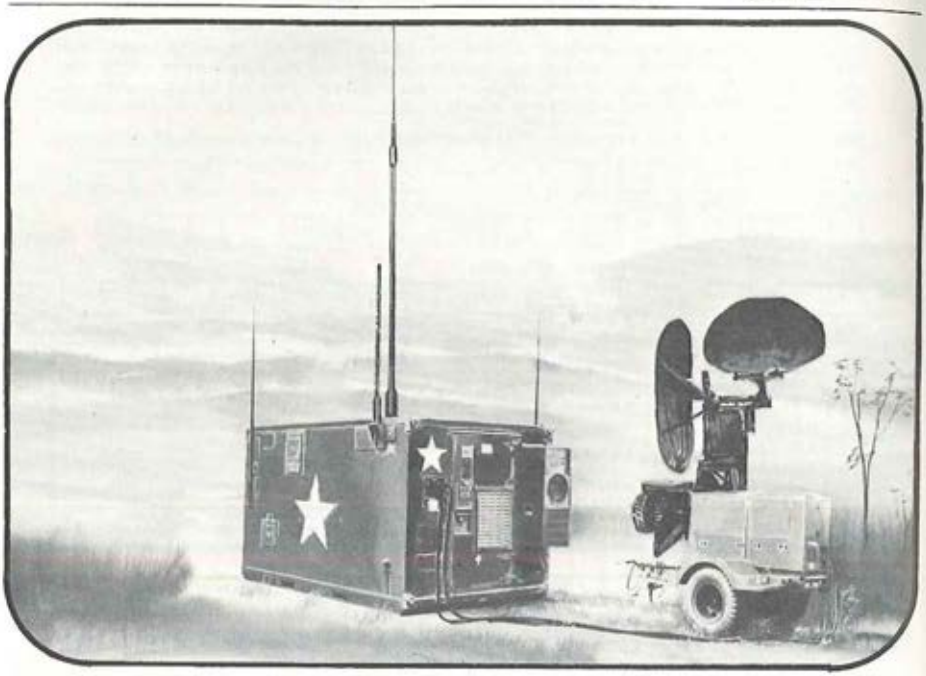
There's an "FCC" in your aviation activities, too!

By Capt. Paul Booterbaugh, Project Leader, AN/TSC-61B Flight Coordination Central



THE AN/TSC-61B Flight Coordination Central (FCC) is a shelter-mounted unit that provides the facilities for air traffic coordination and other in-flight assistance.

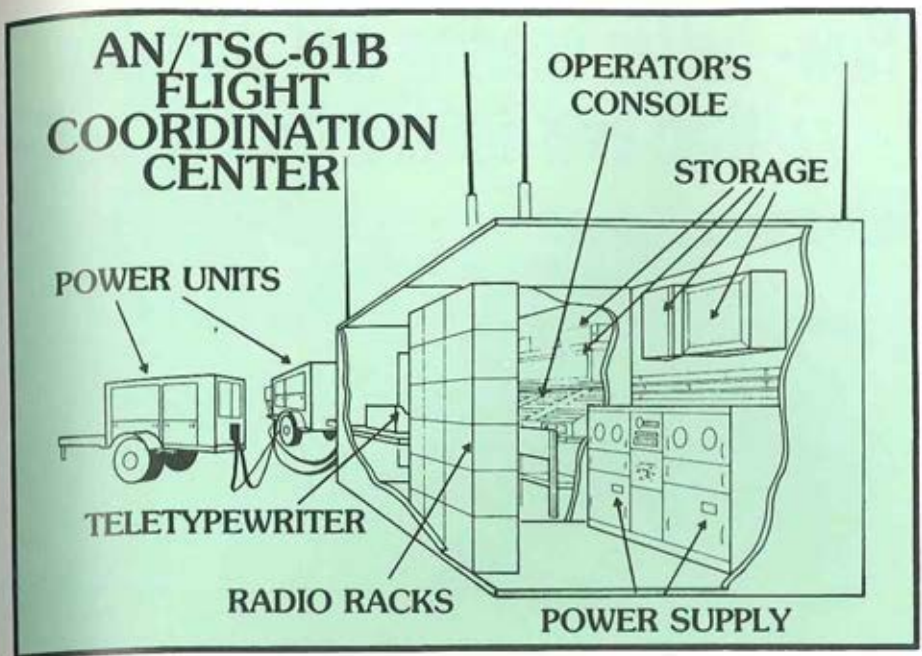
The facility provides the capability to establish and maintain radio communications with aircraft in the HF/SSB, VHF/FM, VHF/AM, and UHF/AM bands. Facilities are available for telephones, radioteletype equipment, and ground-to-ground radio links in order to communicate with associated airfields, ground installatons, Flight Operations Controls (FOC), and other FCC's.

The FCC is usually located in high density airfield regions and supplements FOC capabilities. It may be used as a relay for the FOC and other airfields located near the FCC. This system can be set up under full operation in one hour and 45 minutes.

The interior of the shelter is divided into an equipment room and an operations room. The equipment room contains the communication equipment and work space. The operations room has a supervisor position and two identical controller positions with a flight status console.

A two-room arrangement

The flight controller consoles permit each controller access to a map board, the flight progress strip holder, radio and telephone key



panels, an audio control box, and a headset microphone.

The supervisor's position also has access to radio and telephone key panels and facility for the operation of a secure single-channel, **frequency modulated (FM)** voice channel.

A need identified

The initial systems were fabricated in limited numbers during 1963 and 1964 and were utilized in such operations as **SWIFT STRIKE** and **DESERT STRIKE.** During the same time period, a need was identified for a Quick Reaction Project to provide facilities for an ATC system for the U.S. Army in Vietnam. The resulting system built under this effort became known as the TSC-61, and was sent to Southeast Asia.

Subsequent to the fielding in Vietnam, modifications were made to the system, and were later type classified as the AN/TSC-61A.

An improved version known as the AN/TSC-61B is being produced. This equipment retains the same capability as older models but with state-of-the-art techniques. ★

INTERIOR VIEW — The interior of the AN/TSC-61B Flight Coordination Center is shown above. The Operator's Console appears at the left; the power supply, radio racks, and storage area are shown behind the sliding door partitioning.

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JTMLS: A tactical microwave landing system with planned interoperability

BY EDDIE CORNELIUS, NAVCON PROJECT LEADER, JTMLS

THE principal tactical approach and landing system currently used by the Army is the **ground controlled approach (GCA)** radar system. The GCA equipment is heavy, cumbersome, limited to 200 foot decision height operation, and requires a highly skilled ground controller.

The current standard **Instrument Landing System (ILS)** and Marker Beacons are used for instrument approaches to civil and some military fixed base airfields where this equipment is installed. While ILS has provided highly useful service since 1939, its design and technical characteristics impose constraints which have long been recognized in the aviation community.

Technology has demonstrated that improved landing systems are feasible; however, a number of technical approaches have emerged which required careful evaluation. A group of experts from government and industry, recognizing a common need for an improved landing system, formed a national plan for development of a **National Microwave Landing System (NMLS).**

The plan was approved in July 1971 and the FAA was assigned responsibility for management and direction of the program. The National Aeronautics and Space Administration and all military departments of DOD participated in the program which would provide

civil and military users with a family of systems to satisfy individual users and also to permit interoperability between the various airborne and ground configurations by means of a common signal in space.

The JTMLS consists of a ground subsystem and an airborne subsystem as shown in artists' concepts in **Figures 1** and **2.** It is intended to satisfy the Army's requirements and similar requirements of the other Services. The JTMLS will be interoperable with all other versions of civil and military microwave landing systems and will comply with the MLS standards. The ground subsystems establishes a signal in space covering the landing approach volume; this is supported by the transmission of operating data and auxiliary data. The ground-based subsystem includes a **Distance Measuring Equipment (DME)** transponder.

The airbone subsystem detects and decodes the signal in space to determine the aircraft's angular coordinates (azimuth angle and elevation angle), and deviations relative to the selected approach path. The avionics subsystem includes a DME interrogator/receiver to determine slant range to the ground transponder. This interrogation can also be used by the ground-based subsystem to activate the "signal in space" transmission when the ground-based subsystem is in the service demand mode.

Category II approaches supported

The JTMLS ground subsystem and the JTMLS avionics shall provide guidance to support at least Category I (200-foot ceiling, 1/2 mile visibility) approaches when deployed in a split site configuration on a runway up to 7,000 feet in length; and to Category II (100-foot ceiling, 1/4 mile visibility) approaches when operated split site on runways up to 4,000 feet in length.

The JTMLS ground subsystem is intended to eventually replace the existing tactical GCA systems and tactical interim MLS systems. The JTMLS airborne subsystem will replace existing military airborne instrument landing system equipments.

The National Microwave Landing System will provide appropriate guidance signals so that closely spaced parallel runways may be used to accommodate high density air traffic. With appropriate airborne processing, the high quality signals will permit the derivation of flexible flight paths as an aid to noise abatement and increased capacity in their terminal area. Accurate guidance signals will be furnished that will be relatively insensitive to weather, terrain, structures, and other aircraft.

The JTMLS, a tactical derivative of the NMLS, will provide a significant increase in Army Aviation capabilities in the areas of all-weather air operations, terminal homing, aircraft night operations, air crew safety, and aircraft survivability. JTMLS will make a significant contribution to the reduction of aircraft operational cost, by permitting increased aircraft landing densities during **Instrument Meteorological Conditions (IMC)** and night operations.

Further, the JTMLS will provide new joint operations capabilities with U.S. and NATO combat forces operating MLS facilities in close proximity (land or sea), and will provide an expanded availability of instrument approach aids for common use — civil, military, and NATO operations.

The JTMLS ground subsystem will be designed to be deployed at fixed, semi-fixed, and tactical landing areas where IMC facilities are required.

A three-phase program

The national MLS development program involves three phases of activity. **Phase I** (Technique Analysis and Contract Definition) and **Phase II** (Feasibility Demonstration) were completed in December 1974. This effort established the TRSB technique and its associated signal format. **Phase III** (Development, Flight Test and Evaluation of Prototype Systems) has been completed for only two system configurations (Basic Narrow and Small Community).

Prototype development activity on the remaining civil systems (Basic Wide and Expanded) was held up pending the **International Civil Aviation Organization (ICAO)** decision on an international standard. The U.S./Australian TRSB system was selected as the new international standard approach and landing system by ICAO on 19 April 1978.

A part of Phase III of the National Program, the JTMLS development will capitalize upon the collective background and technology base already established. A contract is planned for award by the Army for the design and fabrication of development models of the JTMLS. This contract will be administered by the JTMLS Lead Service Program Office (PM NAVCON) at Ft. Monmouth, which was established in September 1976 by DOD.

Highest accuracy sought

The objective of this effort is to develop a landing system which will provide rotary and fixed wing aircraft with the capability of making safe in strument approaches to and landing on minimally prepared tactical sites under adverse weather conditions. An effort will be made to design the highest possible accuracy into the JTMLS system when using a precision L-Band DME.

Further, during the development phase, it is planned to resolve as many technical questions as possible such as the capability of the L-Band DME to provide the accuracy required for military applications and the ability to package C-Band, ground angle guidance equipment for tactical use.

In addition, design-to-cost objectives will be imposed to develop equipment that is affordable for the Military Services. The JTMLS models will be tested and evaluated to confirm that the TRSB angle guidance and the precision L-Band DME subsystems designed to meet military specifications can satisfy military operational requirements.

The JTMLS program presents many challenges. It will require close and effective coordination between the Services. To that end PM NAVCON has established a Tri-Service MLS Program Committee. The purpose of the committee is to resolve any differences developed at the Services' working level.

Eddie Cornelius, Project Leader, Joint Tactical Microwave Landing System (JTMLS)

It also serves to expedite the military coordinaiton and decision process. Members of the committee are **Captain (USN) Richard Wilson**, Chief, Avionics Division, Naval Air Systems Command; **Mr. William Lyon**, Program Manager, Traffic Control and Landing Systems Program Office (USAF); and **Colonel Roy White**, PM NAVCON (U.S. Army). A nucleus of DOD representatives, headed by **Colonel White**, have also participated in the recent **International Civil Aviation Organization's (ICAO's)** All Weather Operations Divisional Meeting in Montreal 4-21 April 1978.

The challenges and benefits of attaining interoperability was the subject of discussion at a meeting of the American Defense Preparedness Ass'n on 8-9 March 1978. The audience represented multi-national (NATO) organizations (government and industry).

High degree of commitment

The keynote speaker, **General John R. Guthrie**, Commander of DARCOM, stressed the importance the Army attaches to achieving and maintaining standardization/interoperability within the North Atlantic Alliance. He indicated that the Army is committed to these objectives but warned that only a high degree of commitment on the part of all participants is necessary to insure that we achieve standardization/interoperability. He acknowledged that the maintenance of these objectives, after having been achieved, may present a more difficult problem over the long run. The JTMLS Program offers a candidate for that challenge and commitment. ★

The New Look in Improved Army Air Traffic Control and Landing Systems

Tactical GCA The US Army's AN/TPN-18A modernization program under the direction of NAVCON tremendously improves the reliability and performance of the Army's standard lightweight tactical GCA system...and with hardly any change to its profile.

This veteran landing system provides surveillance, height-finding and precision approach information to GCA controllers for safe landing of aircraft at army airfields and heliports.

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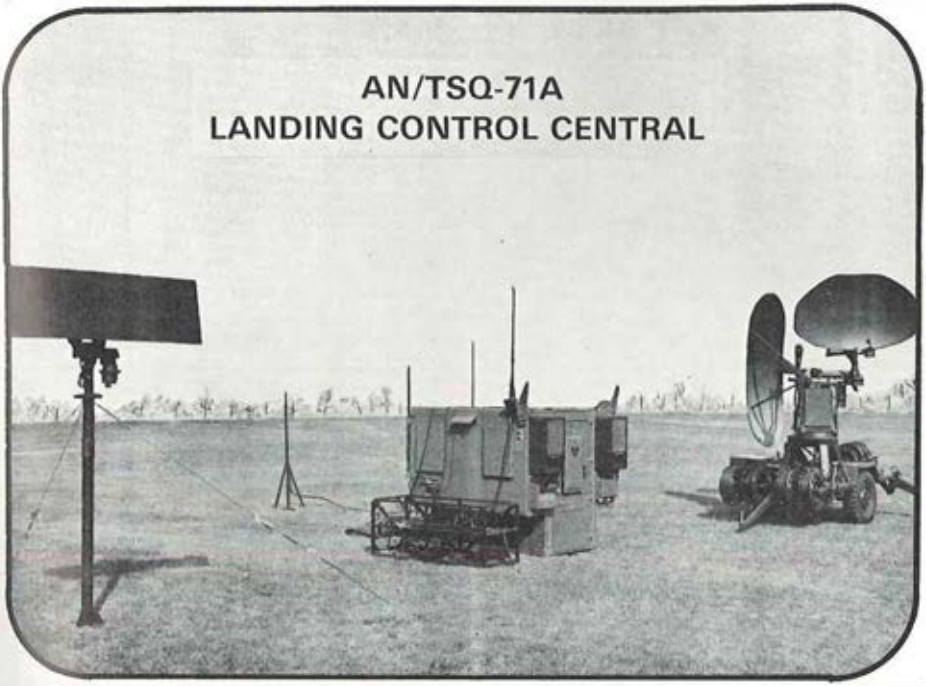
The Army's transportable GCA facility is under modification

BY AL DONOVAN, PROJECT LEADER, AN/TSQ-71A



A Landing Control Central AN/TSQ-71A is a lightweight, transportable **ground controlled approach (GCA)** facility.

The AN/TSQ-71A is designed as a complete operational system providing functional integration of communications, the AN/TPN-18 GCA Radar, and the AN/TPX-44, **identification friend or foe (IFF)** equipment.

The system's primary function is to provide **precision approach radar (PAR)** guidance to aircraft arriving at tactical Army airfields during low visibility conditions. Range, azimuth, and elevation information relative to the aircraft's position is displayed and used to direct the aircraft along electronic cursors (elevation, glidepath, and azimuth courseline) for a precision GCA landing.

A height-finding capability is provided with a direct readout of the aircraft's altitude in the approach sector. The radar displays (indicators) are in the shelter in positions which permit the operators to observe the aircraft positions.

Through use of the IFF equipment and the surveillance mode of the GCA radar, air traffic control functions can be conducted up to a range of 40 miles from the operating site. In this

mode of operation each aircraft desiring an approach to landing is uniquely identified, placed in the queue and provided flight instructions which not only will prevent in-flight collision of aircraft, but also sets up the initial approach to the active runway.

Control by voice exchange

At a range of 10 miles each of the approach-aircraft are followed by the **precision approach radar (PAR)** and the let-down is guided via voice communications to the decision height. Using this system, no dedicated avionics are required on-board the aircraft.

The entire operation is conducted through voice exchanges employing the standard aircraft communications. However, GCA systems require highly trained and skilled operators and maintenance personnel to properly site, calibrate and interpret radar returns to aircraft flight instructions. The pilots' confidence in the use of GCA systems is therefore highly dependent upon system reliability and the skill of ground personnel.

It is because of the previous history of the AN/TSQ-71 and its demonstrated poor reliability in Vietnam that the present AN/TSQ-71A is currently being produced.

In 1973, four prototype models were produced incorporating solid-state circuitry, an improved maintenance concept which greatly enhanced the system's relability.

Al Donovan, Project Leader, AN/TSQ-71A GCA Facility

It has been estimated that a 10-year life cycle cost savings of $150,000 per system can be expected by improving the MTBF and decreasing the MTTR.

Contract awarded

Following highly successful testing of the prototype models, a contract was awarded by NAVCON in January 1978 to ITT/Gilfillan to produce 46 modification kits which Tobyhanna Army Depot will apply to radars associated with AN/TSQ-71A and AN/TSQ-72 Landing Control Centrals.

The Army will then have a low operating cost radar with acceptable RAM characteristics to provide the reliability necessary for safe and efficient flight guidance and landing control of all Army aircraft. ★

Early bird

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Early Influence on Design for Testability and ATE Compatibility

Hughes Helicopters initiated a Test Requirement Analysis of avionic and weapon systems equipments at the beginning of the YAH-64 program. RCA, the team's Automatic Test Equipment supplier, was then able to provide timely technical guidance to other team members for enhancing equipment testability and ATE compatibility.

For more information contact:
Director of Marketing, RCA Automated Systems, Burlington, MA 01803

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ATC UNITS IN THE ARNG FORCE STRUCTURE

BY COLONEL JOHN J. STANKO,
CHIEF, ARMY AVIATION DIVISION, NATIONAL GUARD BUREAU

THE **Army National Guard (ARNG)** Aviation Program has grown tremendously over the past ten years and the role of **Air Traffic Control (ATC)** in the program has increased just as dramatically.

As the Guard Program became more structured and the philosophy of consolidated aviation facilities became a reality, the need for air traffic control became essential.

Most of the Guard's facilities are located on civilian airfields which have either a FAA tower or a UNICOM operated by the civilian fixed base operator. However, some of the facilities are on government installations or training sites, and it's at these facilities where Air Traffic Control becomes critical. We'll look at this area a little closer later in the article.

The Guard basically deals with Air Traffic Control and the **U.S. Army Communications Command (USACC)** in three aviation related areas:

- Tactical Air Traffic Control Units
- Fixed Base Air Traffic Control
- Air Traffic & Airspace Officer Functions

Let's look at each separately and then show the tie in of each to the total program.

THE TACTICAL ASPECT — Just like their active counterparts, Army National Guard tactical **Modification Table of Organization & Equipment (MTOE)** units had Air Traffic Control assigned directly in the unit. Under this original concept the Guard had 519 billets dedicated to Air Traffic Control. These were located in the **Headquarters & Headquarters Company's (HHC's)** of the aviation battalions, both divisional and non-divisional; the aviation companies of the armor and mechanic divisions; air ambulance companies; and other aviation units.

Under the current concept of separate Air Traffic Control units, the ARNG should capitalize on the trained personnel already available in the field by placing most of the new units in the locations where the Air Traffic Control equipment and trained personnel exist. This would normally be a simple matter, but due to the release of the new MTOE's under the ARCSA III concept, which eliminated the Air Traffic Control sections from the units and the delay in the issuance of the new ATC unit TOE's, the problem was magnified.

To prevent the trained ATC personnel from being placed in other aviation positions, an interim fix was devised. All ATC positions from the original units were temporarily placed on the state headquarters **Tables of Distribution & Allowances** pending the finalization of the new tactical ATC TOE's.

Under the new concept the Army National Guard will have approximately 620 personnel in ATC-related billets. If the current proposal is accepted, the ARNG, as a minimum, would have within its force structure, the units shown in **Figure 1** on the next page.

A balanced ATC structure

This distribution of the Air Traffic Control assets will permit the Army National Guard to assign one full platoon to each of the eight ARNG divisions and also provide four other major units with ATC expertise availability. The assignment of two major ATC command elements to the ARNG will provide for a balanced ATC command structure within the ARNG.

The assignment of the separate tower and **Ground Control Approach (GCA)** teams will benefit the Guard in dealing with a fixed based ATC problem as well. Presently there are five ARNG operated airfields located on either active Army or state installations.

These facilities do not qualify for full-time tower due to the limited number of yearly operations. But the lack of a tower on drill weekends when the bulk of ARNG flying is accomplished does create a problem. It is envisioned that by stationing these additional tower and GCA

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teams at these five locations, not only will they have the opportunity to practice their hard earned skills, but the units being served will have a service which they have never had before.

One area of the tactical ATC picture which isn't too bright is the availability of modern equipment. The ARNG has managed, through the use of the highly skilled radar technicians who were available when the Army's Air Defense program was cut back, to keep what ATC radar equipment is available operational. This aging equipment can only be maintained so long, therefore it is critical that future ATC equipment procurement plans include provisions for equipping the ARNG.

The next aspect of ATC discussed is the **ARNG Fixed Based ATC Program.** A few years ago, USACC was given, through an update of regulations, the responsibility for all Army ATC. At that time the director of the ARNG asked the Commanding General of USACC, for assistance in determining the ARNG requirements in the future and for immediate help with the program as it existed.

ARNG A Major User

The positive response from Major General Grombacher and his staff was fantastic. In the past couple of years 26 facilities, either operated by the ARNG or where the ARNG is a major user, have been surveyed to determine their ATC requirements. At the present time a comprehensive plan outlining the assumptions of all ARNG ATC O&M functions by USACC is at Department of the Army awaiting approval.

When the plan is approved, USACC will assume total responsibility for the one ARNG operated tower and GCA at Los Alamitos AAF and will also begin maintaining the equipment at the other 25 sites where advisories are operating. The program should streamline and

ATC Units in ARNG Force Structure

Quantity	Unit	Billets
1	ATC Groups Hqs	61
1	ATC Bn Hqs	63
2	ATC Co Hqs (Fwd)	26
12	ATC Platoons (Fwd)	372
5	Tower Teams	35
5	GCA Teams	45
5	TAC Teams	15

COL. JOHN J. STANKO, Chief, Army Aviation Div., NGB

update the equipment available to the Guard while requiring virtually no increase in manspaces. The coordination which now exists between the ARNG Aviation Division and the Air Traffic Control Activity should help to insure that both agencies benefit from this alliance.

The third aspect of ATC in which the ARNG has been virtually involved in recent years is the AT&A Officer Program. As the Airspace utilization problem increases, involvement by knowledgeable personnel in each state was essential. The new AR 95-50 required each state to have an AT&A Officer and this requirement has been met.

To insure these individuals are properly trained and kept informed, NGB took steps to have each AT&A Officer attend the Airspace Management Course at the FAA Academy within the next two years, as well as encouraging participation at the AT&A Officer Educational Seminars.

The assistance given our AT&A Officers by the **Department of the Army Regional Representative (DARR)** has been tremendous. The cooperation given the Guard by these sometimes forgotten "men in the field" is appreciated not only by the states, but especially by us here in the Aviation Division. The union which has evolved between the Guard personnel in the ATC field and the personnel of all of the Army's ATC related agencies is probably the biggest asset we have going for us.

Sure there are problems with training, equipment, and personnel, but as long as the Guard and the ATC Activity personnel continue to work together as closely as they have in the past few years, those problems won't look quite so big.

I personally want to thank the ATC Activity personnel, both at Ft. Huachuca and Cameron Station, for their attitudes in dealing with the Guard. With professionals like you assisting our aviation professionals, we can't lose. ★

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(LETTERS/CONTINUED FROM PAGE 22)

formation must be brought to a halt. I hope you'll see things as I do and will publish this letter in your magazine.

WO1 MARK E. PETERS
503d Aviation Bn (Combat)
APO New York 09076

(Ed. Note: As long as the **Stars and Stripes**, the **Army Times**, the **USAWOA Newsletter**, other media, and this magazine continue to publish change of assignment information tied to ranks and grades, "our opposite numbers" have all the information they want. The fact that CW3 Ken Beardsley at Sill has a new six-month-old daughter and new Senior Aviator wings isn't of any military importance to any enemy, except that CW3 and Mrs. Billy Calder — who lived next door to the Beardsleys at Ft. Knox in 104-C Gilkey— might like to know this and similar information . . Sorry, then, but this time we don't see things your way.)

"IT'S A LONG WAY . . "

Just read the July "Cobra" issue, and to this WWII L-Pilot it sounds like quite a machine. It's a long way from our $2,000 L-4's of 1944! But can we afford war anymore?

The loss rate in Vietnam was pretty bad and our opponents were armed with little but small arms and sling shots. I wonder how the helicopters will fare against a well-equipped modern opponent.

Enjoyed Arthur Hadley's article, "An Imaginary Edge," because I agree with it completely.* Our voluntary Army is really not very good, and I think we're relying far too much on all manner of technical sophisticated stuff that is very complicated.

I remember up at (Fort) Drum over 16 years ago a team there having the newest in communications gear, including a radio teletype. In spite of beautiful weather, very minimum operating ranges, and nobody shooting at us, the damned thing would not work reliably . . and that was a fairly simple piece of gear.

All in all, the whole mess is pretty sad. If we could only get the dedication and the money to spend on such things as mass transit, and forget war for awhile, how much better we'd be. It also shocks me that I no longer know anyone connected with Army Aviation at any level, outside of Bob Williams and you. Lots of luck.

LTC (RET.) SAMUEL FREEMAN
Far Hills, New Jersey

(Ed Note: Times, they are a changin' . . *GEN. George S. Blanchard, the AAAA's ranking officer/aviator, will address the attendees at the coming 12-15 Oct. National Convention in Arlington, Va. As the CINCUSAREUR, he's in the best position to comment on helicopter vulnerability against "a well-equipped modern opponent." . . Yesterday's L-4, Sam, in having no ASE equipment whatsoever, wouldn't last a minute in tomorrow's European environment.)

WRONG BY THREE YEARS!

Dear Editor:

The CH-47 transition that was conducted by the USAR at Ft. Meade might have been the first for the USAR, but it was not the first for the Reserve Components . . In August, 1975, Ft. Rucker and Ft. Sill sent four flight instructors and two ground school instructors to the Stockton Army Aviation Support Facility to conduct a one-time, four-week CH-47 transition course. Eight aviators of the 49th Aviation Company (ASH), the "Delta Schooners" of the CalifARNG, completed the training. Nice try, USAR, but the Army National Guard was first again! The Guard Belongs!

The readers might also be interested to know that this CH-47 Company is going to Europe this Fall for its two-week summer camp.

CPT THOMAS E. LASSER
CAL-ARNG
Stockton, CA

(Ed. Note: Europe for SFT? Unbelievable! In our day, summer field training was conducted in such exotic sites as Camp Drum and Ft. Totten. We even managed a fantastic journey to Fort Rucker one year. Fatten up before you go for those two weeks, Tom. We understand the four-inch knockwurst go for $3.30 each, and that's without a roll.)

GOOD GUYS FINISH FIRST!

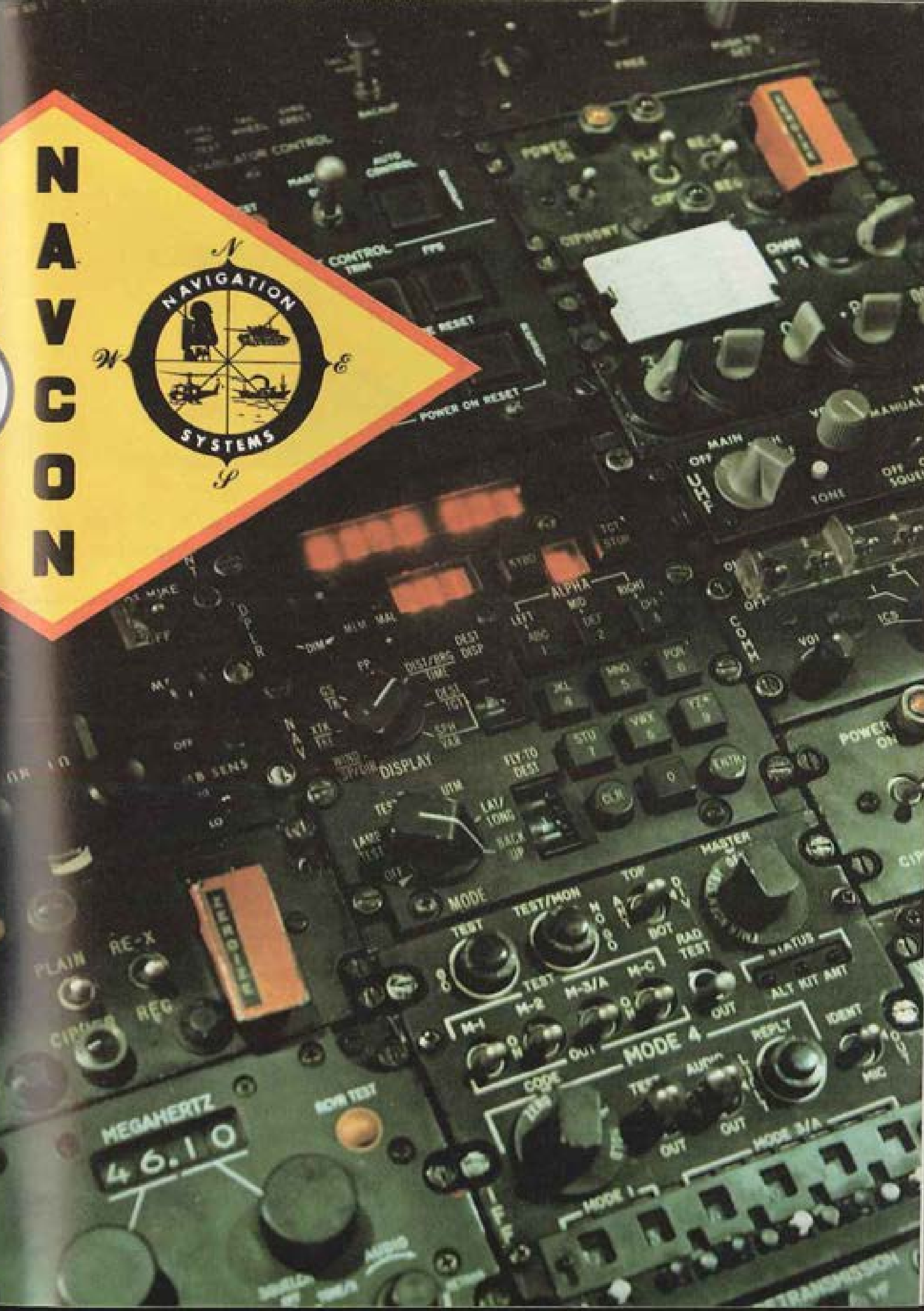
William G. Rutherford has been elected vice president - government relations for the Beech Aircraft Corporation, and will continue to direct all activities of the company's Washington, D.C. office. **Rutherford** joined Beech in 1967 following his retirement from the U.S. Army as a colonel. During his military career he flew all types of Army fixed wing aircraft, accumulating approximately 10,000 hours. A former Vice President of D.C.'s AAAA Chapter, he started with Beech as their regional marketing representative, moving to manager of aerospace marketing in 1971, and director of the Beech Washington office in 1971.

IDENTIFICATION

Sanders Associates, Inc. has named **Dennis Lessard** as the staff artist who painted the exploding Huey in its June 30 "survivability? ask Sanders!" advertisement. The eye-catching piece of art also appeared on Cover II of the July, 1978 magazine.

* * * * *

A "Letter to the Editor" is welcome on any subject, and is subject to editing for space purposes. The writer should include his name which will be withheld from publication at his request.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TRANSMISSION

FIELD Manual 100-5, Operations, 1 July 1976 establishes the basic concepts of U.S. Army doctrine and provides the foundation for Army instruction, training, and combat developments. The principles imbedded throughout this manual are directed toward accomplishing the Army's primary mission of winning the land battle.

To accomplish this mission on the highly lethal modern battlefield the Army must prepare to win the first battle of the next war. In doing this we must accept the very real probability of having to fight outnumbered, but we must none the less prevail. Training, attainment and maintenance of suitable readiness, and the development of esprit and confidence are continuing necessary requirements in the realization of these goals.

Another way to gain an advantage is through the development and use of **"Combat Multipliers"**. These fall into many categories — development and execution of superior tactics, accomplishment of careful and complete planning,

By
COLONEL WILLIAM W. HICKS,
TRADOC System Manager for POS/NAV

Why POS/NAV?

maximization and optimization of fire support, mobility enhancement, the development of effective combined arms team work, and so forth.

The combat advantage will go to the commander who is able to see the battlefield and concentrate his combat power at the critical time and place in order to suppress the enemy and exploit advantage.

It is at this point that **position and navigation (POS/NAV)** enter into the combat arena. Since the days of Nathan Bedford Forrest's Cavalry ("Get there furstest with the mostest") the challenge has been the accomplishment of effective and efficient movement on the battlefield.

Historically, navigation or movement on the battlefield has always been a concern with both combat and support units. Requirements for precise accuracy were ascribable to positioning requirements for field artillery weapons systems and organic acquisition devices. Now, with the introduction of mass aviation elements, an added time sensitivity has been given to the navigational problem.

Our current situation — preparing for a highly lethal battle characterized by high technology, where we face superior numbers but must win — now serves to focus us on the POS/NAV requirement. Our movement about the battlefield, ground and air, must be completely responsive to the requirements and direction of senior commanders. To facilitate transfer of target data between acquisition and delivery systems, acquisition devices must be located on a grid common to the delivery systems.

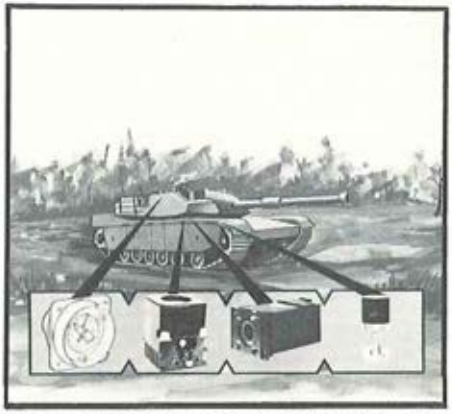
There are a variety of developmental systems which purport a capability to accomplish these goals; each solves part of the problem with no central utopian system and each is on a different developmental time line. A basic mission given to my office is to orchestrate the user requirements for POS/NAV and thereby to contribute to the sorting of this POS/NAV mixed bag. While we cannot afford all systems, there is a reasonable requirement for a logical mix to insure operational dependency through acceptable redundancy.

The simple question is: What is the acceptable system mix?

The seven primary systems

The TSM POS/NAV office was chartered on 7 March 1978. The seven primary systems assigned for monitorship (and a brief system description) are:

- **Position Locating Reporting System (PLRS).** A real-time, over-the-horizon digital radio position fixing and reporting, navigation, identification and limited digital message system. PLRS operates with a family of cooperating users and is being developed jointly with the USMC.
- **NAVSTAR Global Positioning System (GPS).** A passive, satellite oriented radio position and navigation system with world-wide coverage under all-service development with USAF lead. GPS gives three dimentional positioning information.
- **Integrated Inertial Navigation System (IINS).** An airborne self-contained system which uses a combination of a gyroscope and horizontally mounted accelerometers to determine aircraft location by calculating how far it has travelled from an initial known position. IINS also provides bearing by sensing the earth's turning rate and determining the aircraft heading with respect to true north.
- **Lightweight Doppler Navigation System (LDNS).** An airborne self-contained system which uses the outputs of a Doppler radar sensor with aircraft pitch, roll, and bearing data to compute horizontal location and to provide azimuth. LDNS operates up to 14,000 feet over all types of terrain and furnishes present aircraft location and distance, heading and time-to-go for any of the preset destinations.
- **Land Vehicle Navigation System (LVNS).** Under the current program, a simple combat vehicle heading reference unit which determines direction/heading to assist arrival at a desired location or in maintaining a predetermined course under acceptable operational restrictions. It allows the vehicle commander to maintain orientation while moving in the closed hatch mode and will satisfy the need for navigation without dismounting.
- **Positioning and Azimuth Determining System (PADS).** A real time, all weather, day-night velocity-aided inertial survey system palatized for use in ¼-ton vehicles or helicopters.
- **Survey Instrument Aziumuth Gyroscopic Lightweight (SIAGL).** A man-portable azimuth reference instrument to support azimuth orientation requirements of field artillery weapons, target acquisition devices, and for artillery surveys. The SIAGL employs gyro compassing techniques to reference the horizontal scale of an attached theodolite to true north.



IN ADDITION TO PROVIDING ATC AND POS/NAV SYSTEMS FOR ARMY AVIATION, NAVCON ALSO PROVIDES POS/NAV FOR THE GROUND ARMY. ONE SUCH SYSTEM IS THE LAND VEHICLE NAVIGATION SYSTEM SHOWN ABOVE.

Other possible systems

Of no less concern is a collection of other positioning and navigation systems or systems with an inherent POS/NAV capability in various stages of development including: **Long Range Navigation System (LORAN), Army Data Distribution System (ADDS), Joint Tactical Information Distribution System (JTIDS), Packet Radio, Projected Map Display System (PMDS),** etc.

The potential effects of these systems must be continuously evaluated and weighed from a POS/NAV perspective. Of equal concern is the requirement for interoperability with the emerging management systems - TOS, TACFIRE, TSQ-73, and others — and the configuration of POS/NAV systems into varied vehicles or airframes. With the LDNS alone, the problem of

Why POS/NAV? (Continued)

interface into each type aircraft, with or without PMDS or a requirement for **Integrated Avionics Control System (IACS),** is a major problem in itself.

The final result, however, must be a cohesive interoperative position and location system which will complement the flow of information and targeting data and the movement and positioning of forces on a common battlefield grid.

One of our first accomplishments has been the development of an integrated POS/NAV **Operational and Organizational (O&O)** concept. That concept has been published in final draft to facilitate future planning; final publication will be withheld pending completion of the two-year POS/NAV COEA effort schedule to HQDA in mid-August 1978. With this concept, we now have for the first time a common start point for future POS/NAV actions. Application of this concept in the refinement of future requirements should go a long way toward standardizing our POS/NAV family.

"Manpack" deliveries

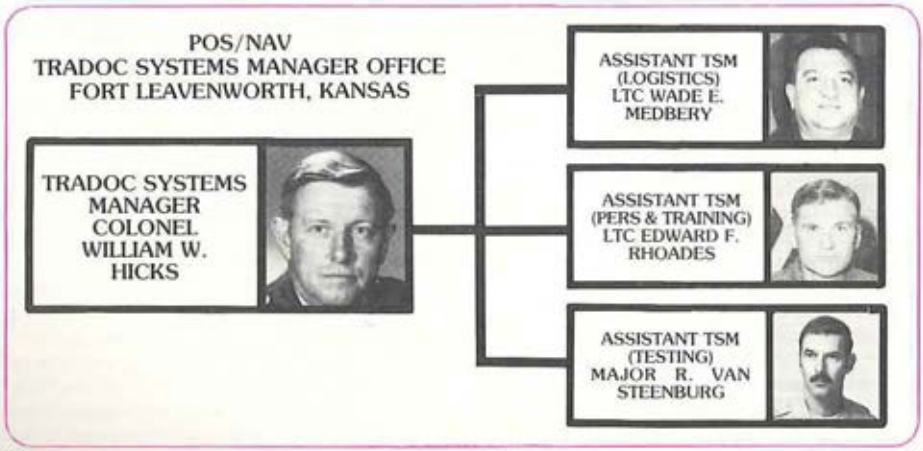
Another aid to the development and standardization of POS/NAV requirements will be the acquisition of 118 AN/PSN-6 (LORAN manpacks) scheduled for fielding in 1QFY80. At the time the LORAN program was terminated these 118 manpacks were ordered to provide a viable surrogate system for the refinement of POS/NAV concepts and the development of material requirements.

A secondary gain is the provision of an on-the-shelf limited contingency capability pending fielding of a full-up system. While the use of these systems will be controlled by the TSM POS/NAV office, it is planned to position them at two or three high use locations in CONUS to insure their optimum utility. Proper use of these systems during the conceptual phase of combat developments will permit more precise system characterization and the requirement definition. Agencies interested in using the AN/PSN-6 can request them through the TSM office.

Optimizing current technology

There is really nothing new in this positioning and navigation problem. We have always been faced with the task of locating ourselves and others on the battlefield, finding the enemy and moving accordingly. Only now we are on the threshold of optimizing current-day technology to permit solving this age-old problem to a higher degree of accuracy in a time-responsive manner.

The result — a definite enhancement of combat power and a positive step on the way to **"WIN THE FIRST BATTLE!"** ★



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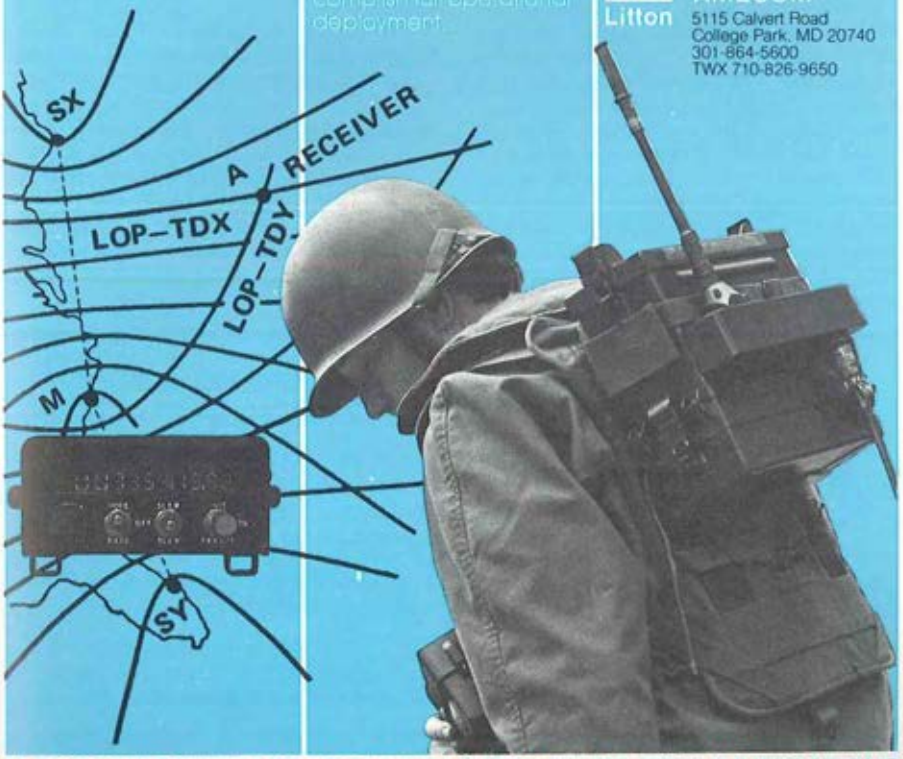

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Life Membership

AAAA Enrollment Plan to End Dec. 31

AT its February 12, 1977 meeting in Washington, D.C., AAAA's National Executive Board approved a Life Membership Program, with an effective starting date of April 1, 1977.

A member-applicant would make a one-time $150 donation to the "AAAA Scholarship Foundation, Inc." and forward his donation directly to the Foundation at 1 Crestwood Road, Westport, CT 06880.

The AAAA — on notification from the Foundation of the member's donation — would provide a Life Membership to the applicant with appropriate credentials signifying "Life Membership" to follow in a later correspondence.

The AAAA Scholarship Foundation would retain the $150 sum in the donor's name, and on his or her death would — together with all other funds received in memory of the donor — provide a Memorial Scholarship in the donor's name in the academic year following his or her death.

The $150 donation to the AAAA Scholarship Foundation, Inc. would be considered deductible for tax purposes.

The 1978 "Life Membership Program" enrollment will cover a four month period, and terminate on December 31, 1978. A consolidated roster of Life Members enrolling in AAAA will appear in the October, 1978 Convention Issue of "Army Avia-

A member may request that his current year dues — if already paid — be credited towards his "Life Membership."

APPLICATION FORM FOR LIFE MEMBERSHIP

I would like to enroll as a **Life Member** of the **AAAA**, and have enclosed a check made payable to the **AAAA Scholarship Foundation, Inc.** in the amount of $150.00. I understand that my donation is tax deductible, that the donation - along with other funds donated in my name — will underwrite an AAAA Memorial Scholarship in my name on my death, and that I hereby authorize the use of the funds for this purpose. When available, please forward my **Life Membership** credentials to me at the address appearing on the enclosure.

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The **Monmouth Chapter** of Army Aviation Association of America will conduct a **Symposium on Aviation Electronics** at Fort Monmouth, New Jersey from 21 to 23 March 1979.

The meetings will provide a forum for describing and discussing research and development programs and the latest industrial developments in Aviation Electronics, both ground and airborne.

With the current rapid progress in **Navigation, Night Vision, Electronic Surveillance, Fly-by-wire, displays, communication, automatic test equipment,** etc., it is expected that these sessions will feature new techniques, new device applications and complete system functions. We are interested in all subjects directly or indirectly related to **Aviation Electronics.**

Original papers, prepared by individual scientists, engineers, military experts and other knowledgeable persons, that have not been previously published or presented and which describe new contributions in the topics and related areas of interest, are invited. Papers may be unclassified or classified up to and including secret. Authors are requested to submit both a 35-word abstract and a 300-500 word summary, appropriate to a 30-minute oral presentation, by 15 December 1978, to Headquarters, U.S. Army Avionics R&D Activity, ATTN: DAVAA, Fort Monmouth, New Jersey 07703.

The 35-word abstract, suitable for possible publication in the program, must be typed on a separate sheet, and include the title of the talk and the author's name. Summaries must be typed on single-side 8½ in. x 11 in. paper (double-spaced) suitable for screening purposes. The author's name and paper title should appear on the title page, with paper title on subsequent pages.

Since papers will be selected on the basis of summary, they must clearly describe what new and significant results have been obtained or can be expected. Any pertinent illustrations that could aid in screening may be supplied.

Authors of accepted papers will be asked to prepare a complete version, accompanied by a photo and biography, by 1 February 1979, for publication in a proceedings to be issued at the meetings.

Doppler: An automatic "set and forget" navigation system

BY PAOLO PAONE, PROJECT LEADER, AN/ASN-128

MODERN Army Aviation battlefield tactics have made nap-of-th-earth (NOE) flying a necessity. Under these conditions, it is no longer possible to rely on continuous "map-on-the-lap" navigation.

This is particularly important since under these flight conditions the pilot's field of view is limited; landmarks are often masked; and selected way-points of destinations are obscured Masking and unmasking techniques executed by the pilot, combined with evasive maneuvers, merely add to the difficulty.

Thus, there is a need for an automatic "set and forget" navigation system, which computes the aircraft's current position continuously and accurately, and gives the pilot bearing and range to selected destinations or targets.

Through the efforts of PM NAVCON, Army Aviation has such a device in its new standard airborne navigation system - the **Lightweight Doppler Navigation System (LDNS)**, AN/ASN-128, as shown in **Figure 1** on the opposite page.

The Black Hawk to be first

The first Army aircraft to have an **LDNS** production installation is the Sikorsky UH-60A **Black Hawk** (cockpit shown above). Present plans call for other Army aircraft to be equipped with the doppler navigation system.

The LDNS will provide accurate tactical navigation for Army helicopters under all conditions, including contour and NOE flight.

As a completely self-contained navigation system, LDNS does not rely on any external devices (such as radio transmitting equipment) being set up and maintained in operation. It is instantly available when power is turned on.

FIGURE 1-LIGHTWEIGHT DOPPLER NAVIGATION SYSTEM (LDNS) (AN/ASN-128)

It does not do away with the map, of course. Since the LDNS can only compute accurately if its operator inputs are accurate, it requires that the operator know how to read and use a map accurately.

Dual development program

The AN/ASN-128 is the by-product of a competitive dual development which was conducted through contracts with Teledyne-Ryan and Singer Kearfott. The results of this highly successful program are an example of NAVCON's use of the competitive **Design-to-Unit-Production-Cost (DTUPC)** concept during the competitive **Engineering Development (ED)** phase of the program.

Both contractors produced technically acceptable systems with the eventual contract being awarded to Singer Kearfott. It's worthy of note that the production price was 37% under the bogie established at the start of the ED phase.

Initial production of the LDNS

Singer Kearfott is building 200 doppler systems currently as part of an initial production contract which includes a firm fixed price option for an additional 600 units. The contract includes a **Reliability Improvement Warranty (RIW)** clause, providing for contractor maintenance for four years after completion of DT-III at a fixed price per system.

Under RIW, the contractor has guaranteed a 500-hour operational **Mean-Time-Between-Failures (MTBF).** If the 500-hour MTBF is not achieved, the contractor has an obligation to redesign the system to achieve the 500-hour figure at no cost to the government.

Singer Kearfott will start deliveries of this system this summer. Installations will be in the UH-60A **Black Hawk** to be followed by installations in the AH-1S Modernized **Cobra**. Later production models are scheduled for the YAH-64A Advanced Attack Helicopter and the OH-58C, and are being considered for the CH-47D **Chinook**

The Marine Corps has also expressed an interest in testing the LDNS for use in its CH-46E and in its CH-53E Heavy Lift Helicopter.

The German government has also selected the LDNS (with some changes) as its standard helicopter navigation system with two ED models currently flying in German aircraft. Production orders have been released by the West German government to Standard Elektrik Lorenz of Stuttgart, a Singer Kearfott licensee, for systems for both the BO-105 VBH and the BO-105 PAH-1, an antitank version of the aircraft. In addition, the Australian Army has expressed an interest in a loan of equipment for tests with a view toward standardization.

Status of the program

As noted, the Engineering Development phase of the LDNS program has been completed. Ten ED models were built, and these units are in use for the following efforts:

The Doppler LDNS

Location	Application
Two at Hughes Helicopters	YAH-64A
Two at Sikorsky	UH-60A
One at Bell Helicopter	AH-1S (Modernized)
One to U.S. Marine Corps	CH-46E
One to U.S. Navy	CH-53E
One at Singer Kearfott	LDNS LRIP Program
One to AVRADA	Tests and Demonstration

Future plans

"Progress or perish!" applies to military avionics and reflects the future of the LDNS. TRADOC Materiel Development at Fort Rucker has recommended the use of a **Projected Map Display System (PMDS)**, such as the ASN-99 **(Figure 2)** for some future LDNS models. Preliminary studies have been conducted to establish how best to interface the LDNS with a PMDS.

Because of limited cockpit space in some aircraft, a problem exists in installing avionics and/or weapons systems including the LDNS' **Computer Display Unit (CDU)** and PMDS **(Figure 3)**. In this connection, a current development by AVRADCOM's Avionics R&D activity may offer a solution.

The development cited is the **Integrated Avionics Control System (IACS)**, a central control panel and a multiplexer data bus to remotely control avionics equipment located outside of the cockpit area. **Figure 4** on page 82 shows the cockpit space savings available in a typical aircraft by using IACS.

Consideration is now being given to having the IACS control the LDNS, thereby eliminating the LDNS CDU. A program to study the long range impact of this change on the LDNS and inclusive of the required MIL-STD-1553 data format is also underway.

Paolo Paone, Project Leader, AN/ASN-128 Lightweight Doppler Navigator System (LDNS)

Accuracy is your responsibility

To summarize, Army Aviation now has an accurate, completely airborne navigation system in the AN/ASN-128 LDNS. Its operator will have a continuous reading of his current position, ground speed, and drift angle. With the coordinates and magnetic navigation of a destination/target carefully inserted, it will provide the magnetic bearing, range, and time-to-go to a selected destination.

However, the Army Aviator must know how to read a map accurately if he is to use the LDNS effectively - and because the LDNS can be no more accurate than the heading reference, careful and accurate compass swinging must be done regularly.

If these cautions are observed, the LDNS can be invaluable help to Army Aviators in meeting the Army's expected battlefield threats for many years to come. ★

Figure 2

★

FIGURE 2 (LEFT) PROJECTED MAP DISPLAY SYSTEM (ASN-99)

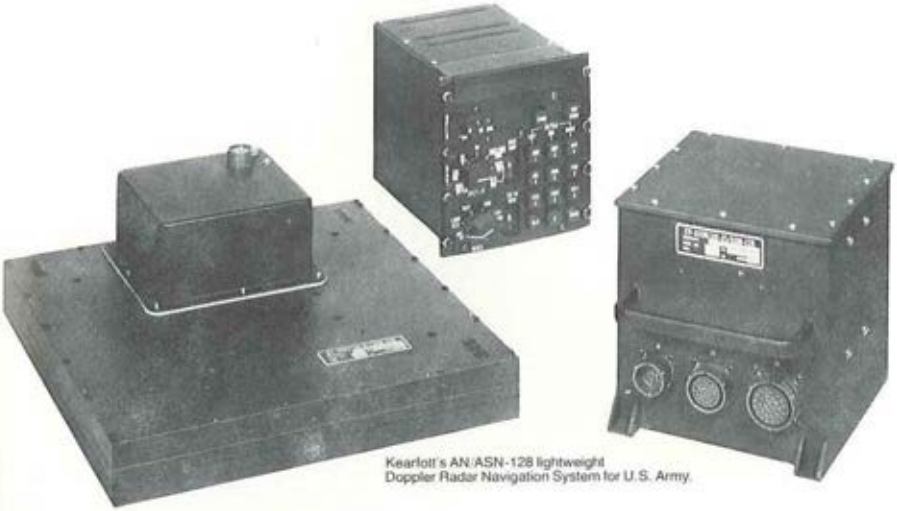
★

FIGURE 3 (RIGHT) THE LDNS'S COMPUTER DISPLAY UNIT (CDU)

★

Figure 3

THE STANDARD FOR DOPPLER RADAR NAVIGATION SYSTEMS



Kearfott's AN/ASN-128 lightweight Doppler Radar Navigation System for U.S. Army.

Kearfott's AN/ASN-128 Lightweight Doppler Navigation System is the U.S. Army's standard airborne doppler navigator.

The Receiver/Transmitter Antenna (RTA) and Signal Data Converter (SDC) constitute the Doppler Radar Velocity Sensor (DRVS), which continuously measures the velocity of the aircraft. The Control Display Unit (CDU) provides control and display functions for the operator, and contains the navigation computer.

With inputs from external heading and vertical references, the ASN-128 system provides accurate aircraft velocity, present position, and steering information. It is completely self-contained and requires no ground based aids.

The DRVS accepts heading, roll, and pitch as synchro inputs and converts them into digital format for transmission to the computer. The DRVS can also be used separately from the ASN-128 to provide velocity inputs to other aircraft equipment.

The CDU accepts beam velocities, heading, roll, pitch and true air speed (in some installations) from the Doppler Radar Velocity Sensor and performs the navigation computations. The front panel includes provisions for entering operator inputs and for displaying system data such as present position, steering information to 10 destinations, and status of the system. The CDU also puts out velocity and navigation data in ARINC digital format.

The CDU performs three functions for the ASN-128:

- Provides mode controls, display controls, and keyboard entry of destinations and other data.
- Performs all computations for LDNS including Doppler processing, velocity coordinate transformations, navigation in both UTM and latitude/longitude, steering signals to 10 destinations, and BITE functions.
- Displays navigation data on its front panel.
- BITE function identifies and displays failed LRU.
- Provides BCD and binary outputs for external equipment.

Operational Advantages:

- Weight 28 lb (12.7 kg)
- FM-CW transmission, with Doppler tracking of the J1 sideband providing accurate velocity measurement from ground level, to over 10,000 feet (3,048m).
- Printed-Grid Antenna—"Land-sea" switch eliminated, because of inherent beam shaping.
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- Over 2000 hour MTBF for the ASN-128 and over 4500 hour MTBF for the DRVS alone.
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For additional information write to: The Singer Company, Kearfott Division, 1150 Mc Bride Ave., Little Falls, N.J. 07424.

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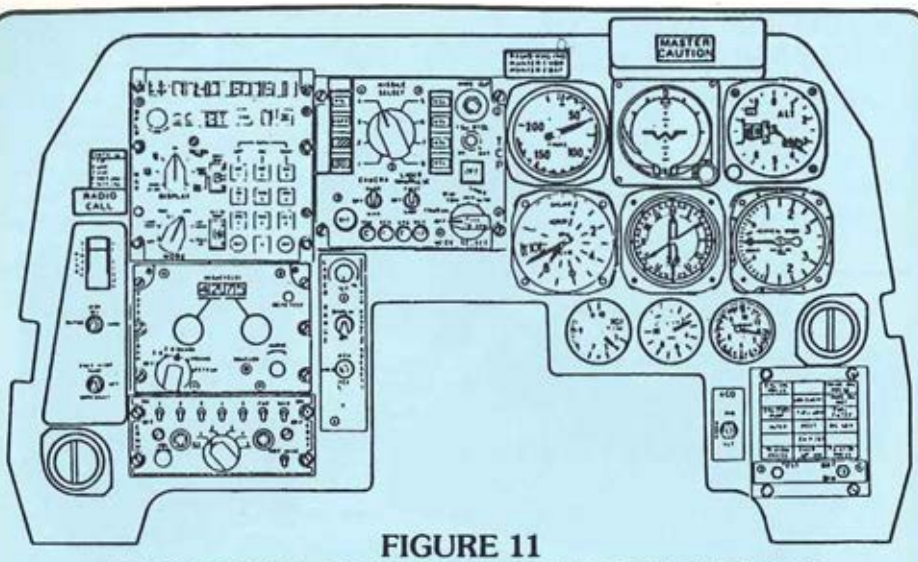

FIGURE 11
AH-1S GUNNER COCKPIT—PRESENT CONFIGURATION

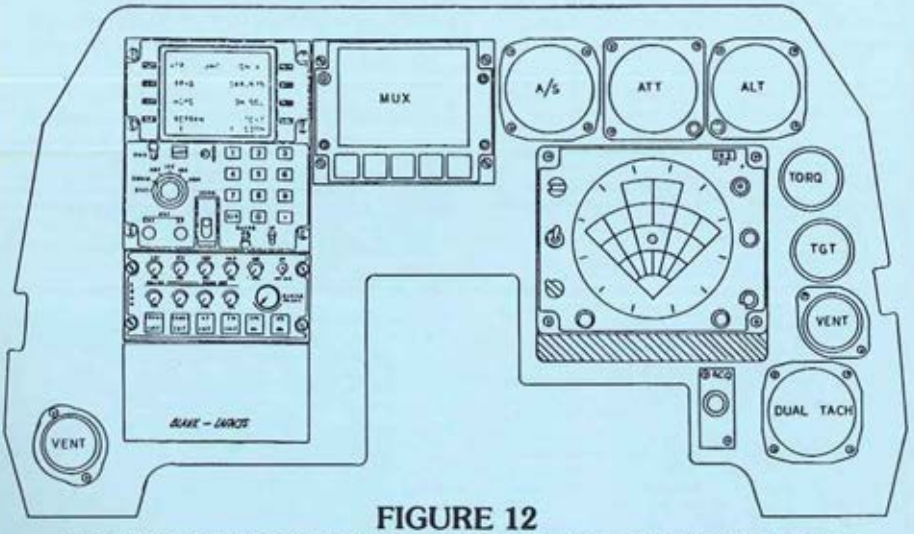

FIGURE 12
AH-1S GUNNER COCKPIT—SPACE-SAVING CONFIGURATION USING IACS

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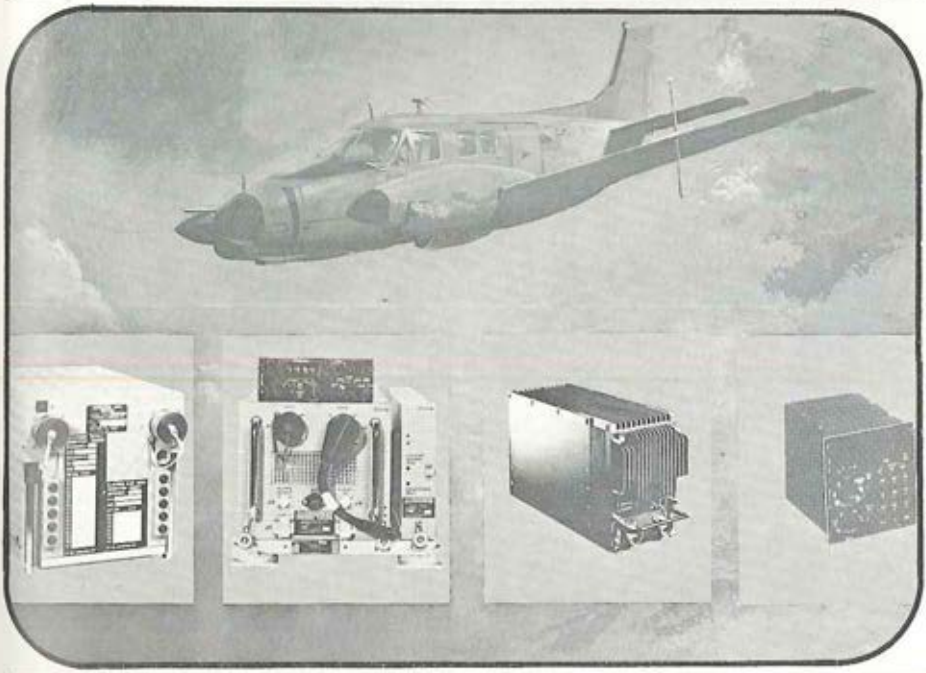
THE Integrated Inertial Navigation System AN/ASN-132 is a low density, highly complex item. The equipment, as shown below in the block diagram, consists of four major items: a standard form-fit function Inertial Navigation System, a TACAN, a Navigation Processor Unit, and a Control Display Unit.

The major thrust of the program is to interface and update the Inertial Navigation System through the Navigation Processor Unit utilizing information from up to ten TACAN ground stations. This is accomplished by having the Navigation Processor Unit control the airborne TACAN receiver and to automatically select various TACAN stations depending on their relative location and validity of their signal. The Navigation Processor Unit then takes the TACAN information, processes it through appropriate filtering and computations, and provides present position information to update the Inertial Navigation System.

The major objectives of the AN/-ASN-132 program are to remain competitive and to tie into large production procurements in a cost effective manner.



Ahead: A tactical Integrated Inertial Navigation System (AN/ASN-132)

BY JERRY CONNOR, PROJECT LEADER, AN/ASN-132

The Integrated Inertial Navigator

This requires the monitoring of tri-Services programs while phasing Army programs with them to minimize our development and eventual production unit costs. For instance, on this particular program, the Army plans to utilize the Air Force AN/ARN-118 TACAN because it meets our accuracy requirements. The Army requirement for these units could be most cost effectively satisfied by procuring the units from the Air Force.

Meeting our unique needs

One Air Force Inertial Navigation System is a prime candidate to be included in the AN/ASN-132 because of the quantities being procured and because the specification for it has been coordinated with the Army and includes our unique requirements.

One of the Army standard computers being managed by PM ARTADS is the prime candidate to be the Navigation Processor Unit in the AN/ASN-132 system. The equipment will be developed, qualified, and logistically supported under the present **Army Tactical Data Systems (ARTADS)** program. Another candidate for the Navigation Processor Unit is a computer utilized by the Navy because of its large production base.

IACS under development

One strong candidate for the Control Display Unit is one being developed, qualified, and fielded by the Army Avionics R&D Activity in the **Integrated Avionics Communications System Program (IACS).** The IACS is a candidate for Bell's Modernized AH-1S Cobra and also the Hughes Advanced Attack Helicopter.

One feature of the AN/ASN-132 system will be the incorporation of a two-wire interconnect system utilizing digital multiplexing signals to control the operating modes of the components and to transmit signal information between components and outside systems. The benefit of this type of interconnect system is its simplicity, flexibility, maintainability, reliability, and reduced cable weight.

The logistics support

The logistics support of the system will be a mixture of techniques depending on the equipment chosen. **Reliability Improvement Warranty (RIW)** will be used for the TACAN and most likely, the INS. RIW is that procedure where when an equipment fails, it is returned directly to the manufacturer for repair at a predetermined price for a fixed length of time, regardless of the amount and extent of the failures. The Navigation Processor Unit will be supported by the more classic organic maintenance procedure where equipment is repaired by Army personnel at different maintenance levels - organization being the lowest and depot being the highest.

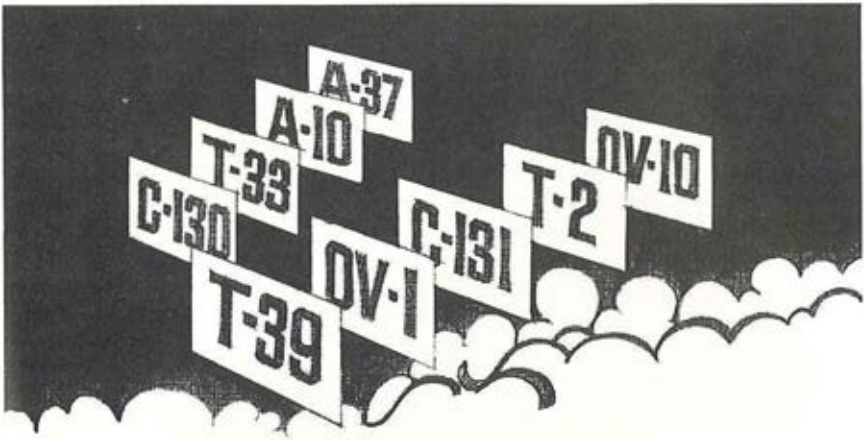
A significant cost reduction

The utilization of components that have and are being developed, qualified and fielded by other programs will significantly reduce the R&D cost to the AN/ASN-132. The utilization of equipment procured from large, competitive procurements will significantly reduce the Army's production unit cost. It is estimated that the Army will save over $1 million for each five systems procured in production, which will more than offset the modest R&D investment. Estimated overall cost savings to the Army by 1989 is $35 million in FY-78 dollars.

Flight testing just ahead

The program at the outset will be the development of the computer software to interface the various components and to develop and program the navigation algorithm. This system will be flight tested in early 1979 to prove it meets overall accuracy requirements. The AN/ASN-132 will then be assembled in a militarized configuration and flight tested in prototype aircraft installaions in mid-1980. ★

Jerome Connors, Project Leader, Integrated Inertial Guidance System AN/ASN-132



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The LORAN Manpack Position Location System AN/PSN-6

By Chris Lucas, OPM NAVCON

THE Army has long recognized that it must have highly mobile combat forces to overcome the superior numbers of enemy troops it may encounter.

With this situation in mind, the Army has developed doctrine, strategy, and tactics to use its mobility to concentrate forces and fire power, to counteract and neutralize threats, to take the offensive, and to exploit penetrations of the enemy's defenses.

Recognizing the need for mobile combat forces, the Army has made large investments in air and ground assault vehicles. The Army has also recognized the need to operate in all weather day or night and has imposed these re--quirements on their combat vehicles and equip--ment. There are two vital keys to effectively use this all weather, all terrain mobility: communica-tions for command and control and knowledge of present position.

Many communications systems are operational and several new programs address communications, command, and control such as the **Army Tactical Data Systems (ARTADS)** and the **Tri-Services Joint Tactical Communications System (TRITAC)**. The Army is supplying the second key for effective mobility; accurate knowledge of present position, with the LORAN Manpack, AN/PSN-6

The AN/PSN-6 has completed its development cycle, has been thoroughly tested, and is now in production. Tests at Fort Hood proved the AN/PSN-6 significantly reduces the time for foot soldiers or mechanized infantry to determine their positions and to reach their objectives.

Also, field tests in Central Europe proved that the AN/PSN-6 is effective in the most adverse signal conditions existing. The AN/PSN-6 is now in production at the Amecom Division of Litton Systems.

The AN/PSN-6 control indicator shown above is normally worn on the operator's belt. A coiled cable connects the control indicator to the LORAN receiver which is backpack carried. The control indicator provides the equipment controls and displays the operator's position location in UTM coordinates.

Brief Description of LORAN-C/D

The operation of the AN/PSN-6 requires signals from a ground chain of either the civil LORAN-C format or of the tactical LORAN-D format. Loran C/D is a method of radio navigation which provides position fixing accuracies in the order of 100 meters over ranges in excess of 1,500 kilometers.

By using low frequency radio ranging techniques, it is possible to fix the position of a receiver automatically with respect to the earth with speed, accuracy, and ranges unachievable by any other system of navigation. The following is a brief description of LORAN C/D:

LORAN C/D chains operate at a frequency of 100 kilohertz, as a combination of one master station and two to four secondaries per chain, synchronized in such a way that the phase relationship of master and slave transmissions is fixed. The coverage area provided by a master and two secondaries is similar to the coverage provided by the East Coast chain as shown in the illustration.

Position is determined within the coverage area by accurately measuring the time of arrival of the signals from the master and at least two of the secondary transmitters. Since low frequency radio waves travel at a constant speed over the surface of the earth, these "time of arrival measurements"are actually range measurements and can therefore be used for accurate position determination.

Accurate and automatic!

Lines of constant time difference form a hyperbolic grid from which LORAN receivers can accurately and automatically locate the postion of a vehicle at any time and in any weather. The grid provided is similar to that shown on the next page. The location of a receiver at point A would be determined by the intersection of the two lines of position, TDX and TDY. These **Lines of Postion (LOP)** represent the locus of points having the same time differences (or range differences) from the master and secondary X and from the master and secondary Y, respectively. A LORAN receiver located at point A automatically measures these time differences and converts the resulting position to the corresponding UTM coordinates.

The location of any receiver can be continuously tracked with a repeatable accuracy, depending upon chain geometry, of approximately 10 to 20 meters and a predictable accuracy of better than 100 meters.

In the tactical area, operation of the AN/PSN-6 is dependent upon the Air Force installation, operation, and maintenance of the AN/TRN-38 LORAN-D ground chain. This chain can be airlifted into the desired area and installed in a matter of hours.

Operational use of the AN/PSN-6

The AN/PSN-6 provides precise position location in the Army's standard Military Grid Reference System, commonly called **UTM** for the **Universal Transverse Mercator** maps that are used. The battery-powered AN/PSN-6 unit can be either fastened mechanically to the AN/PRC-77 radio, or it can be carried separately. A vehicle-mounting adapter converts the unit into a practical and effective vehicle navigation system.

The need for a manpack position locator is clear. Since the Army is dependent on its mobility to fulfill its total mission, it is vital that it be able

to use this mobility under all conditions. Poor visibility conditions caused by fog or darkness or unfamiliar areas which may lack distinguishable terrain features must not reduce the speed of advance.

Patrols and platoon elements using the AN/PSN-6 will be capable of arriving more quickly and reliably at their destinations than they would by using conventional map and compass methods. Ground forces have found that navigation and position location by map and compass has been inadequate for many missions. In terrain without frequent and identifiable landmarks, map and compass navigation has never been precise.

This is especially true in areas where jungle or forest undergrowth makes straight-line walking or compass-line sighting impossible. The AN/PSN-6 provides an accurate all-weather, all-terrain day/night manportable position location system that overcomes the limitation of map and compass navigation and the limitations of line of sight radio transmission systems.

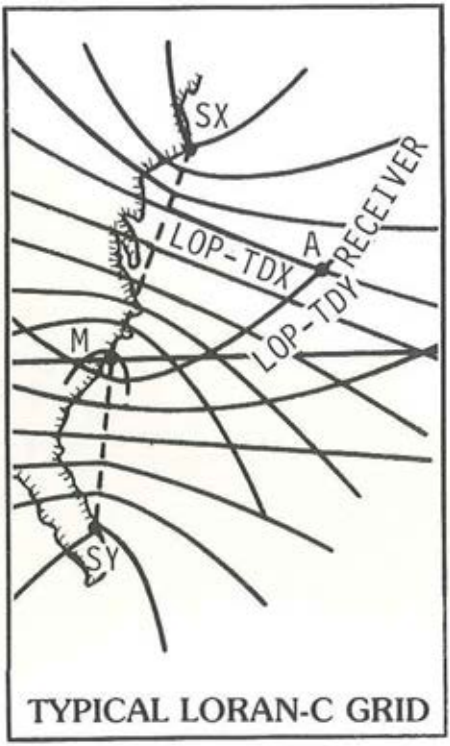
A positive method

Command and control capabilities will be greatly enhanced since units or elements will have a positive method of position determination. This will increase the flexibility and effectiveness of the field commander's application of forces. Combat units will have accurate position information to direct close air artillery fire support.

Medical evacuation missions require timely and accurate position reporting from ground units to airborne med evac units. When a helicopter has to search even a small area for the wounded troops, the aircraft is unnecessarily exposed to ground fire, and the wounded have to endure a longer wait for medical assistance. With accurate position reporting from the ground, the aircraft can fly an approach to the exact spot with minimum exposure to hostile fire.

Tests of the AN/PSN-6 in operational exercises have proven its value to assist troops in performing their mission more effectively under simulated combat conditions. Operational exercises have demonstrated successful operation in a desert-type and forest/jungle-type terrain.

Troops using the AN/PSN-6 have been able to complete a 40-mile course hours ahead of troops using the current Army land navigation system (map and compass).



TYPICAL LORAN-C GRID

The AN/PSN-6 is being used as the test vehicle for evaluation of future Electronic POS/NAV Systems since it is the only system presently available. The results will be utilized in a cost and operational effectiveness analysis which will provide decision makers with a tool to establish proper systems mix, and aid in the design of future systems.

General System Description

The principal components of the AN/PSN-6 are the LORAN receiver and the control indicator. The LORAN receiver is an applique unit attached to the AN/PRC-25 or AN/PRC-77 voice communications transceiver between the battery power source and the radio set. A battery compartment, provided at the top of the LORAN receiver case, is used to house a BA-4386 magnesium battery which powers the

communications transceiver when the LORAN receiver is attached thereto. The bottom of the LORAN receiver case accepts the transceiver battery case which houses a second BA-4386 battery for powering the AN/PSN-6. The AN/PSN-6 can also be carried and used without the communications radio.

A separate readout

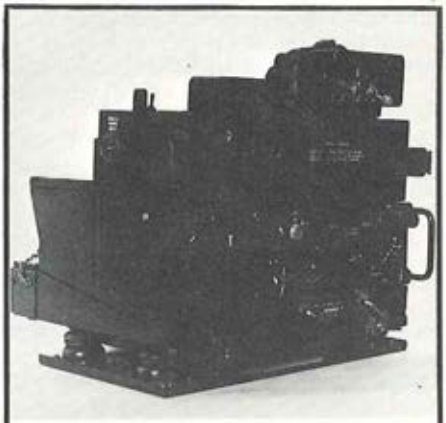
The control indicator is a separate readout and control unit which is mounted to the user's belt. A cable assembly connects the control indicator to the LORAN receiver. The control indicator provides the system controls and displays needed for system operation. The control indicator displays the search, settle, track and test modes and also displays present position in UTM and time difference coordinates.

Reception and processing of the LORAN signals are accomplished in the receiver via an AT-892/PRC antenna and are amplified and bandpass filtered in the preamplifier module. The RF module further processes the LORAN signals to provide hard-limited data which is then sampled by the CMOS LSI sensor timing circuitry. The sampled data is then transferred to the processor via the **input/output (I/O)** module.

The processor serves as the major control and processing element of the receiver. It performs the correlation of LORAN data during acquisition, positions the LORAN data strobes during settle and track, performs the time difference to UTM coordinate conversion, and controls inputting and outputting of all data. The processor also controls four automatic notch filters to eliminate interfering signals. The I/O module also provides the interface circuitry between the processor, RF section, and control indicator. A serial data format is used to transfer data between the LORAN receiver and control indicator to minimize the number of conductors in the interconnecting cables.

In the Manpack configuration, as shown, the AN/PSN-6 is an applique unit attached to the AN/PRC-25 or AN/PRC-77 transceiver. The control indicator displays present position to the user in LORAN time difference coordinates and **Universal Transverse Mercator (UTM)** coordinates.

The vehicle-mounted system, provides the same functional capabilities as the Manpack version. An adapter unit is provided to properly mount the equipment in an Army vehicle. Included as an integral part of the adapter is a DC-DC converter to provide operation from the vehicle power source. ★



The AN/PSN-6 vehicular-mounted configuration with the LORAN manpack set mounted on top of an AN/PRC-77 transceiver, when implemented by means of a vehicle mount adaptor, provides LORAN operation in army jeeps and armored personnel carriers. The adaptation includes a DC to DC converter to provide power from the vehicle battery and a vehicular LORAN antenna.

NEW AWO APPOINTEE

CW4 Leland C. Komich of Alexandria, VA, and the former President of the Coastal Empire Chapter of AAAA, has been appointed as a National Member-at-Large on AAAA's Nat'l Executive Board, replacing CW4 Lloyd N. Washer, MILPERCEN, who has rotated to an assignment in USAREUR. The new AAAA National Board member is assigned to the Warrant Officer Division, MILPERCEN.

Future Army Position and Navigation Systems

By
ROBERT BAKER, OPM NAVCON
Technical Management Division

PREVIOUS discussions have addressed existing or near term POS/NAV systems. In order for Army Aviation to have the maximum capabilities consistent with tactical doctrine, advanced technologies are being developed.

Future and expanded mission capabilities of Army Aviation will depend upon highly improved navigational capabilities for aircraft and for inputs to the aircraft and ground fire control computers.

In addition, there is greater emphasis being placed upon the commander's ability to acquire position data of his forces through reporting techniques not only from aircraft but also from ground users. This, then, places more emphasis upon integrating positioning and navigation into the Army command and control system.

POS/NAV is major portion

Interestingly enough, radio traffic relating to positioning and navigation information is estimated as constituting a major portion of our combat net radio traffic.

Thus, the thought of employing systems which not only perform the POS/NAV function, but also provide real time digital communications and user identification could provide the necessary entry to Army command and control and greatly reduce the load on the presently overburdened combat radio nets.

Although the Army has participated in the development of such systems for several years, the importance of the **Integrated Communications Navigation Identification Systems**, known as **ICNI systems**, which primarily employ **Time Division Multiple Access Techniques (TDMA)** have only recently been recognized.

Unlimited applications

The new Army requirement is know as the **Army Data Distribution System (ADDS)**, and is intended to provide the capabilities mentioned above. The potential applications are essentially unlimited in the areas of providing positioning navigation, identification, and real time data distribution throughout the Army, including the integration of air traffic control and all Army POS/NAV users with the command and control system.

In addition to the Army Data Distribution System efforts, examples of the present Army efforts in support of the total system are the **Joint Tactical Information Distribution System (J-TIDS)** and the **Postioning Location and Reporting System (PLRS)**.

These systems have specific advantages in the navigation area since they do not degrade with time or distance traveled as do our present inertial and doppler systems. On the other

ALL THE GOODIES! — Colonel Walter Ratcliff, right, President of AAAA's Lindbergh (St. Louis) Chapter, presents an AAAA membership pin and decal, and copy of "Army Aviation" to Major General Richard H. Thompson, Commander of the Troop Support & Aviation Readiness Command. □

EASY TO SPOT! — The Connecticut license plates of Hartford's Peter Stern bear the parochial phrase, "QUAD-A." Peter serves in an aviation-related assignment: Associate Editor and Advertising Manager of "Army Aviation Magazine." □

Future POS/NAV Systems

hand, they are vulnerable to electronic warfare techniques to which inertial and doppler systems are not.

Thus, the ultimate concept of hybrid configurations of **J–TIDS, PLRS,** or **ADDS** with inertial or doppler systems has definite advantages in providing the most effective system for aircraft navigation.

Anticipated accuracy

Another technology area in which the Army has interest is the **Global Positioning System (GPS)**. Although this system is not an ICNI system, reporting could be provided through combat net radios much the same as it is done in the Army today. Advantages of this technology lie in the "common" grid aspects of all users being on the same absolute grid, and the anticipated accuracies, which may not be obtained by other future systems.

Again, the idea of combining an externally referenced navigation system through hybrid techniques with inertial or doppler navigators may greatly enhance the capabilities of future Army navigation systems.

Affordability a major issue

Affordability becomes a major issue whenever deployment of POS/NAV systems is addressed. Inertial technology is relatively expensive, and hybridization may include two expensive sensors. Mixes of these equipments are mandatory to properly equip aircraft to adequately perform the particular mission and must be considered carefully.

In summary, the future navigation and air traffic control capabilities of the Army aircraft are largely a function of, and dependent upon, concerted efforts to integrate real time data distribution, and user identification with the command and control system, considering affordability, and the need for **Rationalization, Standardization and Interoperability (RSI)**, within NATO and the ABCA countries. ★

The multi-Service/DOD Global Positioning System

BY RICHARD S. STEELE, Chief,
Program/Financial Management Div., OPM NAVCON

THE Global Positioning System (GPS) is a space-based radio navigation system that will provide, when operational, accurate three-dimensional position, velocity, and time to suitably equipped users.

When it becomes operational, the **GPS** will consist of the three major segments: a Space System Segment, a Control System, and a User System Segment.

GPS is a multi-Service effort

The GPS program is a multi-Service and DOD agency effort with the Air Force as the lead or executive service. The Program Manager and **Joint Program Office (JPO)** are located in the **Space and Missile System Organization (SAMSO)** in El Segundo, CA. Active participants in the program include the U.S. Air Force, Army, Navy, Marines, and the Defense Mapping Agency.

The Office of the Project Manager, NAVCON is continuing to participate in the GPS program with specific concerns for the use of the GPS to update self-contained navigation systems and /or various hybrid Position Navigation systems. Current information indicates that the GPS user equipment will be fielded in the mid-80's time frame.

A three-phase program

GPS is evolving from a three-phase program of concept validation, full scale engineering development, and production deployment:

Phase I will validate the concept, identify the preferred GPS design, define system cost, and demonstrate the military value of the system.

Phase II will determine the configuration of the user equipment needed to accommodate all classes of user host vehicles. This equipment will be compatible with the fully operational GPS and will be integrated into various types of vehicles and weapon systems. Operational test and evaluation is planned for Phase II Engineering Development models. The operational satellites and their control segment are also being developed during this phase.

Production in Phase III

Phase III is the GPS production phase. It'll optimize and verify the operational effectiveness of the system and obtain additional information concerning the use of all types of user equipment for new or improved military applications and tactics.

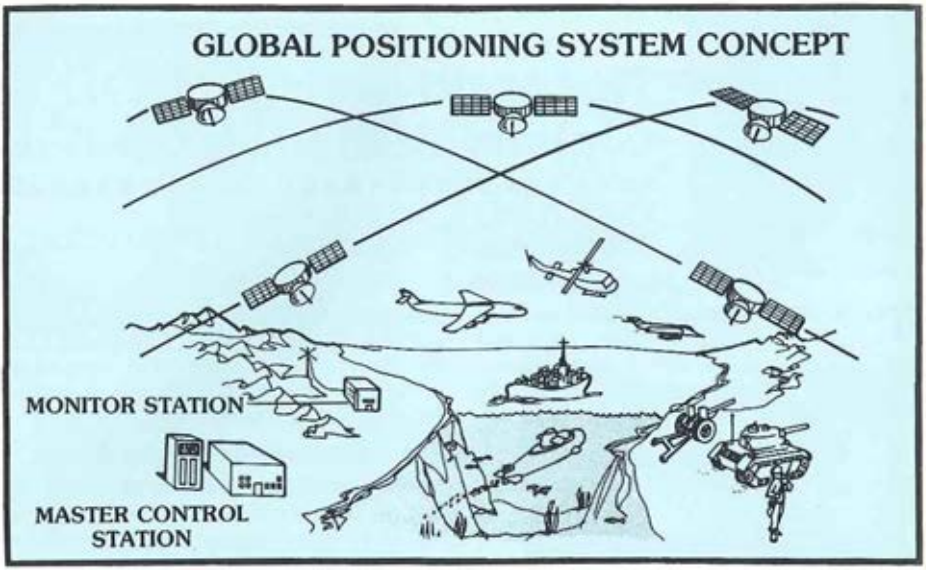
The program will enter Phase II in the third quarter FY-79.

GPS will provide a capability which does not exist in the Army today. NAVSTAR will be a continuous, worldwide system with ability to provide three dimensional position with better than 10 meter accuracy to military forces. This will enhance the Army's capability to navigate during hours of darkness and limited visibility on a 24-hour basis under adverse conditions. The NAVSTAR GPS will enhance mobility, accurate firepower, and command control.

A need for two systems

The Army needs both self-contained and externally referenced systems. A self-contained system provides invulnerability to electronic counter measures but has accuracies which degrade with time or distance.

For example, the AN/ASN 128 **Lightweight Doppler Navigation System (LDNS)** is a low cost, highly reliable, dead reckoning, self-contained navigation system which does not depend on any external source for information. It is designed for fleetwide use in both rotary and fixed-wing aircraft. The **LDNS** will allow Army Aircraft to navigate between any two points with a near all-weather and 24-hour



capability. At present the errors for Doppler are bounded only by manual up-date during flight.

Another example of a self-contained system is the **Integrated Inertial Navigation System (IINS)**. This system contains a gyroscopic device that can either maintain or define a constant position with respect to space, and accelerometers which measure acceleration in three orthagonal directions (up/down, left/right, forward/backward). By integrating these accelerations, the distance traveled is obtained. By a deadreckoning process using directional information from the gyroscope, the position of the aircraft can be obtained.

USAF TACAN employed

The inertial navigator currently is updated by a TACAN navigator to obtain precise positional information. The TACAN to be utilized in this program will be the AN/ARN-118 which is an Air Force TACAN presently in full scale production.

Self-contained systems require that initial postion information be provided at the start of a mission. In addition, characteristically, Doppler systems degrade as a function of distance travelled, while inertial systems degrade with time. Presently, the Army self-contained systems require a survey point at some place on the airfield for the initial position input.

With the promise of the new GPS system, the self-contained systems could be integrated as a hybrid and provide automatic and very accurate initialization and update information. NAVCON is responsible for the systems integration of these and other Army applications for GPS. Likely systems which will require interface with the GPS are the Doppler and the Integrated Inertial Navigation System.

During Development Test/Operational Test-II the Army plans to test a hybrid GPS/Doppler system in the AH-1 **Cobra** aircraft. Other GPS tests planned include manpacks, trucks, and jeeps. ★

In a future issue, Paolo Paone will answer many pertinent "user" questions on the LDNS with his well-illustrated article covering: "How does a Doppler navigation system work?" — "How does it measure ground velocity?" — "Doppler vulnerability to missiles" — "How can the LDNS be employed?" — "Fire Control" and "System Performance." □

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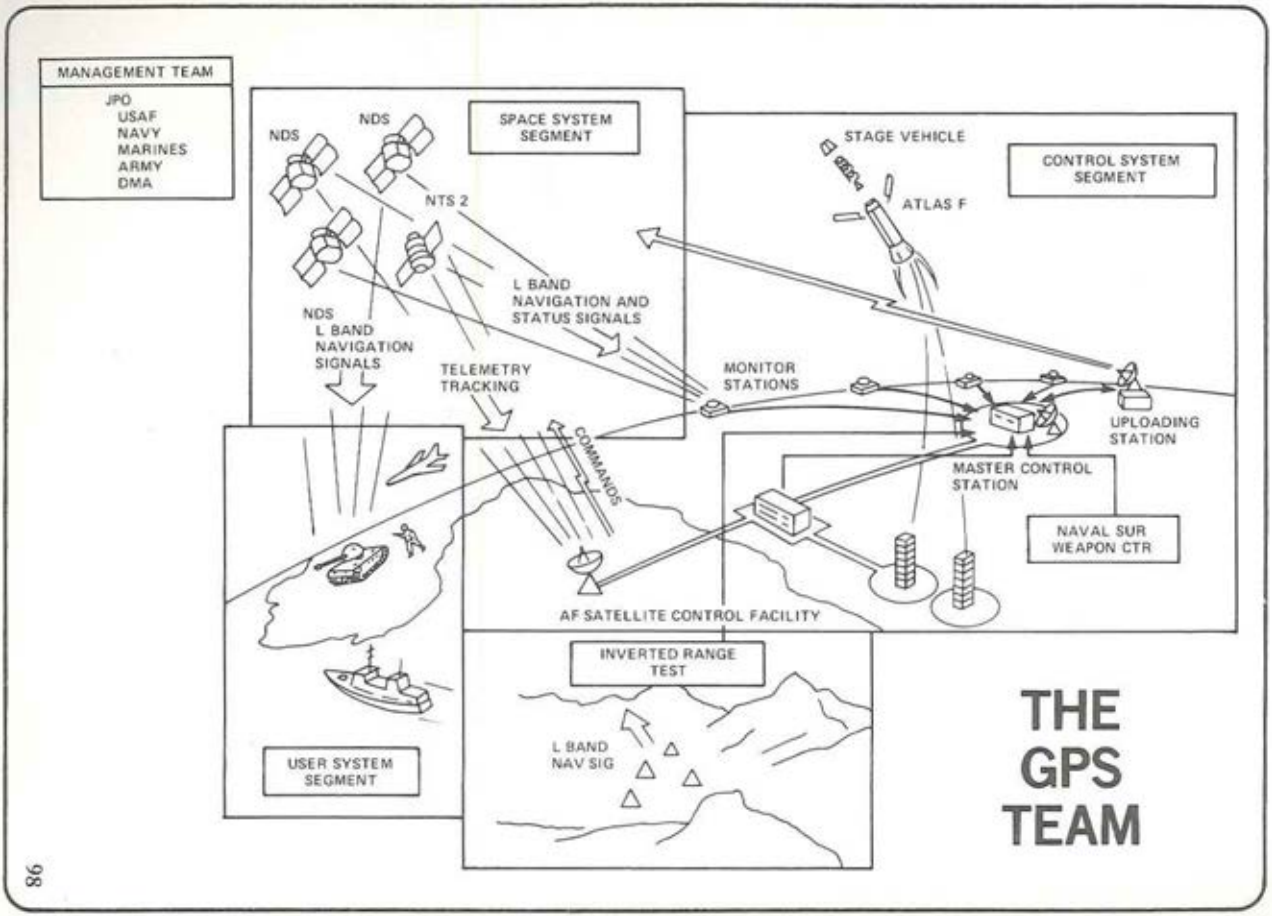
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HEADQUARTERS UNITED STATES ARMY
MATERIEL DEVELOPMENT AND READINESS COMMAND
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I welcome the opportunity to comment in this issue of the AAAA Magazine. Rarely does a publication of this type offer comprehensive coverage of the systems and subsystems which support Army aviation, particularly in the area of avionics for navigation and air traffic control. It is refreshing to see an issue devoted to these very important ancillary systems, many of which will be entering the Army inventory during the 1978-1980 time frame.

These systems, which exploit new technology, will significantly enhance our ability to conduct aviation missions with greater reliability and safety under adverse visibility conditions.

Robert O. Baer

ROBERT O. BAER
Lieutenant General, USA
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for Materiel Development

month's takeoffs

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Calendar

DECEMBER						
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30						

JUNE—OCTOBER AAAA ACTIVITIES

★ ★ JUNE 2. Corpus Christi Chapter. Awards & Officer Installation Night. Philip C. Norwine, Bell Helicopter Textron, as guest speaker. Cocktails/Dancing. O-Club Ballroom.

★ ★ JUNE 10. Army Aviation Center Chapter. Birthday Party. LTG Harry W.O. Kinnard, Ret., as Birthday Speaker. Champagne/Cake-Cutting. USAAVNC at Fort Rucker.

★ ★ AUGUST 3. David E. Condon (Ft. Eustis) Chapter. Social. Hot Dogs/Hamburgs/Munchies AND all the beer you can drink! Ft. Eustis Rod & Gun Club.

★ ★ AUGUST 9. Esfahan (River City) Chapter. Business-Social meeting. Election of Officers. Refreshments. Taft House.

★ ★ AUGUST 17. Stuttgart Chapter. Professional Meeting. Herr Arnold, Chief Air Traffic Controller of Stuttgart Int'l Airport will speak on Stuttgart ATC. Snoopy's All Ranks Club, Stuttgart Army Airfield.

★ ★ AUGUST 17. Franconia-Marne Chapter. Professional Luncheon. (Postponed from 19 May because of weather.) COL Amedee Arzel, Commander, French Army Aviation as guest speaker. Kitzingen Officers' Club.

★ ★ AUGUST 19. Connecticut Chapter. Summer Skirmish-Pool Party. Buffet dinner, bar, bathing beauties! Home of Dotty & Art Kesten in Westport, Connecticut.

★ ★ AUGUST 25. Leavenworth Area Chapter. Professional Luncheon Meeting. A representative of Hughes Helicopters Division will present a briefing and film. Hearth Room—Ft. Leavenworth O-Club.

★ ★ AUGUST 26. Tar Heel Chapter. Summer Cookout, Swimming & Dancing. Snacks—Munchies—Free Beer—Cash Bar. Pirates Cove Club House, Cary, NC.

1979 AAAA CALENDAR

- Mid-March—Sixth Region-AAAA Convention, Reno, Nevada.
- March 21-23. 1979 Avionics Symposium sponsored by the Monmouth Chapter. Ft. Monmouth, N.J. area.
- March 28-31. 1979 USAREUR Region Convention. Garmisch, Germany.
- April 19-22. 1979 AAAA National Convention. Colony Square Hotel, Atlanta, Georgia.
- May. 1979 Product Support Symposium sponsored by the Lindbergh Chapter. St. Louis, Missouri.
- June. 1979 Fifth Region-AAAA Convention (Tentative). Ft. Hood, TX area.
- June-Sept (Site & Date to be determined). First Region—AAAA Convention.

★ ★ AUGUST 26. Washington, D.C. Chapter. 5000 Meter Fun Run. Awards to top male and female finishers. Davison Army Airfield Picnic Area.

★ ★ AUGUST 31. Corpus Christi Chapter. Luncheon and Professional Meeting. BG Edward M. Browne, Program Manager—AAH, DARCOM as guest speaker. Mexican food. O-Club.

★ ★ SEPTEMBER 24. Corpus Christi Chapter. Football Game. Dallas Cowboys vs St. Louis Cardinals. Bus trip, free setups on bus, two nights' lodging and game tickets all included in package price.

★ ★ OCT. 12-15 . 20th AAAA National Convention. Stouffer's National Center Hotel, Arlington, VA. (Details appear on Pages 10-12 of this issue.)

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ARMY AVIATION MAGAZINE
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GOOD LUCK!

Senator John Tower (D-TX) presents the U.S. flag to Army **Captain Linda Horan** and Army **Major Michael Summers,** two members of the 11-member U.S. Helicopter Team who were to compete in the **Third World Helicopter Championships** held at Vitebsk, USSR in early August. **Vic Powell,** far left, Executive Director of the NAA, and **Joseph Mashman,** head of the U.S. Delegation, attended the ceremony in Tower's office. A report of the results of the '78 Championships by Powell appears on P. 18.

AVAILABLE!

A comprehensive, 138-page book, **"The Helicopter: Its Importance to Commerce and the Public," is available from the Helicopter Ass'n of America,** 1156 15th St., N.W., Suite 610, Washington, D.C. Co-authored by **Ann N. Davis** and **Robert A. Richardson,** the study documents the diversified uses of rotorcraft in support of commercial operations. □□

PLAN AHEAD!

The **20th National Convention** of the **Army Aviation Ass'n (AAAA)** will be held at Stouffer's National Center Hotel in Arlington, Va. during Thursday, Oct. 12 through Sunday, Oct. 15. The theme of the 1978 Professional Programming, "Army Aviation on the NATO Horizon," is enhanced by the presence and participation of **GEN George S. Blanchard,** Commander-in-Chief, U.S. Army, USAREUR, and a follow-on Allied Panel. The details of the 2½-day program appear on pages 10 and 11 of this issue. An **Advance Registration Form** (Page 12) and a **Stouffer's Room Reservation Form** (Page 14) are also provided. □□