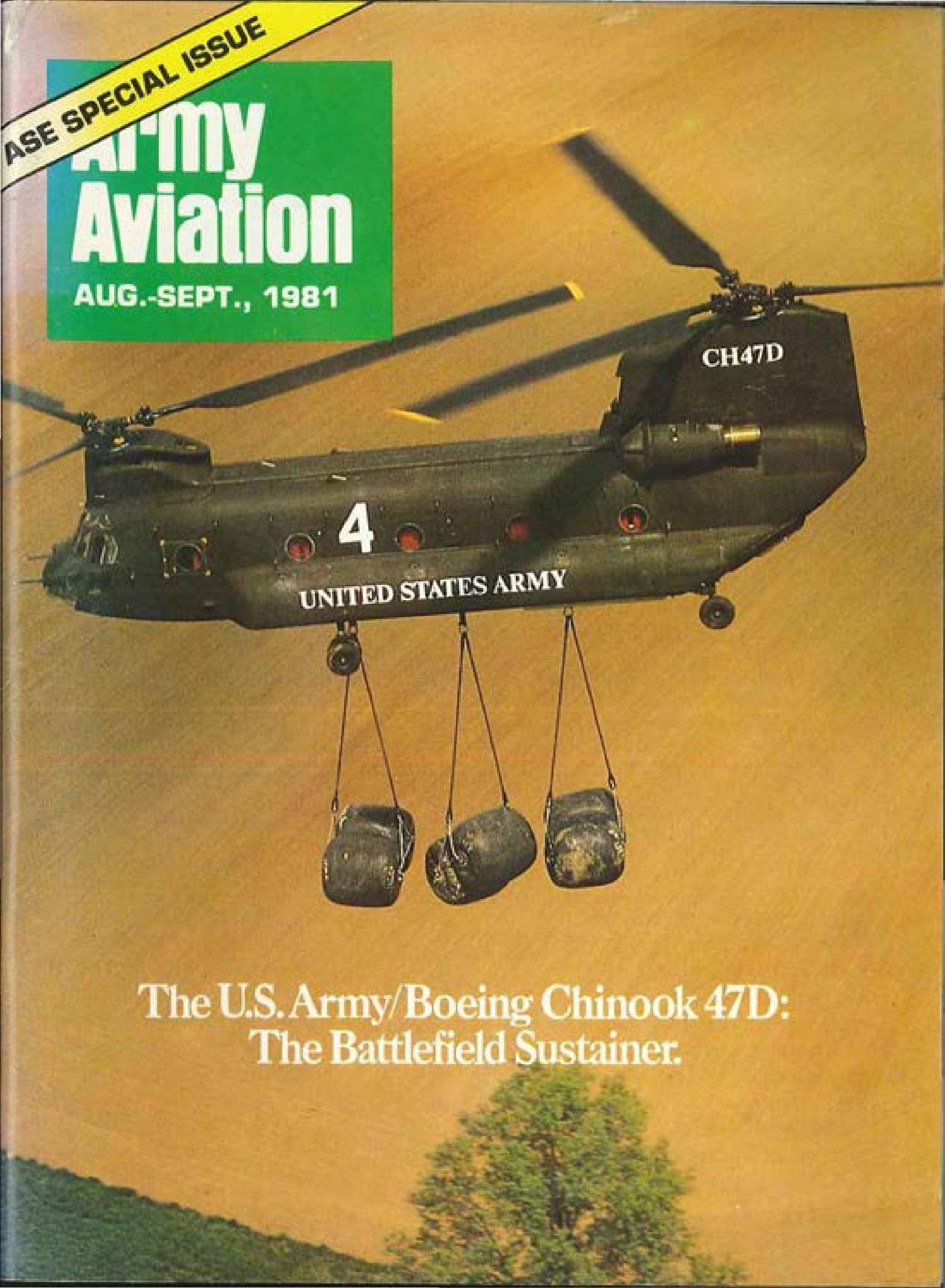
ASE SPECIAL ISSUE

Army Aviation

AUG.-SEPT., 1981



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ARMY AVIATION

ARMY AVIATION
A professional journal endorsed by the Army Aviation Ass'n (AAAA)

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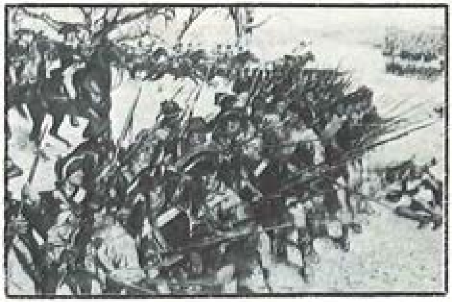
VOLUME 30 — AUGUST-SEPTEMBER, 1981 — NUMBERS 8-9

FEATURES

AIRCRAFT SURVIVABILITY EQUIPMENT — 1981

YORKTOWN
A great Army victory; a 1981 celebration!



THE **American Bicentennial** comes to an end this October 16-19 with four days of celebrations at Yorktown, Va. During the four days, some 400,000 people will visit the site of the **Battle of Yorktown,** which **Sectary of the Army John O. Marsh** called a "great Army victory" in his keynote address at the 1981 AAAA National Convention this past April.

With Monday, October 19, designated by Congress as a national day of observance and by the Virginia General Assembly as a state holiday, the celebration at Yorktown will culminate with an address by **President Reagan** at 2 p.m.

Extensive parking available

Five U.S. and two French warships and several tall sailing vessels will anchor in the York River. From 22 states and Canada, some 4,000 costumed volunteers will assemble at Yorktown and recreate more than 100 Revolutionary War regiments; their encampment is expected to number in excess of 1,100 tents.

Extensive preparations will be made for parking on many of the outlying battlefields and for shuttle bus transportation to the town.

Four-Day Highlights

The day-to-day high points include:

Friday, Oct. 16 — 10 a.m., military parade from the Victory Center to the battlefield; 1:30 p.m., opening ceremonies at the battlefield followed by an hour-long pageant. Heritage Festival, colonial arts & crafts, entertainment and displays on the waterfront and river. Battlefield demonstration of the tactics used by General Washington preliminary to the siege.

Saturday, Oct. 17 — 10 a.m., parley ceremony reenacted; 160 cannons fired. Full-day entertainment at three points. Seafood festival.

Sunday, Oct. 18 — Demonstrations on both land and sea. Ecumenical service held in battlefield stadium. Evening concert and mammoth fireworks display.

Monday, Oct. 19 — 2 p.m., a reenactment of the 1781 surrender of **Lt. Gen. Lord Cornwallis** will be followed by a speech by **President Reagan** and a military review.

Members Welcomed

David E. Condon (Ft. Eustis) Chapter President **COL "Jim" Rockey** encourages all Virginia, Maryland, and North Carolina Quad-A members to take in the well-planned historic exercises at which many active and retired Army will congregate. ■

Let's Recognize the Event!

"... the bicentennial of that event — the Battle of Yorktown — will be observed this October and I want the **Army Aviation Association** to play a role in assuring that this event is recognized for what it is — a great Army victory — a victory that would mean that all of the hopes of the Declaration of Independence would belong to the American people, and would ultimately produce six years later our great Constitution."

—Secretary John O. Marsh

ADVERTISERS IN THIS ISSUE

Applicants for 1982 Scholarship Aid Sought by AAAA

The AAAA Scholarship Foundation, a separate non-profit educational activity created to provide scholarship aid to the sons and daughters of AAAA members and deceased members, announces the availability of assistance funds for the 1982 college-entry year. Program participation is limited to the children of members with an effective date of membership on or before March 31, 1981.

APPLICATION PROCEDURE

Student-applicants are asked to request the appropriate application forms by writing to the AAAA Scholarship Foundation at 1 Crestwood Road, Westport, CT 06880. Requests for applications must be received on or before January 1, 1982. Grades and individual test scores are to be submitted by February 8, 1982. All forms, together with other supporting data, must be returned to the Foundation on or before February 1, 1982 to receive Awards Committee consideration. The student-prepared application should state the full name of the applicant's father-member and address of student if different.

ELIGIBILITY CRITERIA

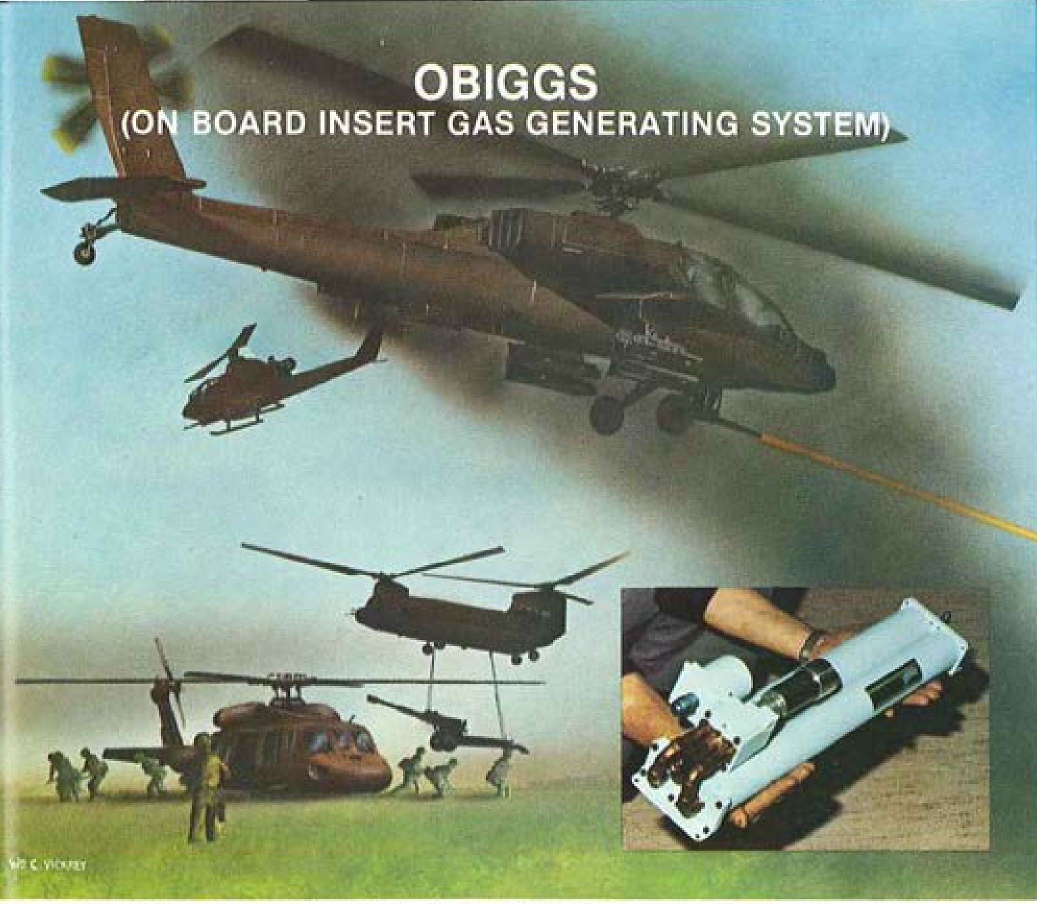
The AAAA applicant must also be: (1) a high school senior who has applied to an accredited college or university for Fall, 1982 entry as a freshman.

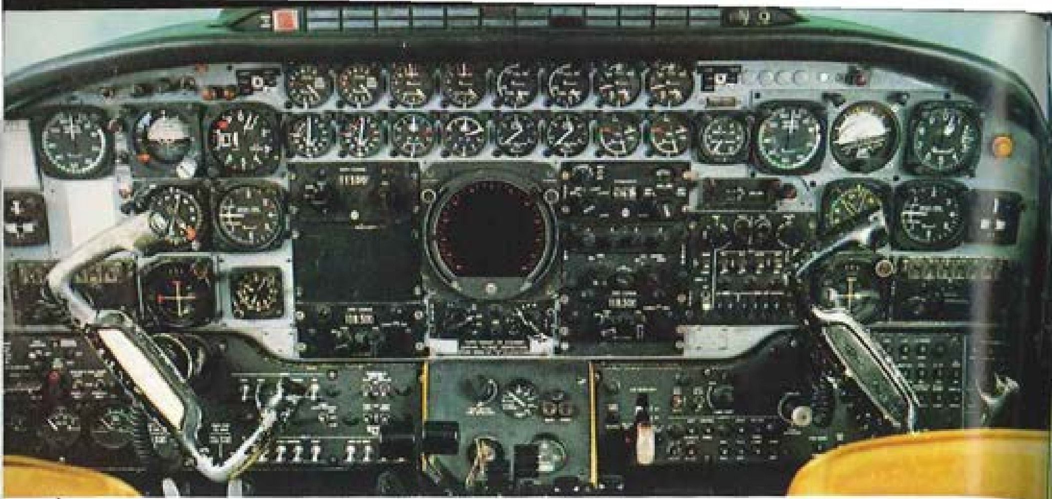
SELECTION & NOTIFICATION

Selection of winners will be made during the month of March 1982 with each applicant to receive a list of the winners not later than 1 April 1982.

BACKGROUND DATA

Incorporated in December 1963, the AAAA Scholarship Foundation provided 14 scholarships in 1981, and has furnished more than $71,700 in direct aid.


OBIGGS
(ON BOARD INSERT GAS GENERATING SYSTEM)



New capabilities for

There are times when less can mean more as in the case of King Radio Corporation's U-21 avionics update/retrofit program for the U.S. Army. While saving 268 pounds, the panel on the right clearly illustrates King's understanding of pilot workload and King's ability to plan, engineer, install and flight test complete avionics systems.

The U-21 avionics update/retrofit program offers the flight crew dual comms with displayed active and standby frequencies for easy access to four frequencies; dual navs with 10-waypoint, TACAN based RNAV and displayed active/standby nav frequencies. The fully integrated flight control system features pilot's 4" flight director and Horizontal Situation Indicator with separate and independent artificial horizon and HSI for the co-pilot. In addition to standard operating modes the KFC 250 flight director and autopilot includes yaw damper and altitude preselect and alerting along with a servoed, encoding altimeter.

King uses the latest in state-of-the-art in microprocessors and LSI technology so you're assured of avionics with increased reliability. And that boils down to a higher mission completion rate, more flexible mission capability, less time for crew qualification, higher payload, and greater dispatch ability. And, if problems should arise, King has over 850 dealers worldwide in addition to factory personnel, who can solve your problems quickly and cost effectively.

The same design, installation and flight testing capabilities that have given new life to the U-21, can be applied to such other veteran performers as the U-8, T-34, T-37, T-39, T-41, T-42, C-12, OH-58, UH-1 and O-2, to mention just a few.

King Radio manufactures in

The Army gets a shot in the arm!

by
Brigadier General
Ellis D. Parker
Deputy Director of
Requirements and Army
Aviation Officer,
ODCSOPS

OVER the past 40 years, Army Aviation has made gigantic strides in pioneering" aviation tactics, doctrine, and techniques for the modern battlefield.

Chinooks have flown to Alaska and to Europe; **Caribous** have flown to Southeast Asia; and numerous records have been established for which we are all unjustly proud.

I am pleased to report that we have established yet another first that ranks among the best. That is the August sweep by the United States at the **World Helicopter Championships** in Poland.

The **United States Helicopter Team**, under the leadership of **Major Roy W. Mann** of Davison Army Airfield, Ft. Belvoir, VA, has won the title of **World Helicopter Champions** for the United States. Specific team and individual scoring and an extensive photostory appear elsewhere in this issue.

This is the first time the U.S. military has participated in the world helicopter competition. Seven Army crews and one civilian crew comprised the United States entry into the **Fourth World Helicopter Championship** held in Piotrkow Trybunalski, Poland, 14-23 August 81.

The **U.S. Helicopter Team** won both individual and team top awards. **CW3 George Chrest** of Ft. Hood, TX, was named **World Champion Helicopter Pilot.**

This is an extraordinary achievement. I believe everyone in the Army Aviation community shares the joy, excitement, and professional pride of this truly outstanding accomplishment. All members of the team are to be applauded for their extraordinary effort, personal sacrifice, and victory. They've brought prestige and honor not only to Army Aviation but to the nation.

I observed the team in training at Ft. Campbell, KY, in late July and was amazed at the high level of skill and teamwork that had been developed in such a short period of time. Great care is being taken to properly capture and record this training and competition experience. These lessons learned will surely have a meaningful impact on Army Aviation training.

Again, I congratulate **Major Mann, CW3 Chrest,** and all members of the **World Helicopter Champions** on their supreme accomplishments and the great honor they have secured for the United States Army.

A critical key

One of the critical keys to the future survivability of our aircraft in combat and the waging of war on the modern battlefield is the availability of effective **Aircraft Survivability Equipment (ASE).**

The equipment being developed and fielded can mean the difference in success or failure in the arena of sophisticated threat electronic devices and weapons systems.

There is a strong need for ASE for our aircraft. The article in this issue of **Army Aviation Magazine,** which is devoted to ASE, expound on the capabilities, developments, and programs of the varied ASE "suits" available for Army aircraft. I believe you will find the article interesting and informative. ■

PAUSING for a moment after completing an extremely interesting and challenging tour with the Army's Air Assault Division, I've been able to enjoy a few, rare tranquil moments. These have given me some time to reflect on where we in Army Aviation have been and where we're headed as professionals in the aviation field.

Seeing it all!

Thus far in my career, I've had the opportunity to observe and to evaluate the aviation community from within and without — in Europe, in Asia, in the Pacific, and in CONUS.

In the process I've seen Army Aviators praised and I've seen them maligned; I've seen them promoted, cited, and lavished with awards and I've seen them summarily RIF'd or passed over; I've seen them relegated to the motor pools and headquarters' jobs as they strove mightily to remain branch qualified; I've seen them drive miles away from their primary job attempting to meet "Cat B flying requirements"; and I've seen them faced with the dilemma of having three specialties or the zero potential of two combat arms specialties.

As I look back, I wonder how Army Aviation survived after all the effort expended in developing the Air Assault concept, and the fact that much of the priceless aviation combat experience gained by the Army in Vietnam has been frittered away by RIF's, passovers, and reassignments to other specialties.

I'm deeply troubled by all that I've seen and have considerable reservations about the way Army Aviation is being employed and where we're headed.

As we begin the '80's, I see SC 15 being an equally managed combat arm primary specialty at MILPERCEN; a new force structure, the ACAB, being fielded; and a fleet of fully capable, modern helicopters coming onboard.

In particular, I saw in the Air Assault Division, under the dynamic, innovative leadership of its CG, LTG (then MG) **Jack Mackmull**, some extremely aggressive air assault task force training that dared to integrate, task organize, and train its aviation units in a particularly exciting manner.

We're not advancing

The same search for better employment of Army Aviation to cope with the threat of the '80's also continues in Europe, Korea, and elsewhere. Those of us in this business survived by ducking our heads and passively taking our licks, but we haven't advanced, and we're not advancing as a combat arm.

It's Time for an Aviation Branch!

**By
MAJOR CHARLES B. COOK,
Fort Leavenworth, Kansas**

A Separate Branch
(Continued from Page 13)

In my opinion, we've stagnated and have remained content to employ our aircraft in any support role in a "You call; we haul" manner. We've been content to sit back and watch the today's supported ground commanders develop plans using tactics from the 60's. The philosophy that prevails is "The tactics were good enough then; they're good enough now."

We've been fortunate to acquire some remarkable new aircraft, such as the UH-60 "**Black Hawk**," which is currently being fielded, and the pending AH-64 attack helicopter. These new "state-of-the-art" aircraft open up some tremendous opportunities for growth in aviation tactics and doctrine. They'll significantly alter the shape and outcome of today's and tomorrow's mid- to high-intensity battlefields.

But we're not taking maximum advantage of this opportunity. Army Aviation is too fragmented and too spread out, and those who claim proponency for their various pieces of the cadaver are far too parochial. The use of aviation is still viewed in far too many minds as something in the category of a special operation, such as a river crossing — seldom dusted off — seldom used.

It's been our own fault as much as the system's that we, as SC 15's, are not viewed as credible, full partners in the combat arms. But then again most SC 15's today are survivors of that aviation personnel holocaust of the last decade and are not prone to stand up and take issue with something.

We are, however, at a turning point in Army Aviation history where with the proper push, a little daring, and with enough "cajones," we could see Army Aviation develop within its own right. To do this we must have a properly recognized and established **Branch** — one that is empowered to school its own people, take pride in its own esprit, and develop its own tactics and doctrine, and develop the helicopter to the fullest as the weapon it portends to be. Today's Army Aviation has been compared to the American and French armored forces of the 1930's, which were a supporting arm of the infantry. The results of innovative German use of armored forces against such tactics and doctrine is only too well known.

Poppycock!

The thought of an Aviation Branch is supposedly anathema to some. I submit that those individuals are the nearsighted, similar to those who conceived the Maginot Line in the past. The idea that I, as a combat aviator, wearing Aviation Branch insignia, cannot properly integrate aviation into any ground tactical plan because I don't wear the insignia of some "carrier branch" is pure poppycock, to put it mildly.

As a member of the combined arms team, and as a combat aviator, I'm equally well prepared to either fully support the mission at hand as a team member or to take charge of the operation myself and lead it!

Furthermore, the idea that air assault operations cannot be controlled by an aviation unit commander in certain situations in also nonsense. Combat Aviation Battle Captains, the commissioned aviators of the Aviation Branch, will have had the training and developed the expertise to plan and execute an assortment of missions, missions that capitalize on the mobility and firepower associated with any air assault operation that employs Army Aviation.

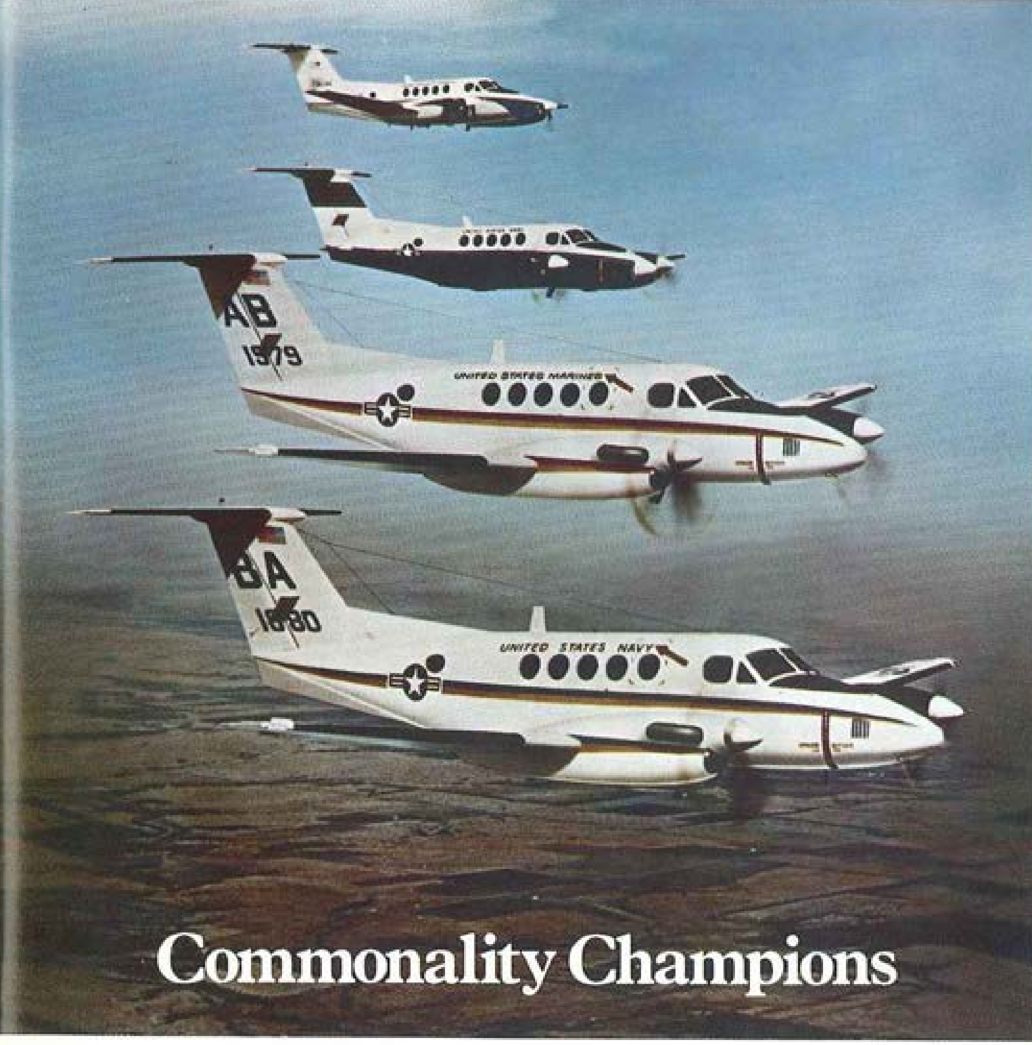
OPEN FORUM

"I read with great interest MAJ Stratton's article in the June issue. The idea of a separate branch is a burning issue with me and the attached article had already been completed in draft when I read his article.

"I would highly recommend that the subject of an **Aviation Branch** be a platform of the AAAA. From my level as a relatively low ranking, grass roots member, it appears to me that the time will never be better than now to pursue this.

"I've been appalled at the apathy shown by most aviators regarding a separate **Aviation Branch.** We need to discuss this in open forum — the vehicle of the magazine is excellent — and we should stimulate some of our your Tigers in developing pro and con views in this area."

—MAJ Charles B. Cook



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The outstanding fuel economy of the C-12 and its impressive record of over 90% operational readiness, means that the C-12s will provide fast, economical and reliable transportation wherever they're used.

The versatile C-12 interior can be changed easily to various configurations for transporting people and cargo.

And special configurations are available for a variety of missions, including aerial photomapping, electronic warfare and battlefield or ocean surveillance.

If your command could use an aircraft with such mission versatility, please write to Beech Aircraft Corporation, Aerospace Programs, Wichita, Kansas 67201.

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We're No.1!

The U.S. Team wins the 1981 World Helicopter Championship!

In a last day, last event, come-from-behind finish, the **U.S. Helicopter Team** made up a 19-point deficit and nosed out the West German Helicopter Team by two points in winning the **Fourth World Helicopter Championships** held at Piotrkow Trybunalski, Poland, during the week of August 16.

The final standings saw the **U.S. Team** in first place with a total of 2,253 points (out of a possible 2,400 points); the West German Team finishing in 2nd place with 2,251 points; and the Poland, USSR, and United Kingdom entries finishing 3rd, 4th, and 5th.

The United States' hard won victory in the 1981 WHC Standings was augmented by the personal accomplishment of **CW2 George D. Chrest** who replaced the USSR's **Vladimir Smirnov** as the "World Champion" in topping **Smirnov** and 37 other pilots in the four-event competition. (See the Team and Individual Standings on Page 16).

Composed of four two-man teams from the U.S. Army and a two-man civilian team from Bell Helicopter Textron, the 1981 **U.S. Helicopter Team** was the first to win a World Championship, previous U.S. Teams having competed in earlier international competitions in Middle Wallop, England; Bueckeburg, West Germany; and Vitebsk, Russia.

CW2 George D. Chrest, left, and CPT Stephen G. Kee of the United States hold the WHC Trophy awarded for winning the First Place Individual World Championship at the 1981 Flyoffs in Poland.

Coached by **MAJ Roy E. Mann**, the U.S. Team started very strongly in being the Day 1 and Day 2 leader. The U.S. then dropped to 3rd place behind both West Germany and Poland after the third event, and then forged ahead to win the competitions when three of its two-man teams each logged fourth event scores of 199 out of a possible 200 points.

In the Individual World Championship, the U.S. took first place (**CW2 Chrest**), 5th place (**CW3 Irvin B. Starrak**), 6th place (**CW3 D.E. Jewkes**), 7th place (**CW3 John T. Bailey**), 21st place (**CW3 Ronald Rivera**). 22nd place (**CW3 Roger A. Bodwell**), 24th place (**Mr. John W. Williams**), and 28th place (**CW2 Scott E. Berrier**).

The Army crews, which flew both **Hueys** and **Kiowas** in the five-nation flyoffs, were represented by Army Aviators from Forts Hood, Rucker, Bragg, and Campbell while the civilianteam of two Bell Helicopter test pilots flew a Bell LongRanger.

Conducted under the auspices of the Federation Aeronautique Internationale, which sanctions international aviation sporting events, the 1981 U.S participation was sponsored by the **Helicopter Club of America (HCA)**, a civilian group organized under the charter of the **National Aeronautic Association.** AAAA member donations underwrote the '81 team's uniforms.

SOME AFTERTHOUGHTS

We asked an attendee and judge at several previous World Helicopter Championships, Sergei I. Sikorsky, to provide us with some of his afterthoughts on the '81 World Championships. The Sikorsky Aircraft executive served as one of the U.S. judges this year and is a most knowledgeable reporter on worldwide RW activities.

SIKORSKY

AA. What were your first general impressions of the competitions?

Sikorsky. There had been extensive planning by the Polish Aero Club. The opening ceremonies were well attended with a crowd of perhaps 3,000—4,000 and it was rather colorful in the variety of flags, the various bands, and the local folklore dancers and other entertainment. The Polish newspapers and Polish TV, by the way, carried daily accounts, the latter in prime time, with a Sunday prime time wrap-up on the overall Championships. I was most impressed by this press coverage.

AA. We hear that there were several protests and point revisions. Were they a factor?

Sikorsky. In the final analysis they were not. Things went quite well in the judging although there were one or two minor complaints by individual teams the first day. Basically speaking, that same evening the judges were able to sort most of it out, and judging wasn't a running problem.

It's interesting to point out that the West Germans used three-man crews on their **Hueys,** the third man being their (TO&E) flight engineer. Since this man constituted a third pair of "eyes" for the cross-country and navigation event, and this would be an unfair advantage, a judge accompanied the West German crews while they were airborne to make certain that only two pairs of eyeballs looked for the event's markers.

AA. How would you rate the degree of skill shown by the participants?

Sikorsky. The precision flying event, the second day's event, was particularly demanding because, in addition to the competitive pressures, it was flown under moderately gusty wind conditions. The caliber of the flying shown on the first day — when many team's maxed the course — continued, and there was no question in my mind or in anyone else's in watching the competitors fly precision courses in 22 knot gusts but that we were looking at champions from all over the world. I had to admit that every single one of them — the Russians, the Americans, the Poles, the West Germans, the Brits — all were very,. very sharp.

AA. In checking the day-to-day team and individual scores, it's obvious that the third day's Cross-Country and Navigation Event put everyone down. How do you account for the disparity in the scores that were posted?

Sikorsky. All five national entries were only 25 points apart after two of the four events, and the

* * * * *

WARSAW, POLAND, 24 August — After loading their helicopters, the winning U.S. Helicopter Team assembles with civilian reporters and the crew of the USAF C-5A transport that brought them to Poland.

SOME AFTERTHOUGHTS

(Continued from Page 17)

navigation (third) event was where we began to weed out a little bit the men from the boys. Again, it seemed to reinforce the thought that the better teams would score reasonably well and the slightly less proficient teams would slip a little bit further behind. The Poles did the very, very best, primarily because this was their home territory, and they had been there and trained.

It's interesting to note that in the previous three world championships the navigation event has always been won by the host country. The British, West Germans, and Soviets each won the navigation event when they hosted the Championships, and it came as no surprise to anyone that the Poles won the navigation event.

An analysis of the individual team scores by events shows that this event proved to be an unfortunate one for 14 of the two-man national teams that had done exceptionally well in the opening two events, including two Soviet, one U.K., and one U.S. team.

AA. The statistics show that the U.S. was in third place, 19 points down, going into the final team event, the Slalom. What happened on the last day?

Sikorsky. That's true; the points really slid around with the U.S. leading during the first two days, and the Poles and West German teams going into first and second place after the third day's Navigation Event. The Slalom Event was a very, very convincing demonstration of piloting techniques, and by the time the event was over the U.S. had taken over first place on a very, very convincing team demonstration.

A good part of this was due to the effort of the civilian two-man team from Bell Helicopter who, in scoring a 199 out of a possible 200 points in the event, did an outstanding job of supporting the U.S. Army two-man teams. This Army—Bell teamwork helped the U.S. to come out on top.

AA. CW2 George Chrest won a Gold Medal as the "World's No. 1 Helicopter Pilot" although he flew with a co-pilot and Coach Roy Mann has cited the effort as a "team effort." In your view, is the co-pilot a factor in each of the four "team events"?

Sikorsky. In the first event, most assuredly yes. The co-pilot helps navigate, spots the finish lines, and drops the bucket into the hole on the roof. In the precision event, he is the "eyeballs" in hanging out the cabin door and saying, "Higher, higher" or "Lower, lower," thereby giving the pilot a better altitude orientation.

In the X-C Navigation Event, he's definitely a tremendous help, being a **second** pair of eyeballs. In the fourth event, the Precision Slalom, the co-pilot has a 30% to 40% workload in handling the bucket.

AA. In other words, you're saying the best piloting job can be negated by an uncoordinated or inattentive co-pilot.

Sikorsky. Exactly. A poor co-pilot performance will take the best pilot out of the running. That's why the powers-to-be will consider making the four events a definite "team" (pilot and co-pilot) effort, and that the only solo recognition be given for the Free-Style Event.

AA. The U.S. did not enter the Free Style Event which, we understand, was an optional exercise that didn't figure in the Team or Individual Standings. There's been little publicity on it. What happened in this event in Poland?

Sikorsky. The event was won hands down by **Carl Zimmerman,** who's with a West German Army Aviation unit in Celle. He took the Free Style World Championship away from young **Vladimir Smirnov** of the USSR who held both the world individual and free-style titles at Vitebsk. **Smirnov** was brilliant, but **Zimmerman's** pilotage, in combination with the more modern **Boelkow 105** with its rigid rotor, enabled him to do loops and rolls which, obviously, **Smirnov,** in the older **Mil-1,** couldn't

TEAM STANDINGS BY EVENTS

POS.	COUNTRY	NO. 1	NO. 2	NO. 3	NO. 4	PTS
1	UNITED STATES OF AMERICA	594	597	465	597	2,253
2	FEDERAL REPUBLIC OF GERMANY	579	597	481	594	2,251
3	POLAND	590	582	503	558	2,233
4	UNION OF SOV. SOCIALIST REPUBLICS	578	588	352	597	2,115
5	UNITED KINGDOM	585	591	274	590	2.040

INDIVIDUAL SCORES BY EVENTS

ORDER FINISH	PILOT AND CO-PILOT AS TWO-MAN CREW	COUNTRY REPRESENTED	EV. NO. 1	EV. NO. 2	EV. NO. 3	EV. NO. 4	PT. TOTAL
			POINTS IN EVENTS				
1	G.D. Chrest-S.G. Kee	USA	199	200	163	199	761
2	G. Pipke-M. Greiner-R. Schone	FRG	194	200	159	197	750
3	K. Hanses-L. Oehler	FRG	176	200	173	199	748
4	A. Szarawara-H. Moryc	POL	195	191	165	196	747
5	I.B. Starrak-R.L. Miller	USA	200	200	152	195	747
6	D.E Jewkes-R.A. Stolworthy	USA	200	194	154	196	741
7	J.T. Bailey-A.L. Porter	USA	195	197	150	199	741
8	H. Dressler-M. Preuss	FRG	199	194	152	195	740
9	Z. Domina-A. Gornicki	POL	198	197	169	173	737
10	H. Kloberg-W. Beikler-K. Hofmann	FRG	189	197	152	198	736
11	Z. Treder-A. Sawicki	POL	197	191	169	179	736
12	K. Wotwicz-J. Janukowicz	POL	196	173	166	200	735
13	W. Hanssen-R. Freese-K. Kurjahn	FRG	191	200	156	186	733
14	Z. Olszewski-B. Kowalowdzany	POL	169	194	165	199	727
15	T. Stekolnikova-L. Korneva	SOV	193	200	133	200	726
16	M. Chapple-G. Batteson	UK	198	197	126	199	720
17	L. Prihodko-L. Tatarinova	SOV	195	188	134	199	716
18	Vl. Smirnov-V. Solovov	SOV	172	197	141	199	707
19	H. Fuchs-W. Gastorf	FRG	173	200	138	196	707
20	R. Kasperek-K. Grzesiczak	POL	195	170	162	180	707
21	R. Rivera-N. Thompson	USA	193	191	126	196	706
22	R. Bodwell-J. Durkin	USA	167	200	155	177	699
23	T. Cwik-Maszczynska-A. Iwanska	POL	172	185	171	170	698
24	J. Williams-M. Meng	USA	165	194	126	199	684
25	K. Jakubiszak-J. Kwasniak	POL	168	188	139	165	660
26	G. Kolesnikov-A. Ulanov	SOV	196	197	46	199	638
27	K. Karasev-V. Golovkin	SOV	167	194	77	199	637
28	S. Berrier-R. McConnell	USA	198	200	29	200	627
29	N. Kostareva-L. Danilevich	SOV	196	179	34	199	608
30	A. Thomas-A. Riddle	UK	145	194	64	195	598
31	A. Baer-R. Klose-D. Hasebrink	FRG	171	194	29	197	591
32	D. Wilson-D. Samuels	UK	192	200	---	196	588
33	Va. Smirnov-V. Popov	SOV	187	194	---	199	580
34	MJH Smith-M. Smith	UK	194	167	---	157	518
35	Champeroux-Perdereau-Romet	FRA	161	176	---	163	500
36	K. Zmeirowicz-R. White	UK	145	158	84	110	497
37	R. George-D. George	UK	195	167	---	99	461
38	Romet-Bererguter-Mezureux	FRA	129	185	---	132	446
39	D. George-R. George	UK	100	152	---	161	413

MAJOR
ROY E. MANN
TEAM COACH

NUMBER 1 IN 1981!

COL JOHN W.
OSWALT, RET.
TEAM MANAGER

CAPTAIN
BRONISLAW MACA
EXECUTIVE OFFICER

WO1
GEORGE CHREST
PILOT

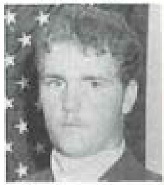
CAPTAIN
STEPHEN G. KEE
CO-PILOT

PFC
ROBERT A. DIDRIKSON
CREWCHIEF

CAPTAIN
KAROL KAWALEC
LOGISTICIAN

CW3
IRVIN B. STARRAK
PILOT

CW3
ROBERT L. MILLER
CREWCHIEF

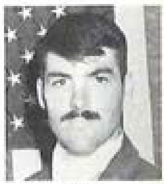


SP4
ROBERT S. FRAZIER
CREWCHIEF

CAPTAIN
JOHN W. CONNORS
OPNS OFFICER

CW3
RONALD RIVERA
PILOT

CW3
NORMAN THOMPSON
CO-PILOT



SGT
PAUL D. SMITH
CREWCHIEF

SGT
PAUL NELSON
OPERATIONS NCO

CW3
JOHN T. BAILEY
PILOT

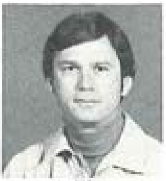
CW3
ALAN L. PORTER
CO-PILOT

SERGEANT
PATRICK O. JACKSON
CREWCHIEF

THE UNITED STATES HELICOPTER TEAM


1SG
JOHN TRAYLOR


SFC
DAVID YOUNG
MAINTENANCE NCO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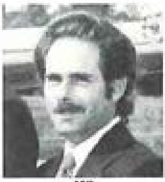
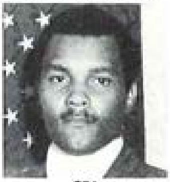
JOHN W. WILLIAMS
PILOT


MR.
MORTEN MENG
CO-PILOT


MR.
JACK ATER
CREWCHIEF


SP4
RALPH ROGERS
PHOTOGRAPHER

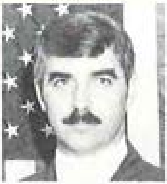

CW3
D.E. JEWKES
PILOT


CW3 ROBERT A.
STOLWORTHY
CO-PILOT


SERGEANT
JIMMIE G. MEAD
CREWCHIEF


CW2
RONALD WHETSTONE
PILOT


CW3
ROGER A. BODWELL
PILOT


CW3
JOHN A. DURKIN
CO-PILOT


SERGEANT
CHARLES R. POOLE
CREWCHIEF


CW2
ROBBIE ROBINETTE
CO-PILOT


CW2
SCOTT E. BERRIER
PILOT


WO1
ROBERT E. McCONNELL
CO-PILOT


PFC
BOWMAN T. WRIGHT
CREWCHIEF


MR.
JOE MASHMAN
PRESIDENT, HCA

A UH-1H Huey representing the United States Helicopter Team crosses the starting line and triggers the chronometer as the starter drops his flag at the Navigation Event at the World Helicopter Championship.

US Team members (L to R) CW3 Irvin B. Starrak, WO1 Robert E. McConnell, Patricia deRoche (US Asst Judge), and CW3 John T. Bailey check to see how accurately the water bucket was placed during the Slalom Event.

do. Incidentally, **Zimmerman** was there only for the Free Style Event; he did not participate for West Germany in the daily events.

The quality of piloting by all of the national teams was very, very good. There were a number of superb individual performances and a particularly blazing one by **Smirnov** in the Slalom Event. Everyone else was making the circuit in 01.80 or 01.90, and some were going slightly over two minutes. **Smirnov** roared through the Slalom circuit in 1.35.

AA. How do you account for this?

Sikorsky. It's a question of technique. Generally speaking, the technique used by most of the American and the West German teams in all of their precision flying events was to go reasonably slow, to fly more deliberately, more precisely. The Russians always seem to have practiced up; they have plenty of time to practice. While they were flying just about as precisely as the West German and U.S. teams, they always seemed to be able to do it significantly faster.

They were really dashing around the courses, and still doing a good job at precision flying. They evidently had practiced extensively and were beginning to try to work in a strategy of gaining points through better speeds.

AA. In your judgment, was the equipment a factor in the outcome?

Sikorsky. The individual equipment seemed to be of less importance than the piloting skill of the competitors, but if I had my druthers, I would say that the way the various individual competitions are laid out, the precision flying — the Slaloms and the various precision aerobatics — all seem to favor a smaller aircraft, rather than a larger one. You just have less inertia; you can maneuver more easily in a tight place; and you can also accelerate and stop more quickly with a small machine than you can with a larger aircraft.

During activities associated with opening day, a U.S. Helicopter Team UH-1H Huey flies by the grandstand. The background sign? "4th World Helicopter Championship — Piotrkow Trybunalski — 1981."

Not too unlike our own UH-1 Huey in size, weight, and appearance, a Soviet Mil-2 helicopter hovers over a panel prior to the start of the Slalom Event during the course of the 4th World Helicopter Championships.

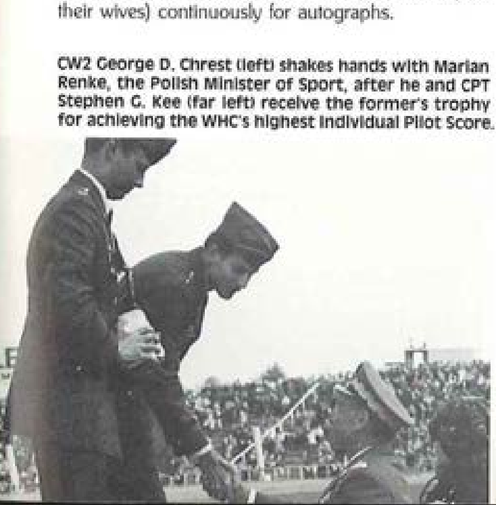
Working as a team, CW3 John T. Bailey holds his OH-58 Kiowa helicopter in position as his co-pilot, CW2 Alan L. Porter, places a bucket of water on a target located in the middle of a table during the 1981 Slalom Event.

AA. Is there anything you'd like to add on the PRC or Poland itself?

Sikorsky. I would hope the Polish Aero Club and the other organizers are commended. They did a very fine job, despite some rather difficult circumstances. They arranged ("with tongue in cheek," they said jokingly) for some beautiful weather. The weather had been marginal, but when the WHC opened, we had four straight days of competition as per schedule — every day being a very pleasant, sunny day. It then rained on the "Rain Day"; and on the 6th day, the Free-Style Event and closing ceremonies were held on schedule. The "Polanski Prance" regaled many midway through the competition, but even this did not cloud the genuinely fine job done by our hosts.

The Polish people themselves were extra warm, friendly, and cordial at all times. They regarded all of the competitors as celebrities and stopped them (and their wives) continuously for autographs.

CW2 George D. Chrest (left) shakes hands with Marian Renke, the Polish Minister of Sport, after he and CPT Stephen G. Kee (far left) receive the former's trophy for achieving the WHC's highest Individual Pilot Score.

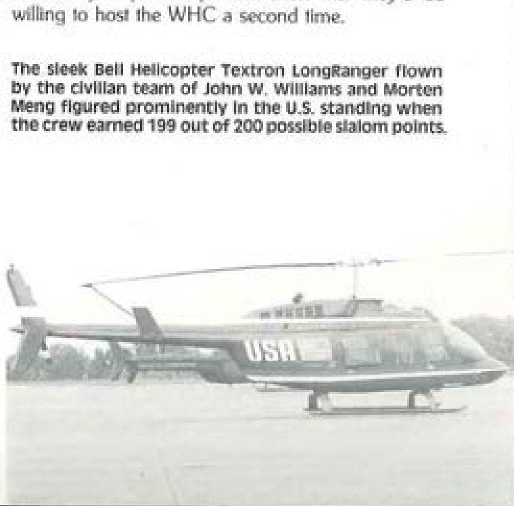


Team Coach MAJ Roy Mann (far left) and Team Logistics Officer CPT Karol Kawalec lead the American contingent from the Piotrkow Trybunalski Stadium following closing award ceremonies at the 1981 WHC.

AA. Where do we go from here? When will the next WHC be held?

Sikorsky. We're the only competing natiuon that has not hosted the WHC and I would very humbly suggest that some thought be given to the U.S., for instance, hosting it at a base in Western Germany because many of the European nations would find it very difficult to raise the necessary money to send their teams to the U.S. for two weeks. It's relatively easy for them to move or even to self deploy from one country in Europe to the next, but it would be more difficult and more expensive for them to move all of their helicopters, pilots, maintenance crews, and support people from Poland, for instance, into Ft. Rucker or New York City or for that matter, Sikorsky Airport in Stratford, Conn. The British Team was kind enough to suggest that if no other solution were found they felt that the Int'l Championships were a sufficiently important phenomenon that they'd be willing to host the WHC a second time.

The sleek Bell Helicopter Textron LongRanger flown by the civilian team of John W. Williams and Morten Meng figured prominently in the U.S. standing when the crew earned 199 out of 200 possible slalom points.



AA. That puts the next WHC in 1984? Right?

Sikorsky. Not exactly. The question came up as to whether it really was right to hold the WHC triennially. A number of contestants, possibly fired up by enthusiasm, said that they would dearly love to see it more frequently, although none want to have annual competitions. They think there's a good argument for holding it in alternate years, and this will be discussed by representatives of the several nations at later meetings.

AA. Any predictions for the future?

Sikorsky. While I hope that the U.S. will field a winning team again, I would not predict such an outcome solely on the basis of our winning this year. It's nice to be the winner, and don't think for a moment that everyone who was there didn't love being No. 1. There was a feeling of intense pride in our team's accomplishments, but when you win by only two points in a 2,251 vs 2,253 point competition, you know that your closest fellow competitor was not exactly trounced and that the battle indeed was hard won.

I look for three things to happen . . . First, the Championships will probably involve additional competing nations. France and Italy may field national teams in the future. Secondly, our 1981 competitors — the West Germans, Poles, British, and Russians — are certainly going to train even harder next time.

An OH-58A piloted by CW3 John T. Bailey is maneuvered as co-pilot CW2 Alan L. Porter attempts to lower a bottle into a hole simulating a hole in a rooftop in the timed Arrival and Rescue Event.

CW2 George D. Chrest, left, the "1981 World Champion," is shown with Vladimir Smirnov, the '78 Champion, before taking the latter for a orientation ride in his OH-58A Kiowa helicopter.

Lastly, while four of this year's five U.S. two-man teams were military crews and everyone appreciated and recognized the merits of the well-coordinated national selection and training plan that was pursued, I anticipate there will be a growth of interest in future competitions by the civilian sector of our helicopter industry. I believe our winning in 1981 will stimulate a greater civilian interest and desire to participate, and I think this stimulation is healthy.

AA. Thank you, Mr. Sikorsky.

OVERVIEW

In addition to **Mr. Sikorsky,** the U.S. Judges at the 1981 World Helicopter Championships included **Joe Mashman,** a Bell Helicopter Textron Vice President and President of the Helicopter Club of America; **C.W. "Wes" Moore,** President of MBB Helicopter Corp.; and **Charlotte Kelley** of Pinetop, AZ.

A 66 page in depth look at ASE (Aircraft Survivability Equipment) in current use and planned for Army Aviation in the near future.

DEPARTMENT OF THE ARMY
HEADQUARTERS, UNITED STATES ARMY FORCES COMMAND
FORT MCPHERSON, GEORGIA 30330

Some things are obvious. On the battlefield we are likely to be more effective if we avoid getting killed early in the fight. Not so obvious is how we ought to equip and train our force to accomplish the fundamental act of survival. And always we must remember, the mission is to do the job and survive — merely achieving passive survivability does nothing for us.

Suitable equipment which provides crew warning and system protection is just part of the solution. A key point will continue to be the training of our force to take full advantage of all the passive and active means of protection. Everyone is involved. Aircrews must use suitable tactics. All elements of the combined arms team must be directed and employed to contribute their individual efforts to the accomplishment of the team mission. But our labor will be for naught if the POL truck driver and the mechanics at the company base are not taught to maintain camouflage, and avoid tracks in open fields, and learn to tuck the choppers in cracks in woodlines and the shade of buildings.

Fortunately, the Army Aviation Community is better organized today than ever before to address in a serious and comprehensive way the many facets of survivability. We have a Project Manager for Aircraft Survivability Equipment to coordinate and emphasize the development and installation of equipment to help us survive. This special edition of the "Army Aviation Magazine" will serve to bring us up-to-date in the many programs underway.

The emphasis on survivability is timely. New and better equipment is important. But training and battlefield discipline are still fundamental.

R. M. SHOEMAKER
General, U.S. Army
Commanding

ASE Increases Combat Effectiveness

By COLONEL EDWARD C. ROBINSON,
Project Manager for Aircraft Survivability Equipment,
US Army Aviation Research & Development Command (AVRADCOM)

ASE improves the combat effectiveness of Army Aviation by combining both passive and active countermeasures systems with proven tactics that take advantage of the maneuverability and standoff capability of Army Scout and Attack Helicopter teams.

Signature reduction and crew warning are the two types of passive countermeasures. Signature reduction measures, such as low reflectance infrared (IR) paint and the flat plate canopy perform two functions, for example. Not only do they reduce the initial detectability of the aircraft, but they also degrade the ability of threat weapon systems that depend on visual tracking or infrared guidance to acquire, lock on, and track their targets.

Crew warning systems, like the AN/APR-39 Radar Warning Receiver, will provide warning to the pilot that he is being engaged by threat weapon systems and will also act as a target locator by providing a relative bearing to the threat.

When both these types of passive countermeasure techniques are coupled with proper tactics, they contribute to a significant increase in aircraft survivability and the maintenance of the integrity of Ar-

ASE Increases Combat Effectiveness

my Aviation as an effective force.

Combat effectiveness is also maintained by active countermeasure systems, such as decoys and jammers. Decoy systems, like the M-130 General Purpose Chaff Dispenser system, present a more attractive target for the radar directed system to lock on. This permits the pilot to maneuver to an alternate firing location from which to reengage targets.

Jammers as countermeasures

Jammers, such as the AN/ALQ-136 Radar Jammer or the AN/ALQ-144 IR Jammer, provide the most significant enhancement to combat effectiveness of all the countermeasures systems. This is accomplished by the ability of those systems to actively introduce errors into the guidance or tracking system of infrared tracking and radar directed threat systems.

For the infrared guided systems, these errors are input continuously during the entire time of flight of the missile, causing significant miss distances. For radar directed threats, the jamming signals prevent the threat from being able to successfully lock on and track the aircraft, thus forcing the threat system operator to switch to an alternate target tracking mode, such as optics.

This ability to stand and fight, provided by ASE, causes an increase in combat effectiveness that complements the survivability enhancement features of Aircraft Survivability Equipment. The synergistic result is a force multiplication effect on the basic fleet of Army aircraft.

Future Plans and Challenges

The Soviets in the 1980's will not be content to be second in technology; they're pushing hard and trying to catch up. The challenge is to maintain our technological edge." Such was the warning contained in a message presented earlier this year by **Dr. William J. Perry,** former Under Secretary of Defense for Research and Engineering.

In his address, he highlighted the less publicized but more serious challenge facing not only the ASE program, but the entire military electronics research and development effort.

We hear every day of the growing numerical superiority of the Warsaw Pact Forces in Western Europe but very little of their technological growth. In fact, the scope and sophistication of the technology being exploited to improve the performance of threat weapon systems is expanding at an ever increasing rate.

These two initiatives, a threat growing in numbers with an increasingly complex set of fire control systems, combine to make the task of ASE (enhancing the combat effectiveness of Army aircraft) a formidable one.

To meet this challenge, an aggressive program is being forumulated, one that takes advantage of both the experience gained during the development of existing ASE and the technological edge of the U.S.

This effort addresses improvements to existing countermeasure systems as well as new

M-130 GENERAL PURPOSE DISPENSER

program starts in the areas of radar, infrared (IR), and electro-optical technology.

Naturally, the preparation of a plan to enhance the existing capabilities of both our active and passive ASE is closely linked to the anticipated growth in the threat capability. As a result, in the area of radar countermeasure systems, attention is being given to expanding the frequency coverage beyond its present limits.

Further, the processing capabilities of our systems are being expanded to give the systems the ability to operate in a high signal density environment and to identify the increasingly complex waveforms being employed by the threat. Within the field of infrared, ASE improvement programs will follow the general trend to operate at the longer infrared wavelengths as the use of thermal imaging and focal plane arrays to improve weapon performance increases.

In addition, as the scanning methods employed by IR missiles become more intricate, advantage will be taken of the capability growth to transmit stronger IR jamming signals with sophisticated modulations. The appearance of lasers and enhanced optics as part of fire control systems on the modern battlefield has caused our program to include further improvements to the ASE activity in this area. Focus on our optical and laser detection and jamming capabilities highlight the planned improvements in this portion of the program.

It should be obvious that this program to maintain, if not improve, the survivability and more importantly, the combat effectiveness of Army Aviation, is an ambitious one. It is also a program which must be expeditiously carried out to a successful conclusion to provide Army Aviation with the ability to operate efectively on future battlefields.

Supporting Agencies

Although all ASE development and procurement activities are closely coordinated and supervised by the PM Office in St. Louis, the PM ASE depends upon a wide variety of technical personnel from many different DARCOM commands and laboratories for the development of individual ASE systems and for integrating the systems into Army aircraft.

The Electronic Warfare Laboratory, an ERADCOM organization, is responsible for the technical development of all electronic warning and countermeasure systems of ASE. This laboratory administers development and procurement contracts for electronic items of ASE beginning with Advanced Development. EWL is also responsible for maintaining a viable technical data base in the electronic field to counter future threats. Communications and Electronics Command personnel are responsible for the logistics planning and life cycle management of these electronic systems.

ASE systems involving active munitions of any kind are developed by the Armaments R&D Command at Picatinny Arsenal and are supported throughout their life cycle by the Armament Materiel Readiness Command at Rock Island, Illinois.

In the area of vulnerability reduction, such as projectile resistant components and non-explosive fuel cells, PM ASE depends on the AVRADCOM laboratory at Fort Eustis, Va., the Advanced Technology Laboratory (ATL).

Another AVRADCOM organization, the Avionics Research and Development Activity, provides a major service for PM ASE. This organization is responsible for the technical integration of electronics systems into each individual aircraft and for assisting in the coordination necessary to provide up-to-date aircraft operation and maintenance publications. Much of the day-to-day coordination between ASE and the AVRADCOM and TSARCOM aircraft Project Managers is accomplished by AVRADA.

The AVRADCOM organization in St. Louis provides many forms of support to PM ASE, insuring that the PM Office can perform its management function in a smooth and timely manner.

JTCG/AS

The survivability of our sophisticated military aircraft has been acknowledged as an essential element of our national defense. For many years, survivability meant little more than adding armor and self-sealing fuel cells after aircraft entered combat. Consequently, there were penalties in weight, performance, and cost which caused serious limitations in survivability and mission effectiveness. The primary

ASE Increases Combat Effectiveness

lesson learned from combat losses and recent research is that survivability features must be integrated into the basic design of an aircraft as early as possible in its life cycle.

During the early stages of the Southeast Asia conflict (pre-1968), the U.S. military forces experienced an unexpectedly high number of combat aircraft losses. So high, in fact, that the **Director of Defense, Research and Engineering (DDR&E)**, established a focal point in his office to evaluate the combat losses and recommend corrective actions by the individual Services on a "crash" basis. This resulted in a number of tailor-made remedies which failed to address the needs of new systems under development. As the Southeast Asia conflict escalated, so did the combat aircraft loss rate.

Finally, a request to the **Joint Logistics Commanders (JLC)** resulted in their establishing a **Joint Technical Coordinating Group (JTCG)** to bring together the best engineering talent in all the Services to address the many aircraft survivability problems. On 25 June 1971, the charter for the JTCG Aircraft Survivability was signed to ensure continuing efforts to complement individual Service programs; it is reviewed annually by the JLC. The individual JTCG/AS projects are selected to raise the status of survivability to a competitive design discipline through advancement of required technology, evaluation methodology, and formal requirements documentation.

JTCG/AS Objectives

The objectives of the JTCG/AS, as stated in the charter, are to:

- coordinate the individual Service programs to increase the survivability of aeronautical systems in a non-nuclear threat environment;
- implement efforts to complement the Service survivability/vulnerability programs, and;
- maintain close liaison with Service levels to ensure that all survivability research and development data and systems criteria are made available to the developers of new aircraft in Government and industry.

In reaching its objectives, the JTCG/AS functions as a Central Office with five supporting tri-Service Subgroups. Research and development to reduce vulnerability (given hit(s) on an aircraft) is conducted primarily by the R&D Technology Subgroup. Efforts to reduce susceptibility to hit (by various threats) are initiated/coordinated primarily by the Countermeasure Subgroup. Vulnerability reduction addresses damage from unavoidable hits by weapons that are usually difficult to detect/avoid, e.g., small arms, shell warhead fragments, laser beams, etc.

Susceptability reduction addresses detection reduction and avoidance of hits especially by the larger sophisticated weapon systems, e.g., radar-directed AAA, IR/radar/laser-guided missiles, etc. Documentation of survivability and dissemination of information from these four subgroups are primarily the function of the Design Criteria Industry Interface Subgroup.

For those who wish to know more about the JTCG/AS, contact may be made by writing:

Department of the Navy
JTCG/AS Central Office (AIR-5184J)
Naval Air Systems Command
Washington, D.C. 20361

The telephone numbers are (202) 692-0230/1730 or AV 222-0230/1730.

Fact or Fiction?

The U.S. Army is the world leader in the area of providing rotary wing and low speed special mission fixed wing aircraft with equipment/techniques to improve survivability and hence increase combat effectiveness. The ASE **Project Manager's Office (PMO)** is aggressively pursuing a **rationalization, standardization and interoperability (RSI)** program with U.S. allied countries in order to obtain maximum standardization/interoperability of ASE.

While the major thrust of the ASE PMO RSI effort is with the NATO countries, significant emphasis is also being placed on other allied non-NATO countries with evolving interests in ASE. RSI involvements range from providing information briefings to the various allied Governments, to exchange of documents, to loans of ASE equipment for evaluation, to production/installation of ASE on allied aircraft.

The ASE PMO is currently supporting ongoing NATO committees/panels efforts to formulate a NATO requirements document for **Electronic Warfare (EW)** Self-Protection of Rotary Wing Aircraft. In addition, various NATO nations have been provided with loans of U.S. Army ASE for purposes of evaluation. In several instances, these evaluations have resulted in the adoption and procurement of standard U.S. Army ASE.

RWR Co-Production

For example, the AN/APR-39(V)1 Radar Warning Receiver has been procured by several countries and has also been the subject of a co-production license. Evaluations of U.S. Army ASE are currently ongoing by several nations and are being supported by the ASE PMO. The M-130 General Purpose Dispenser is being utilized in the NATO Chaff Trials, **Trial Mace II.** Data from these trials will be shared with all participating NATO countries. On the other hand, the U.S. will likewise share in the data generated by the other participating countries. Many very fruitful data exchanges have already occurred concerning NATO countries' evaluation of various ASE.

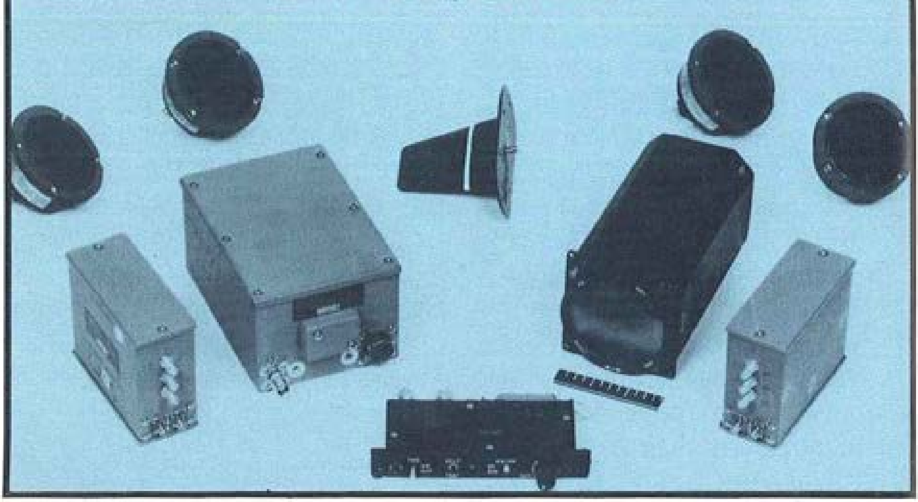
Outside the NATO area, the ASE PMO has been extremely active in RSI. ASE involvement in the **America/Britian/Canada/Australia (ABCA) Quadripartite Working Group on Aviation (QWG/AVN)** has resulted in the establishment of an **Information Exchange Group on ASE (IEG/ASE)** through which exchange of information/data is constantly being conducted. This information exchange has resulted in the draft of an ASE concept paper which is expected to be adopted at the next QWG/AVN meeting in the fall of 1981.

In addition, a **Quadripartite Standardization Agreement (QSTAG)** for the AN/APR-39(V)1 Radar Warning Receiver has been tentatively accepted by the ABCA. Additionally, other ASE are being proposed for QSTAG's.

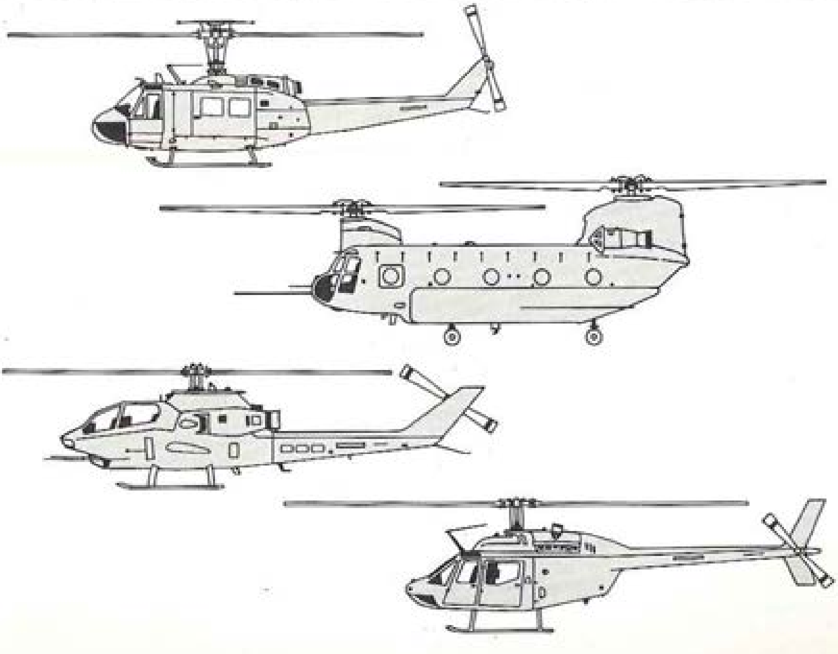
Dedication to RSI

In summary, the ASE PMO is accelerating its RSI program in order to take advantage of the opportunity to effect large gains in Standardization and Interoperability of ASE within NATO and non-NATO allied countries. The ASE PMO is dedicated to the RSI concept and firmly believes that there are distinct advantages to be gained by attainment of RSI goals.

AN/APR-39 (V)1
DETECTING SET, RADAR SIGNAL



Spiral Antenna · **Blade Antenna** · **Spiral Antenna** · **Detecting Set Control** · **Radar Signal Indicator** · **Radar Receiver** · **Comparator** · **Radar Receiver**



The Impact of Systems Integration

By GARY L. SMITH,
Deputy Project Manager for Aircraft Survivability Equipment, USA AVRADCOM

To field effective ASE Systems, the Systems Integration process must be thorough and complete. This is accomplished in the ASE Project Manager's Office by a mix of personnel and resources to develop complex, high technology countermeasure systems for the Electronic Warfare (EW) battle of today and the future.

The ASE program encompasses the following type systems: (1) Radar Countermeasures, (2) Infrared Countermeasures, (3) Electro-Optical Countermeasures, (4) Optical Countermeasures, and (5) Vulnerability Reduction Features. To complicate the problem, the threat systems continue to change and increase in capability.

The ASE development process begins with development of the **Threat to Army Aviation**. Threat information is obtained from a diverse number of sources and then analyzed. It is then used to develop systems requirements in concert with the TRADOC community represented by the U.S. Army Aviation Center and School at Fort Rucker, Ala.

The establishment of systems requirements must consider the technology available to support the later development of the system hardware. Where a technology shortfall is discovered, work is then identified to be accomplished in the DARCOM technical base program. An example of this might be the development of a higher speed processing capability than presently exists.

Developing self-protection

To begin the process of developing self-protection for the aircraft, the problem solving philosophy as depicted in **Figure 1** is used. After a complete analysis of the threat, we might find that standoff tactics are the only countermeasure required to defeat the threat and still perform the mission.

If tactics alone are inadequate, we take the next step: that of reducing the signature of the aircraft. This can be radar cross section reduction, an **infrared (IR)** signature reduction, or optical signature reduction. The tasks become more difficult as we learn more about the threats' capabilities.

The application of signature reduction designs becomes more costly and begins to cause penalties in aircraft performance. Cost and Operational Effectiveness Analyses become more detailed and complex with the Systems Analyst becoming deeply involved.

The next step in the ASE process to provide the required protection is to install a warning device on the aircraft to warn the pilot he is being engaged. He can then perform the proper evasive maneuver or activate countermeasures. To develop the warning device, one needs to know the threat system's characteristics in greater detail.

The system design engineers within the Army and the various Defense industry contractors can then begin to design hardware to receive and process the signals that identify the threat. If the aircraft must stay on station or stay in an exposed firing position (i.e., AH-1 Cobra/TOW helicopter) a device is needed to jam the threat system's fire control or the missile seekers. The design engineer's task becomes even more complex because he must now know the inherent weaknesses of the threat hardware so the jam signal can override or deceive its guidance signals.

The last step, if all else fails, is to harden the aircraft against damage. The kinetic energy of the projectile or the explosive force of the warhead now drives the aircraft components' design and the location and thickness of armor.

The design engineer must perform in-depth trade-offs to size and locate the armor or other protection feature to insure that the aircraft does not become a flying tank.

A Combination of Features

In reality, most Army aircraft today employ a combination of the above described features to insure self-protection against the threat. This is described as an ASE suite (pronounced "suit") for each specific aircraft dependent on the aircraft mission and the threats it can expect to encounter.

Up to this point, we've discussed the

FIG. 1—THE ASE SELF-PROTECTION PHILOSOPHY

establishment of basic requirements for self-protection. We shall now address the systems' integration process for ASE development, production, and utilization. The electronics and electro-optics advances in the state-of-the-art have been staggering over the last few years.

To successfully apply the advanced technology to effective systems development requires a diversification of skilled personnel. These personnel must also stay current with advancing technology. These multiple disciplines require integration for effective organizational performance.

Management Functions are Crucial

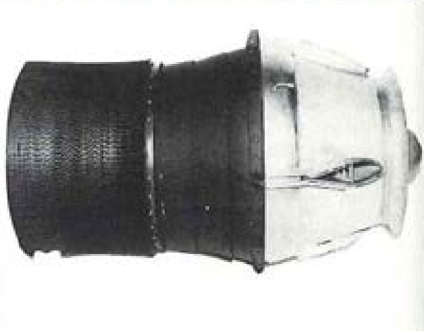
Because of these factors, the management functions of planning, organizing, and controlling are crucial and hence the need for the ASE **Project Manager's Office (PMO).**

The systems requirements are translated into specification language for inclusion in the **Request For Proposal (RFP)** which starts the official interchange with industry. The defense industry contractors then propose hardware designs to meet the requirements. A contract is structured to insure an integrated development approach in concert with DOD Acquisition Policy. The **Project Manager (PM)** must insure that the program is totally coordinated with the development testers and the operational users.

After contract award, design and program reviews are conducted to approve the program plans. As occurs in most programs, plans must change for one reason or another. We seem to be able to accomplish most technical requirements if given enough time and money but are always driven by required IOC's and available funding.

There must be a continued interchange between all of the development community to accomplish "workarounds". The PM must orchestrate these "workarounds" within available assets to coordinate funding, personnel, and technology in relation to the schedule.

To prepare for production and fielding of the hardware, the logistics requirements must be considered early in the development process to insure the hardware will be supporttable once fielded. Of utmost importance is the maintenance concept. With the increased technological complexity of ASE equipment,



AH-1S COBRA SUPPRESSOR

we must provide simple maintenance equipment to allow our technicians to troubleshoot and to repair the hardware.

The latest in microprocessors

Because of the need for the hardware to be "smart", the latest in microprocessors are utilized. These microprocessors and related memory are software reprogrammable. This reprogrammability is needed to allow the software to be changed to meet specifics of the changing threat.

Knowing that we cannot expect to perform the reprogramming actions in the field, we must be prepared to reprogram the software modules in CONUS at a post deployment software support center. This concept then drives the design of the processor hardware to provide for a simple and quick changeout of components or circuit boards at the **Aviation Intermediate Maintenance (AVIM)** level.

AVIM Resources are a Factor

The personnel and equipment resources available at AVIM must be considered when designing the hardware maintainability features.

Developed, fully tested, successfully past the In-Process Review steps, and produced, the hardware is then sent to the first operational units. But to double check the first production units in a user environment, they're tested in a "lead-the-fleet" exercise to uncover any problems that may have been overlooked.

(IMPACT/Continued on Page 90)

Establishing ASE Requirements

By MAJOR RAYMOND L. SPRINGSTEEN,
Project Manager for Directorate of Combat Developments,
U.S. Army Aviation Center, Fort Rucker, Alabama

Today's challenge in ASE is satisfying the user's need for small, lightweight, low-powered countermeasure systems. ASE is an important element in the overall scheme to enhance the survivability of Army aircraft.

Within USATRADOC, the Directorate of Combat Developments, USAAVNC, Fort Rucker has the responsibility to articulate user's needs from the field into Requirements Documents: LR's, LOA's, or ROC's, which will lead to our effective countermeasure system.

These requirements documents are used by the DARCOM community, in this case PM ASE, for the development, procurement, and fielding of Aircraft Survivability Equipment.

The field user is the one who has the greatest impact on what system or techniques need to be developed to insure the survivability of our aircraft in a threat environment.

These needs are translated into the formal requirements after they are validated through studies and analyses. It is important to remember the key role that the field does play in the acquisition of aircraft survivability equipment.

This process is accomplished through continu-

Establishing ASE Requirements

ous dialogue with USAREUR, FORSCOM, WESTCOM, INSCOM, and other elements that impact on Army Aviation. At the center of this dialogue is a constant analysis of the threat that may be faced throughout the world.

Tailored to Meet a Need

ASE requirements must be tailored to meet those particular or special needs that are identified by the user. Those needs may differ from user to user, i.e., the RDF need may not be the same as USAREUR need. Also, needs differ by partciular mission requirements such as **Special Electronic Mission Aircraft (SEMA)** and the attack helicopter. But commonality is always kept in mind.

The threat is a constantly changing force in any combat development process. In ASE the challenge is to provide the best possible countermeasures at an affordable price, a price not only in dollars but in weight, space, and power.

A solid understanding of the threat force is necessary to accomplish our mission. Threat experts from all military segments provide advice in special areas of interest — both current day and looking toward the future. The success of ASE depends on these projections in order to insure an effective countermeasures program.

As threats are identified, user representatives within TRADOC (Fort Knox, Fort Benning, Fort Eustis, and Fort Rucker) evaluate those that must be addressed via aircraft survivability equipment. Some threats are countered through tactics, such as NOE and standoff, and others by fire power.

This evaluation is a continuous process in which there is a constant exchange of information between the parties. DARCOM, PM ASE, the Army Laboratories, TRADOC and DA are all working together to assure that the best possible approach is being taken to effectively deal with the threat.

The **Electronic Warfare Lab (EWL)** at Fort Monmouth is one of the primary labs which supports PM ASE with technologies which will counter sophisticated threats. It is through the PM's interface program with the labs, such as EWL and contact with the U.S. EW industry, that candidate countermeasure ideas are gathered by TRADOC for evaluation as possible solutions.

The ASE ROC

This requires close cooperation with PM ASE since he has the technical expertise to evaluate potential ASE systems. It is through these program management efforts in early research and development that we are able to put together a responsive ASE program.

Promising technological approaches to countering the threat are then translated into requirements. In the case of ASE it was accomplished through the **1974 Family Required Operational Capability (ROC)** which was recently revised (June 1981).

The ASE ROC is a joint TRADOC and DARCOM document which establishes the ASE requirements for all Army combat aircraft. The document was drafted by USAAVNC and PM ASE with input from every major TRADOC school and center with aviation interest, MACOM's, the Logistics Evaluation Agency, the Intelligence community, and DA.

ASE affects all users

ASE cuts across all aircraft lines. The AN/APR-39(V)1, for example, goes on all Army combat aircraft, while other systems are aircraft and mission dependent. Many joint working group sessions went into the requirement in order to cover all possible aspects of Aircraft Survivability Equipment.

The results of the published ROC represent the collective efforts of many subject matter experts in areas of ASE. Each aircraft now has its own special ASE that is designed to counter the threat today and in the future.

The ROC was designed and written to allow easy updating as our future requirements may change according to the threat at the time. These changes will be incorporated through the same process as that of the basic requirement document. With this flexibility in the document, the developer will be allowed to approach the countermeasure problem in a structured program that represents the best approach to the problem.

The user's responsibility does not end with the publishing of a document. He must con-

THE RC-12D SEMA AIRCRAFT

tinue to work with the PM every step of the way to insure we're on the right track so the PM can put together a comprehensive program, and manage those limited resources available to turn out a product that meets the user's needs.

That does not mean that the user can constantly change his mind; it means that he must be on the same wavelength throughout the program. Disconnects in thinking often lead to confusion and unsatisfactory results.

This has not been the case in relationships between PM ASE and USAAVNC who, over the years, have worked very closely with each other to insure that the user receives an effective system that will counter the threat.

In Process Reviews (IPR) are another means by which the user, the developer, and the logistician get together to review the progress of the program. During IPR test results, reliability data, military utility, and other parameters of a system are evaluated. These reviews assist the PM in directing his efforts in a particular area of a program.

Recommendations are made to higher headquarters on the future of a program such as continuation, stop and use another approach, or recommend slight changes in the current program.

Cooperation Leads to Success

ASE is a successful program today because of the cooperation of the Materiel Developer (PM ASE) and the Combat Developer (USAAVNC). The PM has responded to the user's needs as defined in the requirements documents and has always been willing to work with the user in other areas such as fielding systems when the need arises.

The Combat Developer has continuously solicited and received the assistance of the other members of the aviation community in establishing ASE requirements.

The ASE Program represents the best in cooperation in developing new systems to counter a severe threat to Army Aviation in the modern battlefield.

The Financial Management of ASE: A Complex System

By THYRA V. BONDS,
Chief, Program Management Division, Office of the PM—ASE,
U.S. Army Aviation Research & Development Command

The ASE Program represents one of the most complex budgeting and financial management challenges in the Army. It involves the planning, programming, and management of the Research and Development, Procurement, and Spare Parts funding for over 50 different ASE systems.

These systems are or will be installed in various combinations on over 25 different series of aircraft operating in the forces of the U.S. Army, Navy, Marines, and Air Force. During the period FY 72—FY 81, the ASE Program funding was over $321.2 million. For the five-year period FY 82—FY 86 the planned ASE budget is approximately $553.5 million.

Since its beginning in 1971, the ASE Program has developed or currently has in development 42 separate systems. Of these, 23 have already been fielded.

Within the next year alone, we expect seven items to enter production and eight more items to be fielded. At any one time the ASE Program is involved in the management of an average of 146 separate contracts with industry.

Figure 1 found on pages 44 and 45 illustrates the steady growth and accomplish-

The Financial Management of ASE

ments of the ASE Program over the past ten years. The chart depicts the life cycle phase for each ASE item as it transitions from advanced development through engineering development, production, and fielding. As can be seen, there has been a steady and well planned orderly progression of items developed in response to the threat.

50+ Interrelated Programs

One aspect of the ASE Program that may not be realized by most is that each item is a separate program in itself and thus requires many of the management and budgeting actions associated with a large system. For example, each ASE item requires its own development plan, ILS plan, procurement plan, and fielding plan. Each requires its own contracts with normal costs, schedule, and technical performance features. Each requires its own budget and financial management system.

In other words, the ASE Program is actually a collection of approximately 50 individual yet interrelated programs rolled into one large complex program group. As can be seen from **Figure 1**, the budget and financial management personnel must not only be able to handle a very large volume of separate programs, but also must be qualified to simultaneously manage programs in every life cycle phase from advanced development through fielding.

Few Stand Alone Programs

Another unique feature of the ASE Program that adds to its complexity is that very few of the ASE items are stand alone programs. The ASE items are actually developed as **Product Improvement Programs (PIP)** for application to several — or sometimes many — different types of aircraft. It is the responsibility of the **Project Manager (PM)**—ASE, working in close coordination with the aircraft PMs, to develop a detailed management plan for the aircraft's application of each item of ASE.

This plan not only includes the basic ASE item plan but also the flight qualification on the aircraft, the procurement of airframe kits, and the actual aircraft modification plan. These aircraft PIP plans normally are by necessity more detailed than the individual ASE item development plans.

Further, for some aircraft types there can be multiple plans. An example is the AH-1S which had a separate plan for field retrofit of already deployed aircraft, a plan for the contractor "G" to "S" conversion program, and still another plan for new aircraft production.

Some individual ASE items have many aircraft application plans. For example, the APR-39(V)1 Radar Warning Receiver is, by itself, a relatively simple item. However, since it is to be applied to many types of aircraft worldwide (and for all three military services), there are 14 separate APR-39(V)1 aircraft application plans.

As can be imagined, each plan must be coordinated with all others and constantly updated as various aircraft and ASE programs are revised (due to technical, budget, or deployment changes).

This aircraft application system is not peculiar to the ASE Program. It is used for all items of equipment that are developed for employment on aircraft within DOD. What is unique to the ASE Program is the large number of ASE aircraft plans.

An Orderly Evolution

The ASE Program Division has prepared and constantly updates over 55 aircraft application plans. Admittedly, the financial management of the ASE Program is unique and quite complex. However, the program is not unmanageable for two very good reasons.

First, even though the program has grown rather rapidly, it basically has evolved in an orderly fashion. This has permitted the orderly (and sometimes disorderly) development and establishment of the required unique management techniques and systems.

The second and most important factor permitting adequate financial management is that we have been able to attract highly qualified dedicated personnel who enjoy the challenges of this dynamic ASE Program.

We occasionally have personnel vacancies as a result of promotions. Thus, if any of our readers are looking for a challenging and professionally rewarding job, please drop us a line.

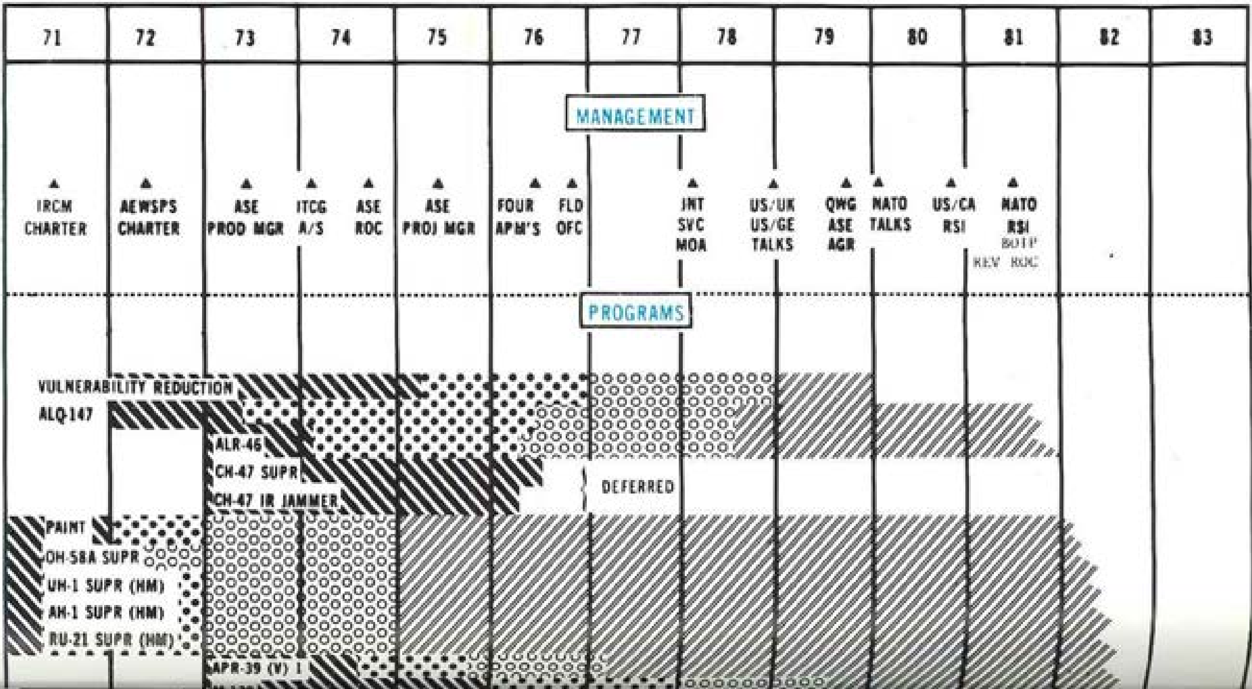
Gentlemen:
What aircraft can penetrate a hostile zone and destroy enemy armor – again, and again, and again?

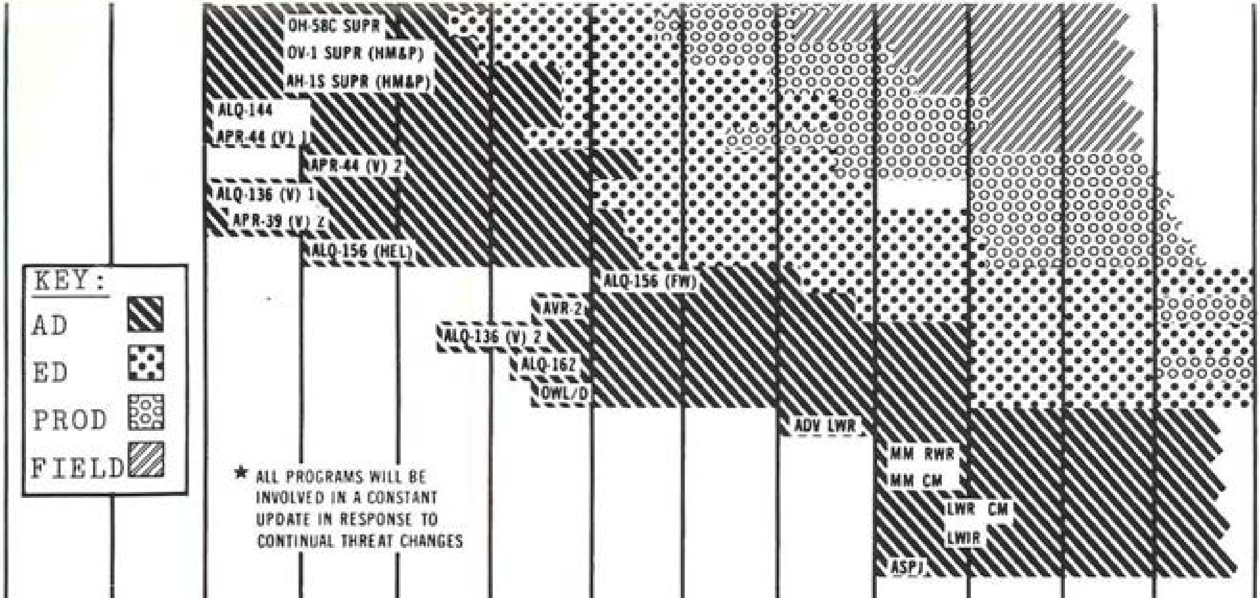
Sir:
An attack helicopter protected by the ALQ-136 Radar Jammer!

AVIONICS DIVISION **ITT**

The ALQ-136—for the combat pilot. There's no ECM like it.

THE GROWTH AND ACCOMPLISHMENTS OF THE ASE PROGRAM DURING 1971-1984





SYS:	6	9	18	20	21	24	23	23	25	29			
FUNDING													
ROTE			8.5	8.0	18.0	19.2	16.5	12.2	13.2	14.4	17.2	29.2	27.2
APA			2.4	.05	6.5	13.6	16.7	17.3	30.8	44.3	21.2	113.7	77.0
PMO PERSONNEL (MIL/CIV)	2/7	2/13	3/30	3/34	3/36	6/41	7/43	7/43	8/40	8/42	8/48	8/50	

Contracting for the Future: The Goalposts Keep Moving!

By PHILIP L. CASIAS,
Chief, Procurement and Production Division, Office of the PM—ASE,
U.S. Army Aviation Research & Development Command

The generic nature of ASE items and subsystems and their applicability to Army aircraft ranging from production status through new planned aircraft, such as the AAH, poses a definitely interesting challenge to the ASE contracting community.

Contracting for ASE in the future will require dedication and innovativeness to accomplish its task. Historically, ASE items and systems have generally been budgeted and processed on an individual basis for each type of series of aircraft. We presently have a total of 150 open contracts and orders which provide support for the ASE mission and ASE for the various Army aircraft.

The contracts cover the spectrum from planning stages through RDT&E, early production, and production requirements. This does not include regular spare and repair part buys which are contracted for separately.

Due to the generic nature of ASE, large quantities are required and planned for future buys. If ever any line of commodity items could be identified as potential candidates that would fall under the umbrella of the Defense Acquisition Process Review Report (The Carlucci Re-

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port), ASE would rank right along with the major weapon systems. If they did not qualify for inclusion from a major dollar value basis, they would qualify on a total quantity basis.

Future ASE contracting will see the continuation of recent initiatives and the development and implementation of new initiatives in an attempt to reduce costs and administrative workload, and improve the contractual management of ASE programs.

On RDT&E programs, continued emphasis will be placed in increased informal management engineering reviews between the ASE-PM Office and our contractors for a hands-on management.They'll use a hands-on engineering approach to identify and resolve problems in lieu of resorting to the traditional volumes of paper and data required in the past.

Every effort will be made to assure excellent long range planning leading to improving workable requirements in RDT&E and early production contracts. Source selection plans will determine the feasibility of emphasizing the importance of soliciting and ranking of maintenance and reliability features submitted by contractors competing for future contracts.

Application of Incentives

Early production contract requirements for competitive **Technical Data Packages (TDPs)** will be reviewed for possible application of incentives for successful verification and for actual successful demonstration by another competitively selected contractor. Incentives for TDPs would be worthwhile.

There isn't any problem that causes more heartburn than to spend good money to acquire a competitive TDP only to discover after acceptance that it was inadequate and additional funds werw required to make the necessary changes. It is expensive from both a schedule and dollar viewpoint and in most cases negates any cost savings that could have been achieved by use of a competitive TDP.

Early production contracts will be assessed prior to award to ensure the proper marriage of the type of contract and all identifiable risks which are to be shared by both the Army and its contractors. Once an ASE item or system production configuration has been established it will be screened to see if it can be a successful candidate for a competitive multi-year contract.

Additionally, current ASE production items and systems will be screened as possible candidates for multi-year contracts and if economic production rates and adequate budgeted funds can be established, we will examine the feasibility of competing and awarding contracts for multi-year buys.

We will also examine requirements of ASE for a single type or series of aircraft to determine whether an economic production rate can be established or if a total quantity competitive buy-out is more beneficial to the Government.

Competitive BOA's

Another initiative being explored is the employment of competitive **Basis Ordering Agreements (BOA's)** where large quantities of ASE items or systems will be required over a period of years and there are two or more companies available who can successfully provide them.

Competitive BOA's could be established to complete a first increment of an ASE system. The winner would be awarded the first increment and all companies who finished within a zone of consideration would also be signed up to a BOA to compete for future requirements.

Additional quantities would then be competed between all companies awarded a BOA on either an annual or multi-year basis. The quantities need only be competed by Delivery Order bids which would provide for adequate price competition and should negate the need for audit support, cost, and price analysis and should certainly reduce contract administrative time.

We will also, where and whenever feasible, award advance buy/long lead effort contracts to assure delivery of ASE items or systems to adequately support the Army's operational needs.

In summary, contracting for the future will be an enjoyable challenge and successful achievement of the described initiatives will be a noteworthy contribution to the Army's readiness posture by the ASE contracting community.

Integrated Logistics Support (ILS) for Aircraft Survivability Equipment

By GEORGE B. HENDON, III,
Chief, Logistics Management Division, Office of the PM—ASE,
U.S. Army Aviation Research & Development Command

Integrated Logistics Support (ILS) is a management philosophy that seeks to insure that all logistics considerations necessary to test, field and sustain our equipment are integrated into the acquisition effort.

The objective is to identify early in the development process alternative approaches to the design which will reduce operating costs, limit manpower requirements, and not exceed current skill levels.

In the practical application of ILS within any development program, each ILS element element represents a functional area which is individually managed by a technical specialist, i.e. supply support, maintenance, support and test equipment, personnel and training, technical data, transportation and packaging, facilities and, last but not least, computer resources.

The management concept of a successful ILS program recognizes that failure to plan early and intensively by any one of these individuals may invariably result in delay of the scheduled fielding.

A test program bridges the development effort to that of production and deployment. The role of ILS in the test program is to provide a System Support

Integrated Logistic Support for ASE

Package (SSP) which provides support to the basic ASE system during test as well as validates the adequacy of the SSP itself.

The SSP consists of repair parts, support and test equipment, technical publications, and trained Army personnel. Supportability risks rise in proportion to the nonavailability for test of any or all of the SSP elements.

The ASE ILS program, although centralized within the Project Manager's Office, extends across the assigned responsibilities of several Major Subordinate Commands (MSC), i.e. AVRADCOM, TSARCOM, ARRADCOM, ARRCOM, ERADCOM, and CECOM. Each command supports the overall ASE ILS program according to its own responsibilities and provides input to each Materiel Fielding Plan published by the Project Manager's Office.

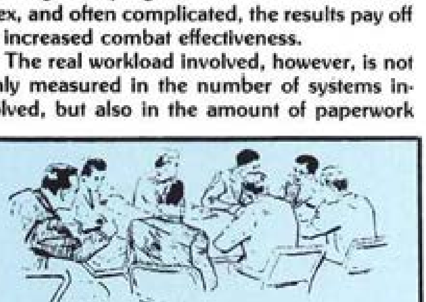
AVRADCOM is responsible for the aircraft integration; TSARCOM executes the aircraft modification and retrofit programs; ARRADCOM and AARCOM develop support for munitions-type countermeasure devices; and ERADCOM and CECOM develop support for electronic countermeasure devices.

Interaction Increases Complexity

The complexity of ASE grows as the various countermeasure devices developed interact with (talk to) other countermeasure devices. Although the program administration is complex, and often complicated, the results pay off in increased combat effectiveness.

The real workload involved, however, is not only measured in the number of systems involved, but also in the amount of paperwork necessary to obtain the required approvals, concurrences, and coordinations for testing and fielding. There has been a steady increase in levels of review, decision points, demands for analyses, studies, justifications, plans, schedules, reports, negotiations, and agreements.

The whole gamut must likewise be applied to each ASE item separately type classified. New ideas and better ways of doing business are needed now so that our response time to changes in the threat can be met by countermeasures in the shortest possible time frame. This can best be achieved if the urgency is felt by all concerned; the combat developer, trainer, logistician, and materiel developer.



THE FAILURE TO PLAN EARLY BY ANY ONE INDIVIDUAL INVARIABLY RESULTS IN A DELAYED FIELDING.

Problem Resolution

Although the administrative and management complexities are far reaching, they are no more so than are operational problems that face us in the field. Some of these problems may not be peculiar to ASE. They include:

Timely initial support, the proliferation of test equipment, the perpetuation of training, software and hardware reprogramming, and the storage and maintenance of increased quantities of classified materiel.

These problems are being pursued aggressively, but their resolution is not a onestep process.

During the development and production of the basic ASE item, there are concurrent efforts to develop aircraft interface provisions, to determine when and where the equipment will be married to the aircraft, and to program funds for the aircraft application.

The aircraft interface provisions are designated to accept a particular ASE item. These provisions allow the basic ASE configuration to remain the same although applied to several different aircraft types.

The Project Manager capitalizes on new aircraft production, on-going aircraft conversion programs, and cyclic overhauls to provision the aircraft to receive the latest ASE available. This is the most cost-effective approach for incorporating ASE and has the least amount of impact on the operational readiness of aviation units. However, time is our worst enemy.

For those aircraft in the field that are not

(ILS/Continued on Page 84)

Labs Support of the Technology Base; How They Support the Program Manager

By ROBERT G. PALAZZO
Chief, Electronic Warfare Division,
Electronic Warfare Laboratory, Fort Monmouth, New Jersey

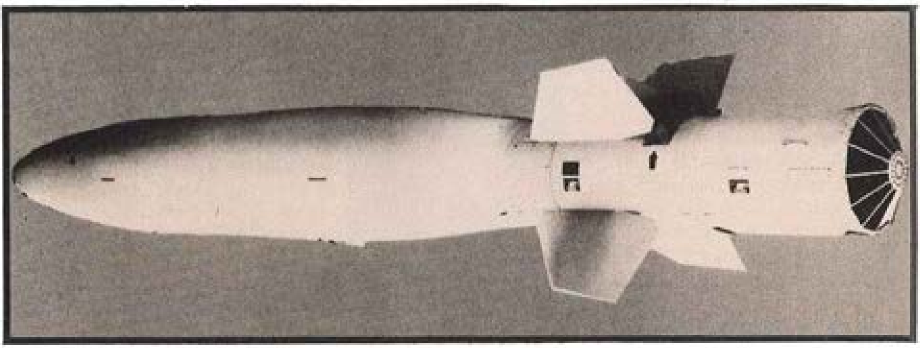
The Aircraft Survivability Equipment (ASE) already fielded and in development will greatly increase the Army's combat effectiveness by reducing or eliminating the enemies ability to detect, hit, damage or destroy Army aircraft on today's battlefield.

The Electronic Warfare Laboratory (EWL), Fort Monmouth, NJ is the developing agency for many countermeasure systems for the Aircraft Survivability Equipment Project Manager. These include the radar warning receivers AN/APR-39(V)1 (V)2, AN/APR-44; radar jammers AN/ALQ-80, ALQ-136(V)1 (V)2, ALQ-162; IR Jammers AN/ALQ-147, AN/ALQ-144; Missile Detectors ALQ-156, AAR-46; and laser warning receiver AN/AVR-2.

They are effective today, but will they retain their effectiveness tomorrow against the increasing complex and sophisticated air defense systems already under development which will be deployed on future battlefields?

It is unrealistic within today's budget constraints to attempt the production and fielding of all the possible ASE candidates that may prove effective or be required to survive against all enemy air defense wea-

AN/ALQ-147A(V)2 SYSTEM



Labs Support of the Technology Base

pons. We must, therefore, maintain an awareness of the ever-changing nature of EW and ASE without investing exorbitant sums on production and fielding of hardware, some of which may become inadequate or obsolete. What, then, is the cost-effective solution?

Technology Insertion

Since PM's do not have technology base funding available to them, as part of their management charter they look to the Army laboratories to provide the expertise upon which they can draw for their own development programs.

The ECM technology base under Project 1L1 62715 A042 is provided by the EW Laboratory. This program is divided into five technology product lines as follows:

Radar Warning, Radar Jamming, Infrared Jamming, Missile Detector Techniques, and Electr-Optic Countermeasures.

Supporting these EW technology product lines are those of other ERADCOM Laboratories' **Night Vision and Electro Optics Laboratory and Electronics Technology and Devices Laboratory (NVEOL & ET&DL)** which provide new and improved components (lasers, TWTS, IR Sources, etc).

The major objectives of EWL's technology programs are:

1) to perform "What If" studies of presently developed and fielded systems against projected and postulated future threats to assess their effectivness,

2) To evolve new methods of countering enemy air defense weapon systems through studies, computer simulations, development of brassboard systems and field experiments, and

3) to perform technique investigations to provide state-of-the-art and improve subsystem and components for replacement and insertion into existing hardware design.

The five EWL product lines represent in FY-81 a $3 million investment in technology for aircraft protection.

Strategy

The issue becomes one of maintaining an adequate technology base and an innovative means of inserting this technology in equipments which are fielded, and also equipments in development. This must be effectively accomplished without increasing their development cycle or impacting the hardware configuration of fielded systems.

Hardware configuration would include "A" kit changes since the cost and associated aircraft down time can overshadow any hardware or "B" kit changes.

The hardware designer must have enough foresight to provide sufficient flexibility (space and power reserves) with ECM hardware to incorporate new subsystems with this advanced technology, and this must include the electronic design itself.

Technnology Insertion must be designed in from the inception of the hardware. The in-

herent flexibility of today's computer-based (miscroprocessor) ECM designs has been a major step in realizing technology insertion.

Technology Challenges

The challenges that must be met and solved by this technology cover a wide spectrum of threat system improvements to include improved signal processing, multiple operating modes, and CCM techniques. Examples of these challenges in the radar, IR, and E-O areas are listed in Table 1. As we can see, challenges are formidable, but solutions are forthcoming.

Payoff

The EWL technology base program has supported and maintained an ECM technology base from which ASE development programs have been able, and will continue, to draw upon for new ECM techniques and technologies. Some examples of these have been improved sources for the AN/ALQ-144 Infrared Jammer; a feasibility millimeter wave warning receiver which became the basis for an advanced development program; a promising lightweight mono-pulse countermeasure subsystem for possible adaption to radar jammers; and a frequency extension for the AN/AVR-2 laser warning receiver.

Furthermore, the technology program prov- a viable and expanding data base of modeling simulation and field test results that are incorporated into existing hardware via new ECM techniques to increase their effectiveness and are the basis of new ECM hardware developments.

The technology base is the arena where the frontiers of ECM are challenged, encouraged, and evaluated at affordable cost prior to entering development. It is the breeding ground of future ECM techniques which the Army will need to keep ASE effective against new and more sophisticated threats on the modern battlefield.

The Electronic Warfare Laboratory is proud to be part of the ASE team and to contribute to the Army's ASE program.

TABLE 1—THREAT SYSTEM IMPROVEMENTS

SYSTEMS	RADAR	INFRARED	ELECTRO-OPTICAL
WARNING	MILLIMETER WAVE COVERAGE	SOPHISTICATED MISSILE PROCESSING; CCM TECHNIQUES HIGH OUTPUT/ EFFICIENT SOURCES	COMPLEX BATTLEFIELD CLUTTER; DISCRIMINATION TECHNIQUES
JAMMING	COUNTER MONOPULSE	BATTLEFIELD ENVIRONMENT; MISSILE SIGNATURES; ATMOSPHERICS	CCM TECHNIQUES; SIGNATURE; MULTI-WAVELENGTH SOURCES
DECOYS	WIDEBAND & EFFICIENT TWTS; IMPROVE DECOY EFFICIENCY/ SIZE EFFECTIVE DECOY DEPLOYMENT	SENSOR DEVELOPMENTS	SENSOR DETECTORS; POINTING & TRACKING DECOY DEPLOYMENT

The ASE Near Term Program; Keeping It Simple

By FRANK A. REED,
Chief, Technical Management Division, Office of the PM—ASE,
U.S. Army Aviation Research & Development Command

In a discussion of combat effectiveness, all too often the dividing line between potential and actual capability is overlooked. It's very easy to talk about what is coming in the near future, but it's also very difficult to establish where we are today and what has to happen to make the future a reality.

In the case of ASE, that dividing line is finally being crossed such that the force multiplication potential of ASE systems is being realized in the field rather than just discussed at home.

Systems are being fielded in quantity and the character of our aircraft are changing, some very obviously in outward appearance. The future that used to be is here today, and the discussion of combat effectiveness now centers on training and tactics where it most needs to be.

But there is also a new horizon and, in the case of ASE, the capability that we enjoy today can quickly erode tomorrow as the threat technology changes. In the following discussion, the current and near term ASE program is reviewed from a "big picture" point of view so that the combat aviator will know that the ASE program is not just a game of potentials.

Have you ever been

The ASE Near Term Program

challenged to plan and execute a program that deals with every scientific and engineering discipline to produce state-of-the-art equipment that must not become obsolete? In addition, throw in limited resources and the requirement to maximize combat effectiveness at any moment in time!

An Open Ended Project

The above describes the ASE program, an open ended project guaranteed to tax your "tolerance for ambiguity" to its ultimate limit.

So how did the program realize success when born from chaos? Believe me, there was some divine intervention coupled with some good, farsighted planning (and a little luck) to get the program to the point it is at today.

The major rule followed from the start, **"Keep it simple,"** has paid off to a maximum. The simple systems were easier to develop and were also, in general, low cost. This gave the program the momentum to mature quickly and accomplish early success.

A quick glance at **Figures 1** through **3** will identify ASE systems which exist today. They are at the left of each logic flow diagram. Examples are passive signature reduction items such as paint and IR suppressors. The more difficult part of their requirements definition was how passive should they be and with an eye to the future, how should they be designed so that they would yield the maximum complementary effect from active countermeasures, in this case, an IR jammer?

"Keep it simple!"

Another example is the radar warning receiver complimented by a special purpose radar jammer. With **"Keep it simple"** in mind, the available resources, both monetary and human, were aligned with a plan that structured R&D programs against time such as items were fielded, effectiveness was optimally increased toward a certain near term goal. The ASE philosophy of tactics first; passive items

FIGURE 1 — ASE RF PROGRAM FLOW

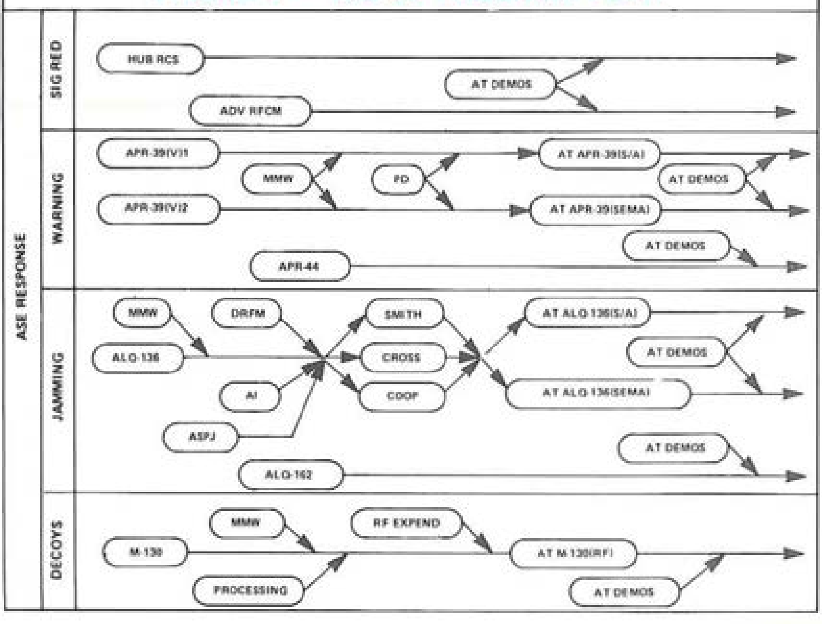


FIGURE 2 — ASE IR PROGRAM FLOW

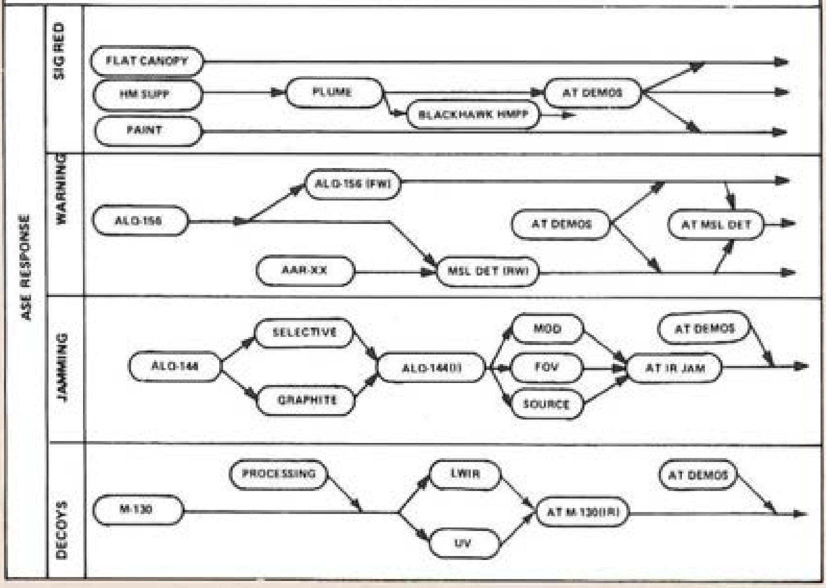
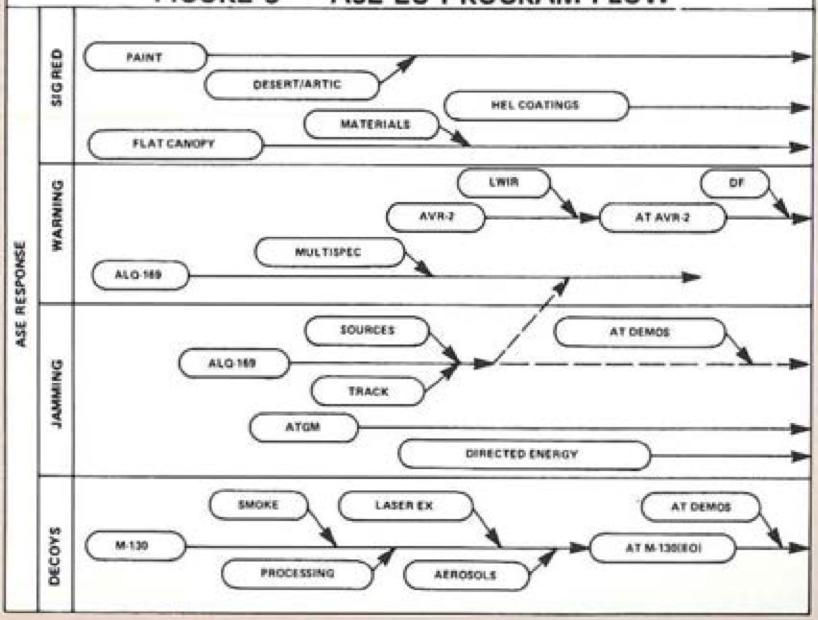


FIGURE 3 — ASE EO PROGRAM FLOW



The ASE Near Term Program

next; followed by warning, active jamming, and hardening was evoked, and the program born.

Today, every combat Army aircraft has been or is being modified with a baseline set of ASE systems. The important feature of these suites is that they were designed to be updatable and have set the stage for what happens next in the now mature ASE program.

The Near Term Program

Let's examine what is happening to insure that the systems of today do not soon become obsolete tomorrow!

The near term program is defined to span from now through 1987. During this period of time, the program plan must take into account new obstacles as well as the old ones. In the past, as now, the primary obstacle to ASE success was and is aircraft space, weight, and power availability to accept ASE items. Systems were tailored, and will be in the future, to overcome these problems, but affordability is now a major issue.

Because of the size of the Army's large aircraft fleet, even a modest cost item, when multiplied by large numbers, becomes a major investment. If it is a new system that will be fielded for the first time, significant funds and time for modifying aircraft ("A" Kits) will be required. Near term requirements have driven the program into an "**update whenever possible**" philosophy to meet the changing threat in order to reduce the investment in ASE to a minimum considering both cost and time.

This may seem like a backward program methodology, but it is mandatory in today's economical environment. This philosophy has been planned and is at this time being implemented to the greatest extent possible.

Technology has provided the microprocessor for software updates and top level management has recognized the requirement for fielding ASE on a priority and total fighting unit basis. The ASE challenge is how to update in a timed modular approach to obtain the greatest time-phased capability within the constraints that drive the program.

As an example, let's look at **Figure 1** which depicts the flow of ASE radar programs as a function of time and threat technology. In the case of radar warning, the APR-39(V)1 for attack and scout aircraft is seen at the left. From an EW point of view, it is probably the simplest of all systems while at the same time being one of the most powerful.

Modular Improvements

The plan for updating this system is to add modular improvements to extend its frequency range well into the **millimeter wave (MMW)** domain. This path was chosen based on cost and the large investment already made relative to aircraft that have been equipped with the APR-39(V)1.

Consideration was also given to the logistics capability that has been developed (at considerable pain) and is now functioning. The idea is not to throw away what already has been achieved, but to build on it for the future. In the case of the improved APR-39(V)1, called for R&D purposes the AT APR-30(S/A), the changes will not be visible inside the cockpit.

The updates will consist of additional antennas and receivers interfaced with the APR-39(V)1 which will remain in place. Had the choice been to go to a new system based on technology available today, the impact would have been significant and may have resulted in a "potential" system whose affordability may have limited the procurement quantity and thus its ultimate contribution to total Army combat capability.

Similar Planning Evoked

As can be seen in **Figure 1**, similar planning has been evoked for the APR-39(V)2, ALQ-136(V)1, and the M-130 systems. Similar planning is also being executed in other areas as shown in **Figures 2** and **3** for infrared and optical countermeasures.

Obviously, total updating cannot occur because new threats will appear that have capabilities beyond those that the current ASE items address. Note that planning for development within the flow and logic of the program.

Also note that as the threat becomes more complex and sophisticated, ASE will be required to leave the domain of simplistic systems and their associated low costs. The ASE program is quickly nearing the point.

(NEAR TERM/Continued on Page 84)

Effectiveness Testing: Testing the new countermeasure against the threat

By WILLIAM S. (BILL) McDONALD,
General Engineer, Office of the Project Manager—ASE,
U.S. Army Aviation Research & Development Command

A fairly routine SLAR reconnaissance mission takes on an added dimension when the pilot and mission specialist receive an audio warning that momentarily chills the cockpit.

A quick cross-check of the **radar warning receiver** (RWR) scope verifies the audio and gives an initial source direction of the signal. Further processing by the RWR indicates the received signal has the proper threat characteristics for a surface-to-air missile target acquisition radar.

The very unappetizing thought of trying to survive an engagement with a sophisticated supersonic missile is rapidly becoming a reality. The next event, the SAM battery, activates its target tracking radar, which is usually a narrow beam emitter that tracks the target and provides data for target/missile intercept.

The pilot is notified of this action on the RWR scope. It's white knuckle time for the crew with the RWR signals indicating the aircraft is now being tracked continuously.

A quick check shows that jamming of the target illumination frequency has begun, and the survival of the aircraft now hinges on the electronic countermeasures (ECM) be-

Effectiveness Testing

ing employed by the onboard **Aircraft Survivability Equipment (ASE).**

The pilot quickly pursues the optimum flight profile for survival by making the correct flight attitude changes in rapid fashion, thereby optimizing the ECM antenna patterns and reducing his detectability. The crew's eyes search for the plume of the advancing missile, the onboard missile approach detector comes into play. As the pilot executes his evasive maneuver, he deploys chaff and utilizes his automatic ECM to further mask the aircraft.

If all is successful, a SAM will fly harmlessly to a self-destruct condition and the mission aircraft will turn to continue its portion of solving the intelligence variable of the C–I equation.

The foregoing scenario depicts a possible future engagement between an aircraft and a hostile missile battery, and these are the type of scenarios used to develop functional requirements and operational specifications for the components in today's and tomorrow's ASE suites. With proper planning, research, and analysis, ASE can prepare Army aircraft to operate against the anti-aircraft threats of tomorrow's battle environment.

Four milestone system development

Testing plays a major role in the evolution of aircraft countermeasures equipment. In a classical four milestone system development, two major test events occur.

The first test event occurs between Milestone I and Milestone II. This test event is **Developmental Test I and Operational Test I (DT I/OP I).**

This event marks the end of the advanced development phase of a product. The results from DT I/OT I are generally used to determine the optimum design, one that will then enter the engineering development phase. The major test event during engineering development is DT II/OT II.

Results from DT II/OT II are reliability, maintainability, supportability, compatability, and effectiveness with all areas being heavily interrelated. One quick example of how intertwined these areas would become would be antenna locations.

Let's say to increase system effectiveness antennas must be relocated to reduce fuselag profile blockage. The obvious questions tha arise are:

Does the new location provide enough isolation so the system doesn't interfere with other avionics systems?

What impact does the new location have on needed spares and how accessible is the new installation?

Can the level of repair remain the same?

How accessible is the new location to preventative and unscheduled maintenance procedures?

How does the new location change reliability of not only the antenna but the aircraft components and structures affected by the relocation?

The above is a short and somewha simplistic example of how a seemingly smal change can impact on a program. A somewha more graphic illustration of configuration alteration would be the simple addition of an arresting hook on the F-111. Where design is impacted, there is no simple textbook solution

How Are We Doing?

So much for philosophy, let's return to ou aircrew and from a standpoint of effectivenes testing examine how ASE is working today fo their survival tomorrow.

To do this, let's first define "test" which reads out as "the means by which th presence, quality, or genuineness of anythin is determined; a means of trial."

When **effectiveness** is added to test, th trial is now against the threat. To pass judge ment on an ECM system, detailed knowledg of both the countermeasures system and th threat system is required. Without a doubt, th area of highest risk during effectiveness testin is in correct threat definition.

Various intelligence sources are used t determine the latest known and postulate threat capabilities. Countermeasures, by the very nature, has been developed into fielde threat systems. As can be expected with a rea tionary type response, the threat may evolve in to its next growth version, thereby negating th original countermeasures.

The Army ECM community tries to mov swiftly to alter this forced obsolescence befor fielding a system by planning flexibility into each new generation of active and passive countermeasure devices.

Once the threat is defined and the initial countermeasures sets are made available for testing, a detailed program of sequential testing starts. Initially, the contractor is responsible for proof testing to specification standards. Once spec compliance has been demonstrated, closed loop laboratory testing follows. This is usually a computer-controlled and enhanced simulation test.

The dynamics of threat engagements are modeled and run in real time in varying scenarios to determine the proper combinations of countermeasures techniques and combat tactics. Once optimum techniques and tactics are determined, multiple runs are made to build a statistical base to evaluate effectiveness through **measures of effectiveness (MOE)**. During lab tests, equipment failures are also analyzed and some verification of contractor specification compliance is conducted.

Next, effectiveness testing combines all previous knowledge and experience in flight testing which insures that the countermeasures set can perform in its intended environment and defeat the threat using formulated techniques and tactics.

Flight testing varies from using actual firings on instrumented drones to simulations against captive airborne or ground-based threat simulators. Once fielded, the last two steps of testing are a recurring process as new threat variations are recognized.

Testing of Aircraft Survivability Equipment is an iterative process. Once fielded, countermeasures sets must be retested to update techniques and tactics. As the threat evolves, so must the countermeasures. ◄

COL N. Michael Bissell, right, Commander, 17th Aviation Group (Cbt), is shown receiving his Master Army Aviator wings from MG Moore, ACofS, J3, Eighth US Army, during July 23 ceremonies held in Seoul, Korea. COL Bissell became eligible for the award on June 1, 1981.

COL Niles C. Clark, Jr., left, receives the ceremonial flag from BG Jack A. Epperson, Commander, Army Depot System Command, during July 21 change of command activities at the Corpus Christi Army Depot. Behind Apperson is COL Walter Ratcliff, who retired as CCAD Commander after 28 years of service. At far left is SGM Donald Greelee, Depot CSM.

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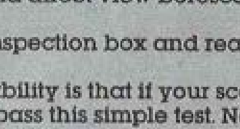

Operational Testing through User Tests: The Proof of the Pudding!

By COLONEL ROBERT A. BONIFACIO,
President/Commander, U.S. Army Aviation Board,
Fort Rucker, Alabama

The United States Army Aviation Board is chartered to represent the aviation community, the "user", during the materiel acquisition process of ASE. This vitally important responsibility is executed through the conduct of "User Tests".

"User Test" is a generic term representing many categories and types of tests, all of which place an item of equipment in a typical user environment in order to collect information to assess operational issues relevant to that item. Evaluating the degree to which a piece of equipment, whether active or passive, contributes toward survivability entails much more than demonstrating whether or not a device will work. Often that can be adequately demonstrated during development testing (DT).

Because survivability is interrelated with many other factors, such as aircraft performance, C^3, doctrine/tactics, training, target detection/acquisition, navigation, threat, maintenance, etc., the user test, which measures the effectiveness of a device in an operational environment, is the real proof of the pudding.

Inherent within determining the operational effectiveness of a device is

The Proof of the Pudding!

dependability. Dependability of ASE is described in terms of **Reliability, Availability, and Maintainability (RAM).** Operational RAM considers not only the inherent capabilities or deficiencies of the equipment, but also the ability of the individual soldier to repair and maintain an item using concepts and procedures which are provided in repair manuals and available tools and **Test Measuring and Diagnostic Equipment (TMDE).**

It is important that equipment works not only in the laboratory in the hands of technicians, but more importantly, that it works in the hands of combat troops in the field. A device must be capable of being diagnosed and repaired by the typical user working within the constraints of the tactical unit facilities using a typical prescribed load of repair parts.

Recent Tests Conducted

Because of the operational nature of tests conducted by the Aviation Board almost every test contains issues pertinent to aircraft survivability. Test reports and other "lessons learned" are provided to the aviation community for consideration in the development of doctrine, tactics, techniques, and equipment.

For example, the Mast Mounted Sight (MMS) and FLIR Augmented Cobra TOW System (FACTS) are not ASE per-se but it would be hard to argue that they do not enhance survivability. In the operational testing of items like this, emerging results and developing tactics and techniques are used to examine contemporary and developmental ASE to insure that the user's voice is heard early in the acquisition process.

Some of the more recent tests on ASE have included the AN/APR-39(V)1 and (V)2 Radar Warning Receivers (RWR), the XM-130 Aircraft

INNOVATIVE METHODOLOGY USED AT THE ARMY AVIATION BOARD IN TESTING THE AN/ALQ-156 RADAR MISSILE DETECTOR.

General Purpose Dispenser, the AN/ALQ-144 Countermeasurers Set, the AN/ALQ-136 Radar Jammer, the AN/ALQ-156 Radar Missile Detector, and other ASE.

Suitability testing of the AN/APR-39(V)1 RWR was conducted at Fort Bliss, TX, and effectiveness testing against multiple radar simulators was also conducted. As a result of operational testing, recommended changes to the equipment were submitted. These changes were incorporated into production models, thus providing a higher quality product to the user.

M-130 Chaff/Flare Dispenser

The M-130 is a chaff/flare dispenser designed to protect Army helicopters against radar-guided weapons systems and Infrared (IR) missiles. The system was tested on helicopters at various test sites. The M-130 (Chaff) is dependent on the use and proper interpretation of the Radar Warning Receiver indications while the flare mode of operation is designed to operate with a missile approach detector.

The AN/ALQ-144 is an IR jammer designed to defeat IR threats to Army helicopters. It is an active electronic device which can be turned on and forgotten during the mission requiring little additional workload on the aviator. The system was tested for effectiveness and endurance testing was also completed. Four systems were flown a total of 750.5 operating hours.

Findings during the OT/DT II resulted in minor modifications to the hardware. Recommendations were adopted changing the maintenance concept to allow more organizational maintenance and to include an Aviation Intermediate Maintenance (AVIM) level where none existed to affect faster repair turnaround time for the unit.

The Radar Missile Detector

The Operational Test of the AN/ALQ-156 Radar Missile Detector was recently completed. Innovative instrumentation and methodology was incorporated into the test to compensate for the reluctance of all concerned to fly the system in an aircraft against a live threat missile.

Instead a howitzer was used to represent the threat.The projectile offered similar radar signatures and the velocity of the round could be adjusted to represent a threat array. The howitzer was fired on an offset trajectory at the aircraft so that the projectile would penetrate the missile detector's protective circle thus allowing the system to be operationally evaluated.

The Aviation Board is currently scheduled to conduct user tests on the AN/AVR-2 Laser Detection System (LDS), the AN/ALQ-162 Continuous Wave (CW) Jammer, and the Optical Warning Locator/Detector (OWL/D). Test Managers are currently following the development of these items to ensure the aviation user community is represented early in this process. And, as stated previously, ASE aspects are assessed in virtually every test conconducted by the Aviation Board.

Conclusion

The Aviation Board's motto, "Fidelis Operanti" (Fidelity to the Operator), signifies the commitment of the Board to the user. We are proud of the role we play in contributing to the efforts of the U.S. Army to supply dependable, effective ASE to the aviation user in the field.

Operational Experience is the key to realistic development

By MAJOR DAVID L. CUNNINGHAM,
Assistant Project Manager, Electro-Optics, Office of the Project Manager, Aircraft Survivability Equipment, USAAVRADCOM

An inherent mission of **Aircraft Survivability Equipment (ASE)** is to develop the most effective countermeasures for known and postulated threat weapon systems. Such developmental efforts may range from the application of existing tactics to the development of ultra-sophisticated, state-of-the-art, Radar/Electro-Optic/Infrared Systems.

The Project Manager's primary role is to provide a nucleus of coordination and control for the daily developmental activities associated with specific systems. In the management of their projects, each Assistant Project Manager must bring forth the necessary leadership to guide the development effort through a multitude of essential requirements. Such leadership is requisite to keep the project not only within the framework of acceptable cost, schedule and technical performance, but to ensure compatibility with the "real world" environment.

The ability to keep a program on a "real world" scale is the greatest challenge the Assistant Project Manager must contend with. The difficulty begins with the very cosmopolitan nature of the term "realism" itself. It is not an issue a single individual should or

Operational Experience: The Key to Development

could adequately address; rather, it is a collection of ideas and thoughts formed into a comprehensive statement acceptable to the community at large.

To make the application of "realism" even more difficult, one must consider the very nature of Aircraft Survivability Equipment. Essentially we are dealing with the development of countermeasures for threat weapon systems, which requires a precise, detailed knowledge of such systems and their employment.

Of even greater consequence - the same requirement exists for threat systems not yet fielded but whose development is expected. In certain cases such intelligence is relatively well defined because of hardware possession. In other cases, it's a result of technical and political analysis which can change as quickly as the tide. "Realism" often becomes an elusive abstraction.

Definition and Redefinition

A threat capability, once defined, must be further identified as a threat to Army Aviation and even more specifically to aircraft type, mission, and operational area. The task of matching threat capabilities to specific countermeasure requirements is essentially a TRADOC function.

But again, it involves a coordinated effort among intelligence analysts, operational users, combat developers, and, of course, the PM-ASE. In many instances the requirement is clear and unquestionable as in the case of countermeasures for the basic infrared seeking missiles.

In other cases, the requirements analysis must be accomplished with less than a perfect knowledge of either the threat system capabilities or the real capacity of current tactics to neutralize such threats. The latter is generally the dominant situation which certainly provides the fodder for many lively discussions. It is in such discussions that the basic concept for each countermeasure program evolves.

In any discussion involving capabilities and tactical employment, a key factor that must be considered is operational experience. The experiences of each aviator involved in the countermeasures issue must be fully exploited. Considering such experience, the Assistant Project Manager must develop a sound appreciation for the views of the user community and disseminate the realistic capabilities of the developer.

There can be no tolerance for decisions that are based purely on emotional input, nor can we afford to base critical decisions solely on our own individual experiences whether they be from flying operational missions in Europe or Korea, flying actual combat in Vietnam, or from participation in special evaluation and test programs.

Very few individuals, much less units, have a depth of actual combat experience against currently identified threat systems and certainly none against postulated threat weapons.

Drawing upon All Others

The term "**operational experience**" should not be construed as being limited to **aviators**. We must consider the operational experiences of combat, combat support, and combat service support elements as well. The Infantry Commander may certainly have a valid input relative to the effect of certain aircraft countermeasures when employed or activated in the vicinity of his area of operations. Likewise, the Logistics Commander may be able to appraise us of what we may realistically expect of specific support concepts.

Another facet of "**operational experience**" which must be examined is that of our other services. Our blue-suited brethren have been actively involved in the countermeasures business since the beginning. Our Navy and Marine compatriots have also successfully defeated many of the same threats that we, in Army Aviation, now encounter.

It is simply common sense to share not only our technical information but our operational experiences as well. In most instances the operational environment is so vastly different that one could not begin to imagine compatibility but, invariably, a common thread will exist.

Another pool of "**operational experience**" can be found with our allies. Some countries do have recent combat experience against cur-

OPERAT'L EXPERIENCE

(Continued from Page 70)

rent threats and are certainly a realistic source of information for our own programs. In a more common vein, other countries may have conducted evaluations with similar countermeasure programs. The results of such evaluations and related experiences can prove invaluable in our own developmental efforts.

A Cauldron of Contentions

As we progress from requirements definition to hardware development, the dialogue exchange begins to include an even greater population. Within the development community, every functional area certainly has a justifiable contention of what is realistic for specific programs; however, as with the user community, one must realize that such contentions are often formed from a cauldron of established methods, preconceptions, and imperfect information.

Since the development effort is non-linear and requires concurrent actions from a multitude of functional areas, any misconceptions can spell disaster for a project.

I've described the various sources of "**operational experience**" but such experience can have a positive effect upon the development effort only if properly assimilated and applied. The task of disseminating such a vast array of information, and having it commonly accepted and understood by a multitude of people, would normally be next to impossible. However, the professional impetus of all people in Army Aviation is the catalyst that makes the impossible happen.

Today, we enjoy a sound Aircraft Survivability Program that is well on the way to fulfilling the most crucial requirements. Because of the foreign technology explosion, tomorrow's programs must be even more responsive to threat developments and our own capabilities. It is useless to develop hardware that is absolutely effective if we cannot afford to field it due to cost or technical complexity.

While a cornerstone of ASE, technology is certainly not a panacea. Today's Army aircraft are simply incapable of carrying large countermeasure payloads, and our ability to minaturize and integrate the multiplicity of required systems is dollar restricted.

The ASE program is special because it is truly a program of the future framed in the reality of today. To be effective, we must continue to maximize the advantages of tactics, insure adequate training, and demand efficiency in design.

Above all we must never forget that the ultimate weapon is the ingenuity and courage of the individual soldier. "**Operational experience**" is a reflection of that ingenuity — let's use it.

Shown receiving their Master Army Aviator wings from BG John C. Bahnsen, left, ADC of the 2nd Armored Division and a Senior Army Aviator, are, left to right, LTC John P. Kennedy, MAJ Glenn Granberry, CW4 Walter E. Jones (being pinned), and CW3 Thomas Shirley. MAJ John J. Sweeney, far right, received the Senior AA Badge. The award ceremony took place at Ft. Hood on August 4 and also cited MAJ James E. Enault; CPTs Steven B. Toon, Brian Thom, and Jeffrey W. McClure; and CW2 Bernard D. Partridge as Senior Army Aviators.

Lasers: A new threat to Army Aviation . . or are they?

By CAPTAIN DONALD R. FAINT,
Threat/Intelligence Analyst, U.S. Army Aviation Center (USAAVNC), Fort Rucker, Alabama

Almost from its inception, the **Light Amplification by Stimulated Emission of Radiation (LASER)** has been heralded as the ultimate weapon — a death ray right out of science fiction. But, in its early years, laser range was measured in feet, and power outputs were orders of magnitudes less than those required for a true ray weapon.

But research continued. The damage mechanism inherent to a beam weapon required the beam to be placed on a specific point and held on that point for a period of time; thus, a tremendous pointing and tracking problem resulted. To many people, these problems presented almost insurmountable obstacles.

Initial skepticism over the ability to generate lasers of sufficient energy for weapons application gave way to cautious optimism. Today, the laser weapon is a reality only a few short years away with the first fielding of a tactical laser weapon.

Research continues at a frantic pace amid feelings of cultivated optimism that an eventual technological breakthrough will entrench the laser as a weapon of the first order. The driving force to continue laser research was provided by the tremendous potential

Lasers: A New threat to Aviation Army?

and advantages offered by such a weapon system.

Aside from its destructive power, the laser offers a weapon with a time-of-flight so small that, for practical purposes, it is instantaneous, thereby eliminating the requirement to lead a target.

The laser beam's narrow width also permits the selective destruction of a single point target within a larger target group.

Lastly, the laser weapon offers the user the ability to handle a large number of targets due to its low "fuel" expenditure per shot, thereby enabling a single laser weapon to store a tremendous number of shots.

A promising air defense role

In the near term laser application is most promising in the short range air defense role. In fact, the Soviets, as early as 1974, in open source literature, discussed the use of laser weapons to not only defend against enemy aircraft, but to blind troops, destroy optics, and burn out electronics. All indications are that the Soviets will field a laser weapon, most likely an air defense weapon, within the decade and other directed energy weapons shortly thereafter.

But what is an air defense laser? How will it work? What is its range? What are the countermeasures?

All are good questions and are very difficult to answer.

Laser weapons are normally classified by power output: **low energy laser (LEL), medium energy laser (MEL),** or **high energy laser (HEL).** In terms of threat to Army Aviation, all three have a potential. But before we progress into the weapon itself, a few words on the laser itself are in order.

A laser beam is generated when atoms or molecules that have been excited to a higher energy level give off energy or "lase" and return to a lower, more stable energy level. This lasing produces a light at such a constant wavelength and phase that a focused beam possesses tremendous power and destructive potential.

So powerful is this energy, in fact, that it is capable of greater destruction over a small area in excess to that destruction generated by nuclear weapons.

A laser weapon consists of a lasing material to generate the beam; a beam control subsystem to focus, direct, and hold the beam on the critical point; and a fire control subsystem to acquire and select targets.

The pointing and tracking problems that plagued early laser weapons research have been largely solved. This was demonstrated by our ability to destroy aircraft in flight as demonstrated in 1973 when the USAF shot down a winged drone with a gas dynamic laser.

Again, in 1976, the Army successfully deployed lasers against fixed and rotary-wing drones. In 1978, the laser was used to engage and successfully destroy a TWO anti-tank missile in flight.

More recently, the USAF tested an airborne laser system against aerial targets. With the successful completion of this test, the laser has progressed from being a futuristic drawing board weapon to a weapon of reality.

How will it work?

The next question, "How it will work?" is almost impossible to answer without knowing the specifics of the particular weapon under discussion. In general terms, the laser threat is in two main categories: the LEL and MEL threat to aircrew electro-optics and electronics, and the HEL threat to the structural integrity of the airframe.

The moderately-powered laser weapons (MEL) would most probably be employed in an anti-crewmember, anti-electronics, and anti-electro-optics role. In the anti-crewmember role a laser can be used to flashblind or permanently blind aircrew members.

All electro-optics and electronics that require reflected energy for target acquisition are particularly vulnerable to disruption or degradation due to laser overload.

The HEL is the true zapper; it possesses the ability to cause catastrophic damage by burning through the thin-skinned components or canopy of the aircraft; by destroying vital components; and by igniting fuel and onboard ordnance.

Let's look at the question of range next. The range of an air defense laser is a primary func-

(LASERS/Continued on Page 84)

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Developmental Testing: Proving the Hardware!

By C.A. BLOCK,
Operations Research Analyst, U.S. Army Aviation Development Test Activity (USAAVNDTA), Fort Rucker, Alabama

The soldier in the field is equipped with the best **Aircraft Survivability Equipment (ASE)** that technology can provide. In order to insure that high quality is obtained, each piece of ASE undergoes a variety of testing.

There are basically two parts of testing-developmental and operational. The **developmental testing** (DT), which will be addressed here, is that testing which is conducted to demonstrate that the engineering design and development process is complete, the design risks have been minimized, and the system will meet specifications, and to estimate the system's military utility.

The **operational testing** (OT) is generally conducted by the typical user after the completion of DT and is a "hands on" in-the-field kind of test. The agency charged with the primary responsibility for DT testing is the **U.S. Army Test and Evaluation Command (TECOM).** The **U.S. Army Aviation Development Test Activity (USAAVNDTA)** acts on behalf of TECOM for the management of DT testing of Aircraft Survivability Equipment.

The USAAVNDTA is currently testing seven dif-

Developmental Testing: Proving the Hardware

ferent items of ASE for use by existing or future Army aircraft. These include infrared suppressors, radar and infrared jammers, and laser warning receivers. The types of tests conducted span all phases of developmental testing, to include prototype qualification, production validation, and product improvement. The result of the engineering testing assures that the latest technology is balanced against reliability and maintainability before an item is fielded.

Finding the "Environment"

Much of the ASE is tested at the Fort Rucker area; however, certain tests require environmental and range conditions that are not found at Fort Rucker. For these tests, the equipment is tested at locations such as Fort Drum, New York, during winter months; at the U.S. Army Tropic Test Center in the Republic of Panama.

Each of the above sites possesses a unique capability that allows the effectiveness of the particular item to be tested against not only various threats but also to determine how well it will stand up to extreme environmental changes.

The results of these tests provide insights on how effective the total system will be in warning, countering, or reducing aircraft vulnerability to the threat and also in providing indications of possible improvements.

Another phase of testing that is of interest is reliability. These tests are designed to determine if the equipment will meet the reliability and maintainability criteria stated in the requirements documents and specifications. This type of testing oftentimes leads to improvements that allow extension of replacement times beyond the initial requirement.

A most important phase of testing is human factors and safety. It is during this testing that a quantitative and objective test is conducted to insure a satisfactory man-machine interface. While the majority of this testing is conducted by the USAAVNDTA, other Army Aviation Center expertise can be called on for assistance.

The Center activities that provide this assistance are the U.S. Army Aeromedical Center, the U.S. Army Research Institute, and the U.S. Army Safety Center. This team approach insures that whatever is fielded can be operated safely and effectively.

Highly trained test project managers, test engineers, equipment specialists, and enlisted men make up the ASE Branch which is part of the USAAVNDTA's Systems Test Division. These personnel work closely with the ASE program manager to provide not only responsive testing, but also suggestions for design changes to improve system effectiveness.

The mix of personnel in the ASE Branch provides a depth and breadth of tactical and technical knowledge that insures that all aspects of a system will be fully examined before a release for production is provided.

The USAAVNDTA uses all of the test sites and all of its engineering expertise to determine that the ASE equipment meets or exceeds the design criteria established by the intended user. The developmental testing will ascertain that those things that can be measured have been measured before the equipment is turned over to the operational tester for his final evaluation as to the effectiveness of the system for use by the soldier in the field.

"Trial Before Combat"

The USAAVNDTA's motto of "**Trial Before Combat**" is more than a catchy slogan. We have over 300 dedicated military and civilian personnel whose only purpose is to assure that when the balloon goes up, the U.S. soldier will be equipped with the most technologically advanced but reliable piece of ASE equipment available.

The U.S. Army Aviation Board is chartered to represent the aviation community, the "user", during the materiel acquisition process of ASE. This vitally important responsibility is executed through the conduct of "User Tests".

"User Test" is a generic term representing many categories and types of tests, all of which place an item of equipment in a typical user environment in order to collect information to assess operational issues relevant to that item.

Evaluating the degree to which a piece of equipment, whether active or passive, contributes toward survivability entails much more

(PROVING/Continued on Page 90)

Take hits . . and keep on fighting!

By COLONEL EMMETT F. KNIGHT,
Director, Applied Technology Laboratory (ATL), U.S. Army Research & Technology Laboratories (AVRADCOM), Fort Eustis, Va.

The Army helicopter is a highly effective fighting machine. With its maneuver, firepower, and communications capability it is a potent offensive weapons system. Its inherent flexibility ensures its wide use on any future battlefield and it is sure to be right up in the thick of things, exposed to all the dangers and hazards of a hostile combat environment.

The enemy can be expected to field an awesome array of air-defense systems in large quantity with increased caliber and lethality; weapons systems which have been significantly improved in recent years. These ballistic threats will range from the 7.62mm ball projectile fired by the individual soldier through an array of automatic weapons systems including the impressive ZSU-23-4. This ordnance will be delivered by an enemy possessing advanced and highly efficient devices for detection, acquisition, tracking and placement of accurate fire on Army aircraft.

In addition, non-nuclear combat today would find U.S. forces outnumbered in terms of infantry armed with heat-seeking missiles, tanks, and artillery. The seriousness of the situation would be further com-

Take hits and keep fighting!

pounded by the presence of fast, heavily-armed enemy attack helicopters on the battlefield.

These are the conditions under which Army helicopters will be employed and it is the threat against which new helicopters are being developed. For it is obvious that Army Aviation must play a significant part if the U.S. Commander is to have the mobility, firepower, and staying power to win the first and subsequent battles.

To perform effectively in this hostile environment, the Army helicopter must show marked improvement in defensive as well as offensive capabilities and a higher order of toughness over their Vietnam era predecessors.

They must have the capability for quick response over both short and long distances; and they must have combat sustainability, ideally as an inherent design characteristic, i.e., they must possess the ability to operate in any threat environment; receive damage; complete the intended mission; and while damaged, continue operations for finite periods in order to perform additional missions.

Combat sustainability of the helicopter is extremely vital and will be dependent on a variety of factors to include operational tactics, signature reduction, electronic countermeasures, and hardening of the aircraft against the various threats. This article addresses efforts currently underway at AVRADCOM's **Applied Technology Laboratory (ATL)** which are intended to ensure sustainability through inherent ballistic toughness.

Ballistic Protection

Due to the sophisticated threat environment described, helicopter designers are confronted with a formidable task. Of primary importance is the comprehensive identification of specific threat projectiles, vulnerable areas of the helicopter, the probable effect of hits within these vulnerable areas, and the subsequent identification of survivability improvements required.

Further, it's imperative that protection be engineered at acceptable cost and minimum weight, especially when retrofitting or product-improving existing helicopters.

Through this process, two major areas that have been identified as particularly vulnerable may undergo substantial improvement. The first of these two areas is the helicopter structure itself, primarily the tail boom and the fuel system.

Tail Boom Improvement

This is a serious subject, but one can't help but note, as a well known fact of life, that it is highly advisable to protect your tail, and in the case of our helicopters, the tail boom is highly vulnerable. The conventional helicopter tail boom, in essence, is an inclosed metal structure of semi-monocoque design.

Detonation of a projectile within the tail boom induces several potentially catastrophic events, including massive removal of structure caused by fragments and excessive "breathing" of the structure in response to the high blast overpressure. Since the tail boom presents a large target area it contributes significantly to the overall vulnerability of the helicopter.

Investigations, including a considerable amount of actual testing, have shown that most of our existing conventional metal booms can be made more survivable through application of relatively inexpensive "quick-fix" hardening concepts.

Selective addition of straps and plates longitudinally along the boom and circumferential straps at the frames to serve as doublers would provide the necessary added strength. The addition of high strength rivets between existing skin attachment rivets and the installation of reticulated foam within the boom are other possible improvements.

These concepts have been demonstrated. They are, however, only expedient measures suitable for possible retrofit of current fleet helicopters. They do not properly address the fundamental problem.

The correct engineering solution must provide multiple load paths to ensure the continued capability of the structure to carry flight loads after fragment damage has been sustained; and it must provide a method of venting the overpressure generated by the detonation of high explosive rounds within the boom.

ATL research efforts have been directed towards the identification and application of more efficient materials to achieve toughness, structural redundancy and acceptable weight in a redesigned tail boom.

These efforts have led to the investigation of fibrous composite materials using an "open" weave or spacewound structural concept. The spacewound structure allows rapid venting of the blast pressure and provides redundant load paths. Two other "open" composite structural concepts which show great promise include the truss and tetracore.

Testing conducted by ATL on a truss type, open tail boom specimen, showed that the structure, after ballistic impact, continued to carry the flight loads for 30 minutes after impact with negligible measured deflections **(Figure 1)**. In general, the composite truss structure demonstrates high potential for improving ballistic tolerance at lower weight and lower cost.

Fuel/Fire Suppression

Of all combat risks faced by Army helicopters, the in-flight fire or fuel tank explosion is certainly among the worst. Testing and analysis have shown that the fuel tank is the single most vulnerable helicopter component. There are three basic catastrophic failure modes of the fuel tank which are of primary concern:

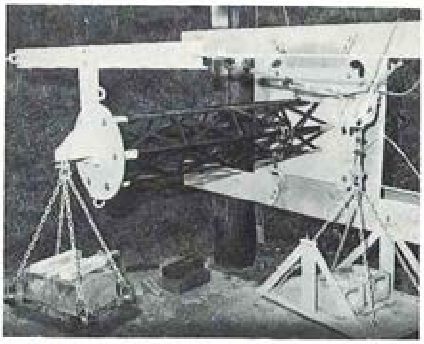
First, the projectile can detonate within the ullage area above the liquid fuel level in the tank and generate combustion overpressure of sufficient magnitude to rupture the tank. In this case the spilling of fuel would most likely be ignited.

Secondly, the projectile can impact the outer wall and detonate within the liquid fuel causing hydraulic ram pressure high enough to rupture the fuel tank. This can result in massive fuel loss and probable fuel fire.

Finally, detonation of the projectile outside of and adjacent to the tank wall and below the fuel level, either in the dry bay area or near the outer skin, will most likely result in fragment/blast damage to the tank wall with the spilling fuel being ignited.

Significant research

Significant research work has been accomplished over the past few years towards reducing ballistically-caused in-flight fires. The



OPEN TAIL BOOM SPECIMEN

use of highly ductile, self-sealing, crashworthy fuel tanks offer a high degree of protection against the ram effects.

Additional protection can be provided by using lightweight foams inside the tank to slow down the shock front and absorb the pressure. This internal foam protection comes, however, with increased weight to the aircraft and some fuel loss due to displaced and absorbed/retained fuel.

In addition to using internal foams, the concept of inerting the combustible vapors in the ullage space above the fuel is highly effective in preventing explosions and fire. This is accomplished by generating an inert gas onboard the helicopter and passing it to the fuel tank to inert the ullage area.

In trade studies, this has been found to be superior to using internal foams in that it's less penalizing to the aircraft from both a weight and fuel point of view.

Powder-filled panels

Application of powder-filled panels is an effective, lightweight method of preventing fuel fire which would be used in conjunction with nitrogen inerting to protect against explosion within the fuel. This concept evolved from testing which showed that if a fire suppressing agent could be placed near the fuel tank wall where it would be released by the projectile energy at impact, only small amounts of agent would be necessary to achieve fire protection.

The concept is applicable for use as a separate add-on panel or as an integral part (within the honeycomb) of an existing structural panel. Extensive testing has proven that the power panel is highly effective in preventing fires on the outer wall/skin and in small dry bay areas (**Figure 2**).

Active detection/suppression is also proving successful in providing protection against ballistically-caused fuel system fires in the larger dry bay areas adjacent to tanks. The concept uses detectors which sense the dry bay fire and provide a signal to discharge extinguishers.

Development of these concepts is continuing at ATL. Each is being enhanced for use against higher level threats and new, more effective powders are being investigated. It is important to note, that no one of these methods will prevent fuel fire or explosion from all three catastrophic failure modes, but when used in concert, complete in-flight fire protection is achievable.

Combat Battle Damage Repair

The ballistic protection measures covered here hold promise for a significant reduction in vulnerability with a resulting increase in staying power. Helicopters will continue to be hit, of course, and if we are to sustain our ability to fight, better, much more rapid methods of combat battle damage repair are required to complement the increase in survivability.

Toward this end, a program is underway to investigate rapid repair methods, provide quick-fix repair kits, and develop appropriate instructions, backed by proper engineering analysis for the safe repair of battle-damaged helicopters. The emphasis is on a rapid return to availability with minimum down time and without guesswork by maintenance personnel. Repairs will be adequate, not necessarily optimum; rapid, not necessarily pretty; and engineered to return safe helicopters to combat instead of back to "like new" condition.

Combat Sustainability

The helicopter is a combat-proven machine that has become an integral part of U.S. Army's fighting power. The threat is awesome and growing. Combat sustainability is essential if we're to win, and survivability against ballistic damage is necessary for the helicopter to do its part.

ATL continues to explore and develop more efficient and economic methods for improving combat survivability and sustainability of existing and developmental helicopters so that Army Aviation can "take hits and keep on fighting." ◄

FIGURE 2A—COMPARISON OF IMPACT APPEARANCE—TEST WITHOUT POWDER

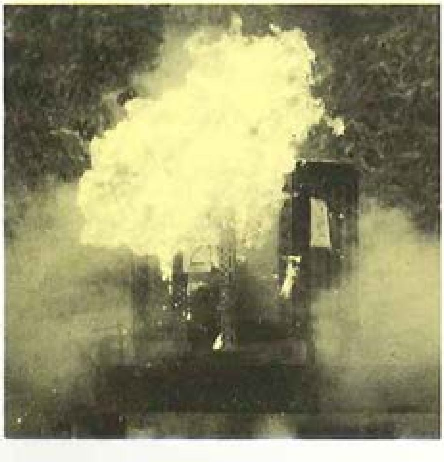


FIG. 2B—IMPACT APPEARANCE—TEST WITH POWDER-FILLED STRUCTURE

NEAR TERM PROGRAM
(Continued from Page 60)

The ASE program has firm direction and is well planned in the near future. Goals have been set which are achievable and will provide certain combat effectiveness. Each and every concerned combat aviator and all support personnel are encouraged to learn as much about the ASE program as possible through proper channels.

Each individual is challenged to become a contributor to the program by sharing innovative thinking and real world experience. It is with this direction that ASE will reach maturity within the field Army and the potential that it has will be realized in the increased combat effectiveness of Army Aviation.

LASERS
(Continued from Page 74)

tion of its power output and beam characteristics. Atmospheric attenuation plays a significant role in limiting the range.

Lasers, like any other light source, are reflected and attenuated by heavy rain, fog, dust, and battlefield obscurants. While beam attenuation is of major concern in the laser weapon atmospheric tactical applications, it presents a minimal problem in space application.

Research on laser countermeasures is being conducted in many different directions. Laser warning receivers, material reflectivity, ceramic hardening of warheads and critical components, and laser filters are a few examples of countermeasures.

Each countermeasure has its problems — warning receivers tell you that you are hit (too late); reflective material countermeasures would be expensive and are not state-of-the-art; hardening would be expensive and require a weight tradeoff; and filters that are effective on one laser wavelength may be totally ineffective on others.

Be that as it may, the above countermeasures represent the initial stages of what certainly will become a major part of Aircraft Survivability Equipment by the end of the century.

In conclusion, the laser weapon is in its infancy. However, with man's propensity for discovery, as well as combat, the laser will certainly receive developmental emphasis in the coming decade.

As power problems, coupled with tracking problems, are solved, the laser is expected to present a formidable threat to any particularly vulnerable tactical aviation forces, and their crewmembers, weapons, and avionics.

It is essential, then, that countermeasures receive similar emphasis to insure battlefield survivability.

ILS
(Continued from Page 52)

scheduled for a depot level program, a field retrofit is planned. Contractor teams are used to execute these retrofit programs to lessen the impact on organic forces. Although the field retrofit is a better pill to swallow for the units, its trade-off in men and materielin the event of hostilities makes the retrofit effort a small price to pay.

ASE began its life as a catch-up program during the Vietnam conflict, retrofitting aircraft under an urgent requirement. Today, new production aircraft are coming off the production line with ASE aircraft interface provisions already installed.

The Bad News.

That's the good news; the bad news is that the threat intrinsically changes. These same new production aircraft will eventually be confronted with new threats requiring modifications to the existing ASE suite under an urgent requirement.

Idealistically, ASE should be applied to an aircraft as a suite made up of the necessary countermeasure devices to effectively defeat all validated threats against the mission profile. The fact that not all countermeasure devices are available at any given time and not all aircraft have the necessary interface provisions to accept the devices.

In spite of the present shortfall in available assets, the recently-approved ASE fielding concept rounds out the ASE suites for all aircraft types, applying available assets on a unit priority basis rather than aircraft priority. This con-

(ILS/Continued on Page 90)

A view from the Pentagon: The good news outweighs the bad!

By LIEUTENANT COLONEL WILLIAM H. MALONEY,
Department of the Army System Coordinator (ASE),
Office of the Deputy Chief of Staff for Research, Development & Acquisition, HQDA

Before getting into the specifics of the Army's ASE program, there is some good news and some bad news.

First, the bad news. Projected Army battlefield scenarios of the future imply an increased Army dependence on responsive aviation capabilities in combat roles. The increased tempo and momentum of the modern battlefield dictate that our aviation assets be sufficiently survivable to be as effective a force on the last day of the conflict as they were on the first.

The Air Force and Navy have had their "baptism of fire" over North Vietnam and consider aircraft survivability equipment as much an integral part of an operational airframe as an engine or a wing. Army Aviation, fortunately or unfortunately, came out of Vietnam with little experience flying against radar and infrared air-defense weapons. The Army did most of its flying at 1,500 feet out of the range of small arms.

Since Vietnam, mostly as a result of the Israeli experience in the Middle East and the air-defense threat that the intelligence community has documented in Europe, the Army has dropped down to nap-of-the-earth flying and is serious

A View from the Pentagon

about stand-off ranges and pop-up tactics to protect its aviation fire power. These actions are all well and good — as far as they go. Unfortunately, the threat has continued to advance.

Well, enough of the bad news — here comes the good. **General John R. Guthrie,** the recent CG of DARCOM, echoed the thoughts of many of the Army leaders when he said, "The lethality of weapons found on the modern battlefield dictates that survivability be an essential characteristic of all combat material. Since the U.S. Army must be prepared to enter the next war outnumbered, we cannot afford anything approaching equal attrition exchange ratios. To ensure our success we must have not only superior firepower, but also great survivability."

An Aggressive Program

As part of this overall goal, the Army has an aggressive aircraft survivability program to protect all Army aircraft against the present and projected air defense threat. The mission of the Aircraft Survivability Equipment Project Management Office is to develop and procure appropriate countermeasures equipment and vulnerability reduction items to protect the current as well as the development fleet from the air defense threat.

This threat encompasses the entire spectrum of **infrared (IR)**, radar, laser, and optically controlled guns and missiles. The ASE Project Management Office also maintains the ASE technical data base to ensure that Army Aviation is prepared to meet new threats as they arise.

The TRADOC community has recently developed and DA has approved a very comprehensive ASE **Required Operational Capability (ROC)** which prescribes a basic and enhanced ASE suite of equipment for each aircraft. These suites have been developed as a result of detailed analytical analysis which played aircraft missions against the air defense threat that the aircraft faces in carrying out those missions.

This is the first time, as far as the ASE program is concerned, that the user and the developer are looking at the entire Army Aviation fleet, fielded and in development, and are reading from the same sheet of music for the **Program Objective Memorandum (POM)** years (1983-1987).

The Army's ASE program, which is still relatively new, has grown from a $5 million R&D program (basically IR paint and suppressors) a little over five years ago to a $25-30 million R&D effort (described in detail later) with a $100 million procurement tab in FY 82.

In addition, TRADOC — more specifically the aviation user — is taking a comprehensive look at Army Aviation in the 1990's weighing its projected capabilities against the threat. This effort, known as the Army Aviation Mission Area Analysis, hopes to identify aviation deficiencies and possible corrective actions (e.g., tactics, organizational doctrinal changes, materiel acquisitions, etc.) and most important of all, prioritized them.

It is anticipated that survivability will be one of the key deficiencies that Army Aviation must overcome in the 1990's. This effort should complement our POM road map in support of the ROC and for the first time give Army Aviation the long range analytically supported documentation it needs to build a consistent program for the future. Well, that's the good news and it far outweighs the bad.

A Broad Steering Group

To assist and guide the Project Manager, the U.S. Army has established an ASE Permanent Steering Group. The membership of this group include the **TRADOC System Managers (TSM)**, the **DCSRDA DA System Coordinator (DASC)**, the **DCSOPS Force Integration Staff Officer (FISO)** as well as other key members from Headquarters, Department of the Army, TRADOC, DARCOM, HQ FORSCOM, U.S. Army Logistics Evaluation Agency, and observers from the other services.

The ASE program is not limited to the U.S. Army. A number of the hardware developments are joint service projects. The three services (USA, USN, USAF) maintain a Joint Technical Coordinating Group central office in Washington, D.C. which permits us to share technology and test facilities. This group insures maximum cross-fertilization and integration of technology and hardware. The ASE

Project Manager is the Army's principal member of this organization.

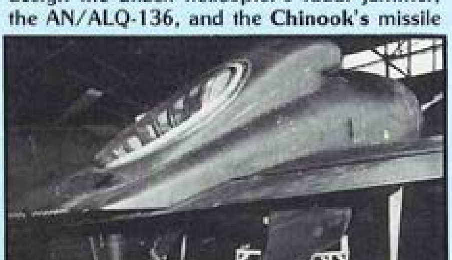
In the R&D arena, the ASE PMO manages the development, test, and type classification of equipments which have demonstrated the capability to significantly enhance the combat effectiveness of the helicopter fleet and Special Electronic Mission Aircraft.

Developments Underway

A few of the many equipments currently under development are such items as the AN/AVR-2 Laser Warning Receiver, a passive laser warning system which receives, processes, and displays threat information resulting from aircraft illumination by lasers. The threat information will be displayed on the AN /APR-39 Radar Detecting Set indicator.

A new Hover IR Suppressor System for the UH-60 **Black Hawk** is being designed to reduce the engine IR emission, both hot metal and plume. The IR suppression is accomplished by preventing line of sight viewing of the hot metal engine parts and diluting the engine exhaust hot gas plume. The AN/ALQ-162(V) **Continuous Wave (CW)** Radar Jammer will provide warning and protection against surface-to-air and airborne interceptor missiles. The signals detected by the system will be validated and either jamming will be initiated and/or warning will be given to the crew.

The AN/APR-39(V)2 Radar Warning Receiver, an improved version of the basic radar warning receiver, utilizes a digital processor and the alphanumeric display to provide warning of specific radar-directed air defense threat systems in a dense signal environment. A major P&D effort has been undertaken to redesign the attack helicopter's radar jammer, the AN/ALQ-136, and the **Chinook's** missile



OV-1 SUPPRESSOR

GRETA — GROUND RADAR EMITTER FOR AVIATORS

detector, the AN/ALQ-156, for application to other systems.

These items represent only a sampling of the survivability features and countermeasures equipment that will be installed on the aircraft in the field and are being integrated into the design of new aircraft in such a manner as to optimize survivability and ensure "staying power" on the high threat battlefield.

On the production side, the AN/APR-39(V)1 has been fielded to eight major commands with application to six different aircraft types. The OH-58C IR suppressor has been deployed to Europe and Korea.The ALQ-147A IR Jammer has been deployed. Radar and infrared jammers and missile detectors are in production and will be fielded in the near future.

These equipments will also be phased into the simulator program and a ground trainer, which will play the role of the air defense threat. The trainer, known as the **Ground Radar Emitter Trainer for Aviators (GRETA)**, has received glowing reports at Fort Rucker, Fort Campbell (101st), and Fort Hood (6th ACCB).

Briefly then, that's "What's happening in the world of ASE". As new threats emerge, the ASE program will continue to first modify existing ASE to counter the threat, or if necessary, develop new countermeasure equipment.

Army Aviation "has come a long way, baby", but the years ahead are going to be even more interesting and challenging, especially in the "World of ASE." ◀

DEPARTMENT OF THE ARMY

HQ, US ARMY AVIATION RESEARCH AND DEVELOPMENT COMMAND
4300 GOODFELLOW BOULEVARD, ST. LOUIS, MO 63120

SUMMARY

ASE programs are extremely complex, dynamic, and time sensitive. The ever-evolving threat demands that we concentrate our finest talents and energies to protect not only our expensive hardware, but our most precious asset--our aircrews. The sophistication of these programs requires the concerted, joint efforts of user, developer, and industry if we are to insure that future changes in the threat to Army Aviation are identified, analyzed, and met in an expeditious, effective manner.

The multi-faceted ASE program is designed to counter the threat by frustrating the enemy capability to acquire and maintain aircraft contact, by reducing system vulnerability to enemy fire power, and by training aircrews to work and survive in the modern battlefield environment. We have enjoyed tremendous success in all areas due to the team effort of our laboratories, TRADOC, FORSCOM, and industry led by the ASE Project Manager's Office. However, we must not become complacent. To survive in combat and accomplish our mission, we must continue to anticipate and counter the threat.

AVRADCOM will continue to support and improve ASE programs and initiatives to insure that our aircrews are afforded the most advanced protection on the battlefield our technology can provide.

Story C. Stevens

STORY C. STEVENS
Major General, USA
Commanding

ILS
(Continued from Page 84)

cept is not without its problems since ASE is funded by aircraft line.

By the end of FY 81 we will have completed 22 successful applications of ASE to ten different aircraft types over the past year,each aircraft receiving one or more of these applications. This has involved over 75 separate fielding actions worldwide to Major Commands.

If there has been one overriding lesson learned in the fielding of so many systems, it is that you can expect catastrophe to strike on a more or less regular basis no matter how good the planning has been. We've also learned that the secret to recovery is that extra mile that someone is willing to go.

People are more willing to go that extra distance if they are part of the team, have been kept informed of the progress being made, have had input to fielding agreements, and, most of all, have had personal contacts with other members of the team.

SYSTEMS INTEGRATION
(Continued from Page 36)

After this testing, the remaining problems are resolved to make the hardware more acceptable to the gaining units.

In the past, we have not had adequate funds to provide the full suites of ASE to all units aircraft. With the available limited assets, the ASE PMO fielded hardware to the contingency forces units first with much coordination between elements to determine the real priority units.

The **Rapid Deployment Force (RDF)** generated additional requirements for ASE hardware and additional funds are planned for its procurements. Significant coordination has occurred within the Army to establish a master priority list to insure that the highest priority units are provided with the required ASE to perform their mission in the most effective and survivable manner.

The systems approach to protect our Army aircraft against hostile threat weapons systems and to improve their combat effectiveness is a dynamic method of coordinating activities, personnel, and material in the development, procurement, fielding, and use of highly effective ASE systems. If the aircraft can stay and fight without attrition, we've done our job in enhancing Army Aviation as a force multiplier.

DEVELOPMENT TESTING
(Continued from Page 78)

than demonstrating whether or not a device will work. That, quite often, can be adequately demonstrated during development testing (DT).

Because survivability is interrelated with many other factors, such as aircraft performance, C^3, doctrine/tactics, training, target detection/acquisition, navigation, threat, maintenance, etc., the user test, which measures the effectiveness of a device in an operational environment, is the real proof of the pudding.

Inherent within determining the operational effectiveness of a device is dependability. Dependability of ASE is described in terms of **Reliability, Availability, and Maintainability (RAM)**. Operational RAM considers not only the inherent capabilities or deficiencies of the equipment, but also the ability of the individual soldier to repair and maintain an item using concepts and procedures which are provided in repair manuals and available tools and **Test Measuring and Diagnostic Equipment (TMDE)**.

LETTERS

LETTERS TO THE EDITOR ON ANY SUBJECT ARE WELCOMED AND SHOULD BE SENT TO THE ADDRESS APPEARING ON THE BACK COVER. THE WRITER MAY REQUEST THAT HIS NAME BE WITHHELD FROM PUBLICATION.

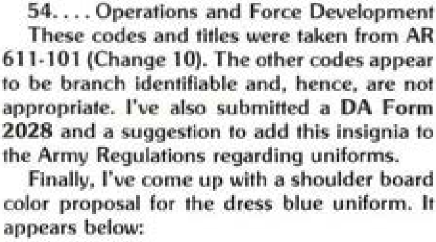
Dear Editor:

I was pleasantly surprised when I saw my article in the June 30 issue of **Army Aviation**. Since writing the article, I've been researching the **Specialty Codes (SC)** and have come up with those specialties that, I believe, when added to SC 15, would make an officer eligible to wear the prop and wing insignia. These are:

SC	Title
28	Training Development
43	Community Activities
46	Public Affairs
48	Foreign Area Officer
49	Opns Research/Systems Analysis
51	Research and Development
52	Atomic Energy
53	Automated Data Systems Management
54	Operations and Force Development

These codes and titles were taken from AR 611-101 (Change 10). The other codes appear to be branch identifiable and, hence, are not appropriate. I've also submitted a **DA Form 2028** and a suggestion to add this insignia to the Army Regulations regarding uniforms.

Finally, I've come up with a shoulder board color proposal for the dress blue uniform. It appears below:



(1) Light Blue (same color as the infantry shoulder board). This represents the sky and the infantry.

(2) Red (same color as the field artillery shoulder board. This represents the artillery.

(3) Yellow (same color as the armor shoulder board). This represents the armored forces.

The shoulder board is representative of aviation as it interacts with the combined arms team (infantry, armor, and artillery). Thank you again for allowing me to contribute to your journal and to present my views to my contemporaries.

MICHAEL V. STRATTON
Major, IN(?), SC 15/51
USAAEFA
Edwards AFB, CA

Gary Rast, 2nd from left, the Director of Gov't Business at Sikorsky Aircraft, presents the second of five $5,000 checks in late August to COL Max McCullar, Ret., Army Aviation Museum Foundation Executive Committee Chairman, as MG Carl H. McNair, Jr., left, Ft. Rucker Commander, and COL James O. Townsend, Ret., right, Foundation Treasurer, look on. The $15,000 Sikorsky pledge to the Museum Building Fund is being paid over a period of five years.

Calendar

DECEMBER						
	M	T	W	T	F	S
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31						

APRIL						
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23	24	25	26	27	28	29
30						

JULY-SEPT. 1981 AAAA MEETINGS

■ JULY 17. Ft. Hood Chapter. Late afternoon membership meeting. Election of Officers. Rod & Gun Club.

■ JULY 18. Checkpoint Charlie Chapter. 2nd Annual Summer Picnic. Bar-B-Q, UH-1 display, US/UK sports. Tempelhof Central Airport Picnic Grounds.

■ JULY 28. David E. Condon Chapter. Professional luncheon meeting. **MG Frank P. Ragano, Ret.,** ADPA, on "Defense Preparedness." Ft. Eustis Main NCO Club.

■ AUG. 11. Ft. Riley Chapter. Professional luncheon meeting. **Russ Rumney,** Bell Helicopter Textron, guest speaker. Ft. Riley Officers Open Mess.

■ AUG. 15. Mid-Pennsylvania Members. Activation Meeting. MUI Army Airfield, Ft. Indiantown Gap.

■ AUG. 17-19. Franconia-Marne Chapter. USAREUR-Wide Combat Aviation Helicup Competitions. Award Presentations and Party. Giebelstadt AAF.

■ AUG. 27. Jack H. Dibrell (Alamo) Chapter. "Super Social" sponsored by the "Graybeards." Bar-B-Q, Dancing, Free Beer. Pearl Brewery.

■ SEPT. 5. Morning Calm Chapter late afternoon "Pig Roast". Hughes 500MD on display. Camp Stanton O-Club.

■ SEPT. 8. Stuttgart Chapter. Late afternoon general membership meeting. Election of officers; 1981-1982 planning. Nellingen Barracks O-Club.

■ Sept. 16. Southern California Chapter. Professional dinner meeting. **William F. Paul,** Executive VP, Sikorsky Aircraft, guest speaker. Hacienda Hotel, El Segundo, CA.

■ Sept. 16. Mount Rainier Chapter. Midafternoon professional-social meeting. Hughes Helicopters' representative on "AAH". Ft. Lewis O-Club.

■ Sept. 17. Checkpoint Charlie Chapter. Business-social get-together. Columbia House, Tempelhof Central Airport.

■ Sept. 22. Lindbergh (St. Louis) Chapter. Professional-business luncheon meeting. "AHIP Program". Community Club, SLASC, Granite City, IL.

■ Sept. 23. Washington, DC Chapter. Professional dinner meeting. **MAJ Roy Mann,** US Helicopter Team Head Coach, and **Joe Mashman,** President, HCA, guest speakers, on the "1981 World Helicopter Championships." Ft. McNair O-Club.

■ Sept. 29. Air Assault Chapter. Late afternoon professional-social meeting. **MG Carl H. McNair, Jr.,** USAAVNC Commander, guest speaker. Snacks-Free Beer. Ft. Campbell O-Club.

■ Sept. 29. Bonn Area Chapter. Half day professional-social meeting. Luncheon, Brewery Tour, Dornier Co. presentation, Candlelight Banquet at German Army Aviation School. Bueckeburg, FRG.

■ Sept. 30. Delaware Valley Chapter. Professional dinner meeting. **BG James M. Hesson,** Dep Cdr, USATSARCOM, guest speaker. MacDade House, Holmes, PA.

■ Oct. 1. Cedar Rapids Chapter. Professional dinner meeting. **MG Carl H. McNair, Jr.,** USAAVNC Cdr, guest speaker. Nebraska Room, Stouffer's Hotel. Cedar Rapids, IA.

■ Oct. 2-6 (Tentative). S. California Chapter. Get-Together to View the Second Space Shuttle Landing. USAAAEFA, Edwards AFB, CA.

month's takeoffs

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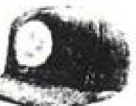

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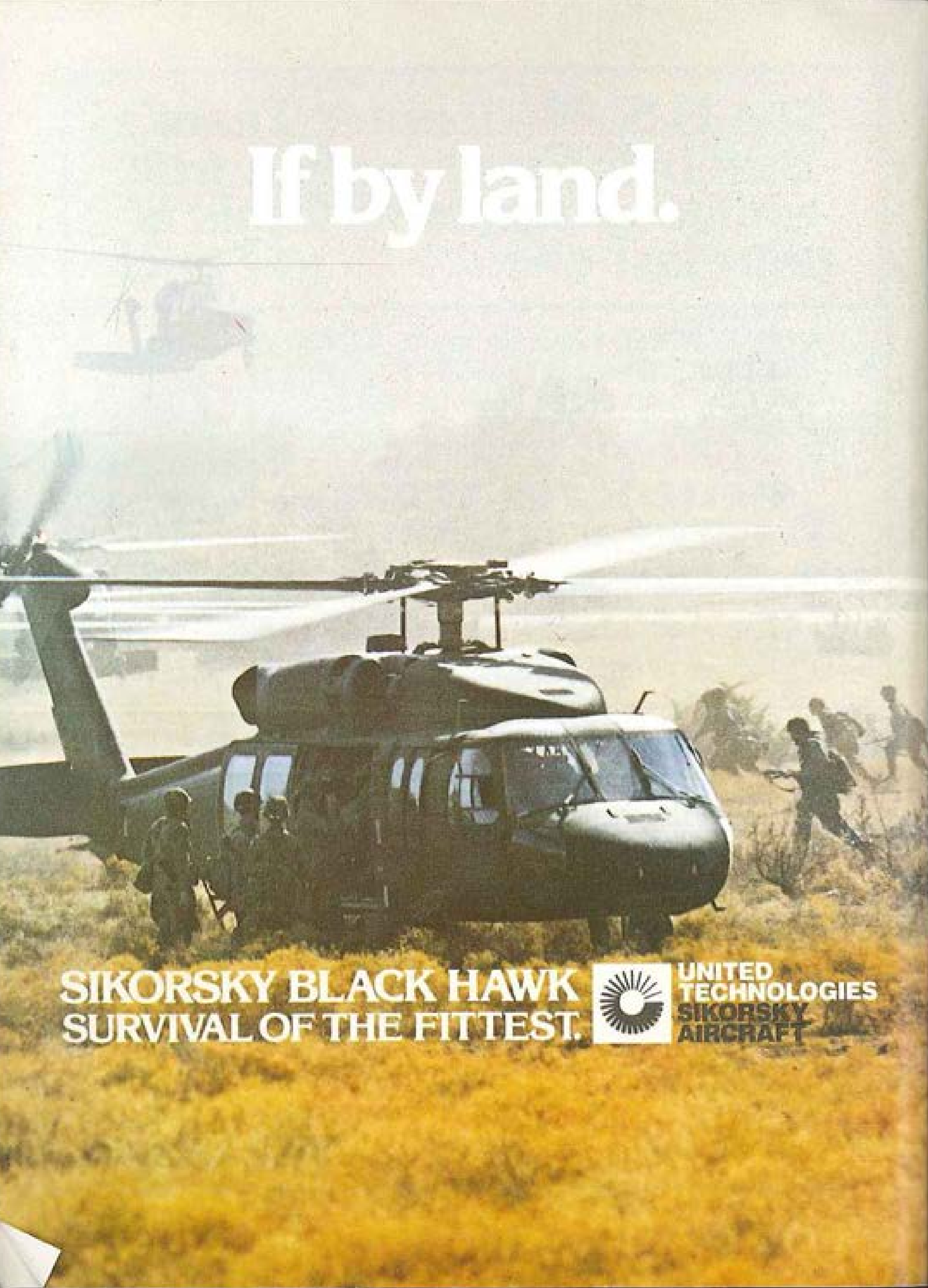
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