UNITED STATES AIR FORCE • APRIL 1968

Aerospace SAFETY

THE MAGAZINE DEVOTED TO YOUR INTERESTS IN FLIGHT

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April 1968 AFRP 62-1 — Volume 24 — Number 4

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PREFLIGHT

Air defense of the United States is an exacting mission. Add major responsibility for air defense of the North American continent and the size of the mission becomes almost impossible to describe. Beginning on page 2 we've tried to tell you something about the Aerospace Defense Command, (1) as a major command of the U.S. Air Force, and (2) as a component of NORAD—the North American Air Defense Command. Lt Gen Arthur C. Agan, ADC commander, kicks off this issue with an editorial on ADC and Safety on page 1.

Highly recommended for all F-4 crews is Major Lloyd Wayne's FLYING THE PHANTOM, page 16. The F-4, says former Phantom pilot Wayne, is a maximum performance doll who must be shown the proper respect. He discusses the aircraft's maneuvering envelope and offers some solid advice for those who are now flying and those who will strap on this potent bird.

This month's article on The Flight Director completes the three-part series on this system by the fellows at the Instrument Pilots Instructor School.

Accident prevention is the product of every man in the Air Force doing his best. On the back cover there's a pat on the back for all you guys who did such a terrific job in 1967. Keep up the good work.

You'll find some good poop in RAMP SAVVY, page 24, and NOISE PROBLEMS, page 22. And for aircrews who need the helping hand of Air Rescue, there's a picture spread on page 25 that we highly recommend. Read it and heed it!

ON THE DEFENSIVE

Aerospace Defense Command is a world-wide organization. Its 94,000 people are stationed at more than 480 bases and other locations, in areas as diverse and remote as the Greenland ice cap and Iceland, the Pacific Ocean area, Europe, the Middle East and Southeast Asia, as well as throughout North America. Its equipment ranges from supersonic air-refuelable fighter-interceptors armed with nuclear air-to-air missiles to extraordinarily sophisticated space-vehicle detecting radars.

As partners in the USAF deterrence team, aerospace defense forces have been on constant alert for more than 15 years, maintaining a defensive umbrella over North America every minute of every day.

Thus, the mission of the Aerospace Defense Command can be summed up in a word: Protection — protection of our nation's resources consisting of people, places and things. The effort required to accomplish the mission is not so easily stated. Success or failure depends on the productivity of a large organization, composed of highly skilled individuals, equipped with complex weapons systems. Members of the Aerospace Defense Command organization have a twofold responsibility, the first of which is to be continuously prepared to repel the airborne threat of any potential aggressor. The second, and equally important because it affects capability, is to preserve the health and integrity of the people and equipment which have been made available for mission accomplishment.

It has been said that people are our most important asset, and for good reason. Aircraft do not take off or land by themselves; automobiles do not take to the road by themselves. Accidents are directly attributable to the action, or lack of it, on the part of someone, somewhere. Whether flying a high performance aircraft or driving a car, people do not deliberately seek to cause loss of life or destruction of property. And yet, both are a common-day occurrence. All too frequently, experience has shown that highly competent, level-headed individuals have needlessly subjected themselves and others to tragedy.

Aerospace Defense Command recognizes the fact that human weaknesses exist, if only briefly, in the best of us. Therefore, safety programs in Aerospace Defense Command are designed to help make the individual constantly aware of his responsibilities to himself, his mission, and to others. Ignorance, complacency, and carelessness are not considered inevitabilities in the course of human affairs. They can be overcome and are overcome by the creation of a sixth sense of safety through education and motivation. Education provides the knowledge necessary to enable the individual to evaluate the consequences of performing or not performing an action. Motivation provides the spark or incentive necessary to make the individual want to put his acquired knowledge to good use.

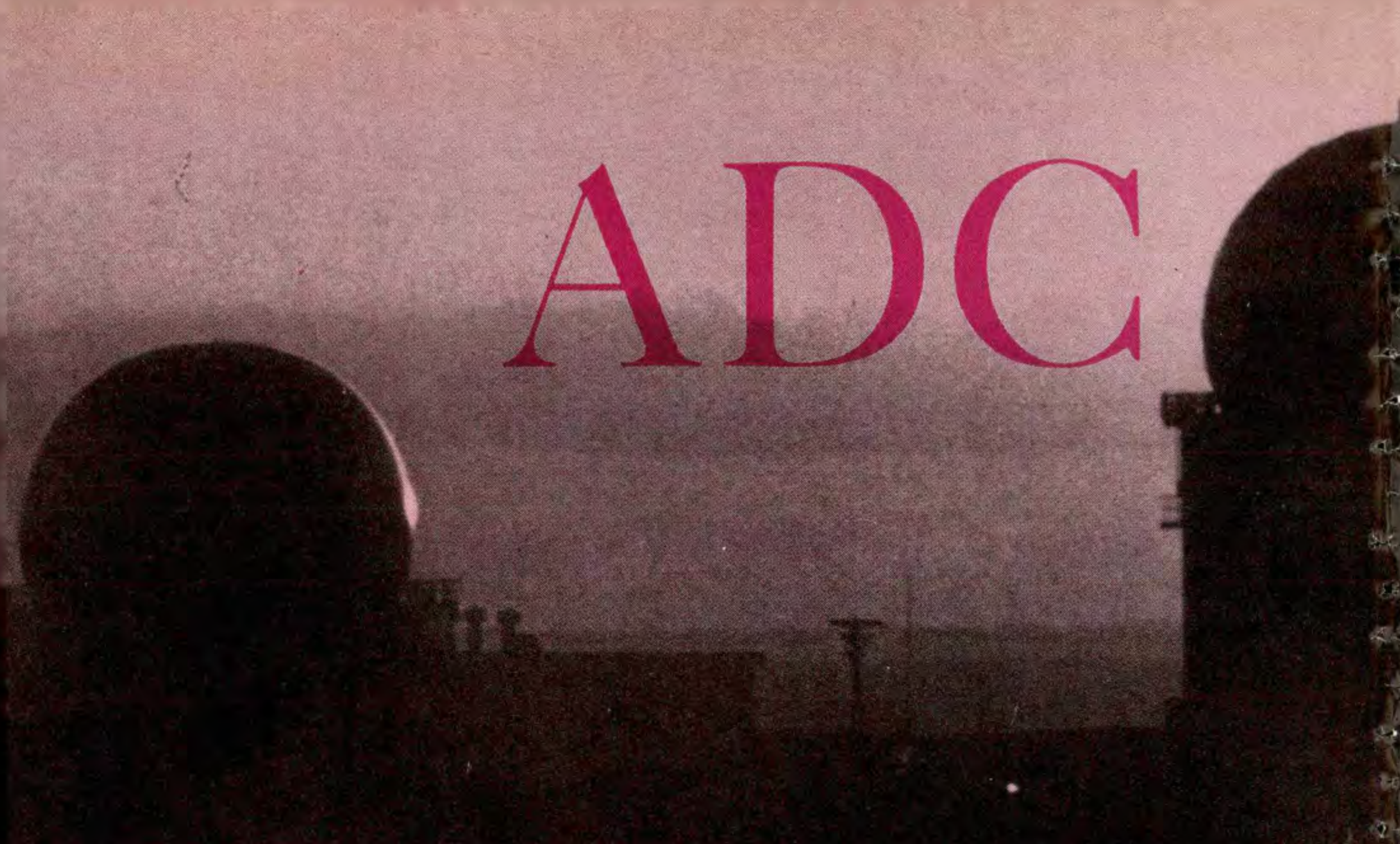
In the field of safety, the combination of education and motivation helps to produce a valuable human asset known as "common sense." Not "horse sense" as it is traditionally understood, but rather the inclination and the ability to make the right decision at the right time based on a sound knowledge of the consequences. In the Aerospace Defense Command safety environment, it is appropriate that command-wide application of "common sense" is sought through the introduction of "defensive" principles. For instance, to be defensive is to know with certainty that an airplane is fit to fly, or an automobile is fit to drive; to be defensive is to know one's own limitations and not exceed them; to be defensive is to be totally conscious of and prepared to cope with the potential hazards which exist during aircraft or motor vehicle operation. These are but a few of the necessary ingredients for a successful safety formula. However, the greatest single achievement in pursuit of a perfect safety record is convincing people to act in a manner which is conducive to long life, either their own or someone else's. This is a difficult task in spite of the obvious benefits to be derived. But it is not an impossible task. Each year brings a gradual and encouraging reduction in the number of accidents having similar cause-factors. This is a tribute to the untiring efforts of Aerospace Defense Command commanders, supervisors, and airmen who are doing a commendable job toward eliminating senseless loss of life and hardware.

Today, as in the past, Aerospace Defense Command proudly stands "on the defensive" for safety, and hence, for more effective accomplishment of the aerospace defense mission of the United States Air Force.

Arthur C. Agan

ARTHUR C. AGAN
Lt Gen, USAF
Commander

ADC



1968 began with the announcement that the Air Defense Command was now the *Aerospace Defense Command*. The change signified recognition of the role the Command now plays both within the atmosphere and in space.

The ADC Commander is responsible both to the Air Force Chief of Staff, and to the Commander-in-Chief, North American Air Defense Command—NORAD. NORAD consists of both Canadian and United States Forces under a single command, with ADC providing more than 70 per cent of its resources. In the event of a hostile attack involving both countries, ADC would act as an integral part of NORAD; if only this country were attacked, and it were determined there was no threat to Canada, then the Command would respond as a unit of CONAD.

The Commander of ADC, Lt General Arthur C. Agan, is responsible to USAF for organizing, training, and equipping USAF's Aerospace Defense Force. As Commander of a NORAD component, he is responsible to the NORAD Commander for providing U.S. Air Force elements for combat.

A pair of F-106s, ADC's primary all-weather interceptor.

tiger with teeth

ORGANIZATION

From the small force created in 1946 to cope with the threat posed by Soviet bombers, ADC has grown to a world-wide command of more than 93,000 personnel at more than 480 units. Today's threat includes bombers, ballistic missiles, and most recently, space vehicles. ADC provides antisatellite defense of North America. The Aerospace Defense Command story is an account of the men and equipment that are our first line of defense against these threats.

Organizationally, ADC is divided into four Numbered Air Forces with 13 Air Divisions and one Aerospace Defense Division. The Air Divisions are charged with the air defense of their respective areas. In each division is a combat direction center that would actually direct the air battle in case of an attack. The 9th Aerospace Defense Division has a different mission, which includes operating the world-wide SPACETRACK network and BALLISTIC MISSILE EARLY WARNING SYSTEM (BMEWS).

After the observer digests the idea that ADC

BOMARC missile. Early models provide targets, later models are on alert.

Ballistic Missile Early Warning site at Thule, Greenland. Other BMEWS are located at Clear, Alaska, Fylingdales, England.

ADC fighter interceptors, top to bottom, F-101, F-102, F-104, F-106. Modifications are improving capabilities of F-104 and F-106.

has a dual defense role, he also notices more differences from the other USAF commands. For one thing, ADC does not operate as many huge, complex bases as the other commands. ADC bases are small by comparison, and in most cases where aircraft are involved, the ADC unit is a tenant, a rather small unit on another command's base, or on a municipal airport.

DETECTION AND WARNING

The vast radar network that shields the North American continent exists for only two reasons — detection and surveillance. ADC operates nearly 200 radar sites situated along the Arctic Circle, in the U.S. and overseas. In addition, four-engine EC-121s patrol the skies over the Atlantic and Pacific oceans, their radars scanning, and computers relaying information into the NORAD COC.

Northernmost, and the system designed to provide the earliest possible warning against a bomber attack, is the Distant Early Warning (DEW) line. Its radars provide coverage from the Aleutians to Greenland. Backing up this system is a detection and identification capability in depth furnished by the radar sites in Canada and the U.S. as well as by the patrolling aircraft.

Assignment to some of these sites means a year in some of the most remote, barren spots in the world. Outstanding features are extreme cold, hurricane force winds, summers with days when the sun never sets and winters with days of complete darkness. But the stations must be manned and ADC crews operate round the clock to make sure no hostile attack will go undetected.

Introduction of the Intercontinental Ballistic Missile in the late fifties presented new defense problems that still have not been completely solved. Although a limited anti-ICBM defense system is under development, the fact remains that no effective method of repelling an all-out missile attack exists. The only defense at present is early warning to provide time to alert civil defense agencies, flush ADC's interceptors, and allow SAC time to launch its missiles and bombers.

Again the answer is radar. ADC operates the Ballistic Missile Early Warning System (BMEWS) which provides about 15 to 20 minutes warning time. This is assurance that we won't be caught flat-footed.

BMEWS consists of radar sites at Clear, Alaska, Thule, Greenland, and Fylingdales Moor, England. The huge antennae, 165 feet high by 400 feet long, beam radar energy into space through which an incoming missile must pass. If a missile were launched it would clear the horizon and pass first through a low fan then a higher fan of radar energy. Computers would read the echoes from these fans and compute the ballistic path. This information would be instantly fed into the NORAD COC, SAC Headquarters, the Pentagon, the Supreme Headquarters Allied Powers Europe, and the National Defense Headquarters in Ottawa.

Effective as BMEWS is, something additional is desired, and is being developed. This system, using over-the-horizon techniques, would detect a launch immediately after the missile left the pad. Disturbances in the ionosphere are detected by beaming radar signals across the launch areas to a receiver. Computer analysis of these signals would furnish earlier warning than is presently possible and would indicate any attempt to launch around the BMEWS fence.

With the Soviet Union possessing the largest submarine fleet in the world, it is prudent to protect against the possibility of sea-launched ballistic missiles. This means supplementing existing radar warning systems with special equipment. Seven sites on the Atlantic, Pacific and Gulf Coasts are being modified to survey those approaches to the continent. They can detect any missile launch at a range of up to approximately 1000 miles.

Radars capable of both searching and tracking will be employed with direct communications to the NORAD Cheyenne Mountain Complex (NCMC). When a launch is detected the radar will be automatically placed in a tracking mode. The site computer will calculate launch and impact points, and relay any threat data directly to the ADC facility in the CMC, which provides warning data to the designated units.

The most "way out" mission in the Air Force is that of detecting, tracking and cataloguing space objects. This is the job of the ADC SPACETRACK system. Since the first Sputnik went into orbit back in 1957, more than 3100 objects have been catalogued, and the number of items now in orbit is approximately 1300. Not all of these are payloads; many are debris from objects that have broken up. A Titan IIIC test missile for example, exploded into more than 275 separate pieces.

F-12, advanced interceptor being tested at Edwards AFB. ADC wants improved manned interceptor with F-12 capabilities.

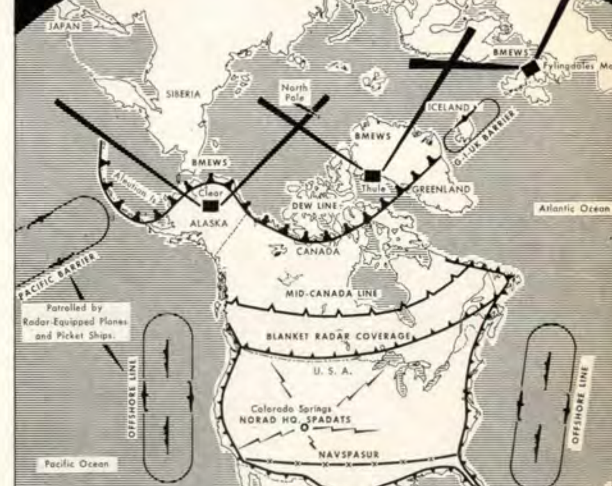
The task of counting and cataloguing this growing space population belongs to the NORAD Space Defense Center in Cheyenne Mountain. The Space Defense Center is the focal point for all the data pouring in from radar, radio and optical sensors from the mid-Pacific to the Middle East. ADC's analysts and computers have become so proficient that they not only have catalogued almost every man-made item circling the earth, but also know where each piece will be at some time hence, and can predict when one will fall out of orbit and reenter the atmosphere. This information is vital in an age where an attack could be launched from satellites.

Space surveillance will be greatly enhanced by the new AN/FPS-85 phased array radar at Eglin AFB, Florida. This huge radar complex is unique in that it does not utilize the rotating antennae commonly associated with radar. Instead, phased array radar beams are formed and steered electronically. The result is a system that can do in microseconds what would require seconds or minutes for a conventional radar system.

With a huge network of radars including BMEWS, the new FPS-85, and inputs from a variety of optical and electronic sensors, the SPACETRACK System will become an even more vital arm of ADC in the future. Also under development is an electro-optical device expected to have a capability of detecting a one cubic yard object in orbit 2000 miles from the earth. It should increase detection range on the order of six to one over radar.

And there are even more exotic systems to come. While it doesn't exist yet, a co-orbital interceptor is on ADC's list for the future. This vehicle could be steered into a position near an orbiting satellite by information supplied automatically by tracking sensors. The co-orbital interceptor could then identify its orbit mate and put it out of action if so ordered.

NORAD detection system includes radar coverage in depth from Arctic to southern border of U.S., as well as sea approaches guarded by radar aboard aircraft and ships.



Vast radar-communications network culminates at scopes where targets are presented to battle commanders, weapons controllers.

F-102 pilot takes a look at Russian bomber.

NORAD Combat Operations Center, Cheyenne Mt., Colorado. ADC provides more than 70 per cent of NORAD resources.

ADC says space technology has progressed at such a pace that the capability could exist before exploration of the moon.

COMMAND AND CONTROL

So far we have talked about some of the tools by which ADC performs its mission. Now, how are these linked together to provide an effective and integrated defensive force?

Selected information acquired by the radars is fed into the NORAD COC in Cheyenne Mountain and into direction centers in each air division. This is done by radio, microwave and landlines. On the receiving end are complex computers that digest the incoming data, classify and store it for instantaneous presentation. The direction centers' primary equipment is the familiar SAGE (semi automatic ground environment). Each SAGE blockhouse contains two giant computers, each backing the other, that cover an area approximately one-third of an acre.

The information presented by these electronic monsters is presented visually on electronic tubes to the battle staff in the direction center. The variety and amount of data is hard to believe. The man at the console can, for example, identify a blip on the screen as to type of aircraft, direction and speed, and altitude. He does this by focusing a light gun on the blip, whose speed and direction are already indicated by the track it makes on the tube. Within moments of querying the target with his "gun," all the data pertinent to the aircraft are printed out for the controller to read.

Occasionally an unknown shows up in the Air Defense Identification Zones (ADIZ), and must be identified—this means ADC fighters must scramble. The horn blows at an interceptor base, and within minutes a flight is airborne. Three of ADC's tasks are rapidly accomplished. The target has been detected, now it is intercepted and identified. Usually it is an aircraft off course. Sometimes it's a Russian aircraft flying a little too close to the North American continent.

To destroy all of ADC's radar sites that would reveal his intentions would be an almost impossible task for any would-be aggressor. However, the SAGE centers are relatively vulnerable to nuclear attack. ADC's capabilities are based on the probability that a bomber attack would follow an initial nuclear missile onslaught. With this in mind, the Command has developed a backup interceptor control (BUIC) system. Representing a later state of the art, BUIC computers are miniaturized versions of SAGE, widely dispersed to make them nearly invulnerable. If a SAGE center were knocked out, BUIC installations at any one of several locations could automatically take over and enable the battle staff to continue to direct the air battle.

Obviously there is room here for only the sketchiest description of the enormously complex defense system. Briefly, however, in addition to SAGE and BUIC a manual capability also exists to assure that any enemy force would be dealt with.

THE WEAPONS

Among the Soviet Union's bombers is the Mach 2 Blinder, with a service ceiling above 50,000 feet and a 4000 nautical mile range. It is equipped with air to surface missiles which have a range of several hundred miles and make it a potent weapon indeed.

To counter the bomber threat, ADC operates four types of fighter interceptor aircraft:

The F-101 Voodoo, a two engine, two seater capable of above 1200 mph. It can engage targets to above 50,000 feet and has a crew of two, a pilot and radar intercept operator.

The F-102 Delta Dagger can do better than 800 mph and has roughly the same altitude capability as the F-101.

The F-106, nearly 10 years old but ADC's newest fighter interceptor, can fly faster than 1400 mph, operates above 50,000 feet and is being modified to increase its capability.

The above are all-weather aircraft equipped with radar and infrared guided missiles, some with nuclear capability. ADC's other interceptor is the F-104, an air superiority fighter armed with missiles and a cannon capable of 6000 rounds a minutes. Its speed capability is in excess of 1400 mph and it can operate above 58,000 feet.

In addition there is the BOMARC missile, a rocket boosted, ramjet powered interceptor with a nuclear capability. BOMARCs are located at several northeast bases.

ADC's 27 fighter interceptor squadrons and the 21 Air National Guard Air Defense units, are located throughout the U.S.

To keep sharp, the crews fly intercepts against other aircraft. Exercises and evaluations are held frequently, using B-57s with sophisticated electronic countermeasure equipment to test the interceptors' ability to get their targets. Once a year each squadron deploys to the Air Defense Weapons Center at Tyndall AFB, Florida, for live firings at air-to-air missiles. Targets are Firebee drones launched at Tyndall, and early model BOMARC A missiles launched from Hurlburt Field. The BOMARCs are fired by crews on rotation from BOMARC squadrons, to the 4751st Air Defense Squadron. There they take part in Combat Evaluation Launches, which provide training for crews as well as target practice for interceptor crews.

The ANG units operate as a vital part of the ADC Force. Like the active duty units, they stand five-minute alert.

At all times, some ADC aircraft are located at dispersal bases, most of which are situated in noncritical areas. In the event of an attack, some aircraft would immediately go to these bases; others, in a bomber attack, would be directed to the intercept and recover at dispersal bases if their home base has been put out of action.

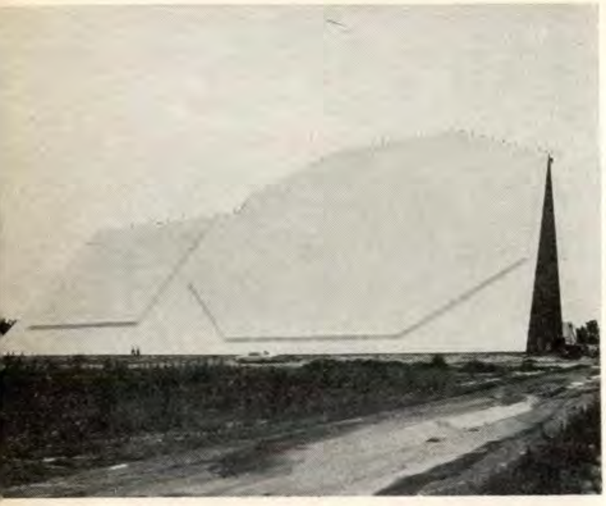
ADC requires an advanced manned interceptor with similar combat capabilities to the prototype YF-12A. These include a Mach 3 speed capability (over 2000 miles per hour) and a range of approximately 2000 miles. An advanced missile and fire control system is also required. The aircraft must be sufficiently rugged to operate under wartime conditions from existing airfields throughout the United States, and it must also be maintainable under the same conditions.

In its future thinking ADC is also looking at an Airborne Warning and Control System (AWACS). While the basic concept applies to tactical operations, the ADC version would be an up-to-date application of the current EC-121 Airborne Early Warning and Control System. AWACS consists of a long range, fairly high speed, high altitude jet aircraft that would be capable of long airborne endurance. It would carry 30 to 40 or more people, to man the equipment. Some of the elements of this airborne warning and control post would be an advanced radar, computers, and an awesome array of communications equipment that would include UHF, data link, SAGE tactical communications network, autovon and teletype.

Spacetrack radar facilities, such as this one in New Jersey, track orbiting objects in space.


NORAD Space Defense Center. Tracking information from several sources is computer processed and displayed on status boards in Center.


Baker-Nunn camera takes highly accurate photos of satellites, can photograph light reflected from basketball-size object 25,000 miles in space.



Giant new phased array radar at Eglin AFB will detect and track satellites. Facility will become operational this year.

Flag ceremony at AC&W site. Sites are self-sufficient, compact and, in many cases, far removed from centers of population.

To get the most from the AWACS' early-warning capability, a long-range continuous high-mach interceptor is indicated.

Two aircraft have been proposed for the AWACS, the Boeing 707 and McDonnell-Douglas DC-8. Both versions feature a pancake shaped radome, atop the aircraft, although no final configuration has been announced. Decisions still to be made involve more powerful engines, life support subsystems, and crew survival (both while airborne and after a crash landing), and an aerial refueling capability.

AIR DEFENSE WEAPONS CENTER

Probably the busiest ADC base is Tyndall AFB, home of the Air Defense Weapons Center. Formerly a wing under Fourteenth Air Force, the Tyndall activity acquired Center status on 1 Jan 68 and is now directly under Headquarters ADC. The Center mission has many facets including: F-101 and F-106 combat crew training, ADC life support training, T-33 pre-interceptor training and the interceptor weapons school. It is the testing center for ADC and furnishes an ideal location for live firing of interceptor weapons. In addition, Center aircraft stand defense alert at Tyndall and Key West, Florida.

At the Weapons Center, radar intercept officers are trained and intercept concepts, tactics, and doctrines are analyzed and evaluated.

AIR NATIONAL GUARD SUPPORT

So far we've just touched on the vital role of the Air National Guard in the ADC picture. The ANG first moved into active air operations in 1951 when 21 of its fighter squadrons were federalized as a result of the Korean War. By the end of 1967, participation in this defense system in the continental United States included 21 ANG flying units and two Aircraft Control and Warning (AC&W) Squadrons. Nineteen of the squadrons fly F-102s while two units are equipped with the F89J. ANG pilots have stood runway alert along with members of active units for 13 years. A large portion of the Aerospace Defense Command's runway alert responsibility now belongs to the ANG. In 1967 Air Guardsmen logged more than 50,000 man-days on runway alert and flew some 15,000 Air Defense sorties.

The ANG currently has 16,000 people augmenting ADC in supplying defense for the North American continent. Air Guard units are based throughout the United States, from Florida to Washington State.

The Hawaiian Air Defense Squadron is assigned to PACAF. It works with ADC, to provide continuous air coverage for the islands. Its primary weapon is the F-102, armed with Falcon air-to-air missiles.

On the mainland, two ANG AC&W squadrons support ADC. Radars of the 130th AC&W Squadron of Utah's ANG scan western skies from the top of a 9000 foot mountain. Guardsmen of the 138th AC&W Squadron at Greeley, Colorado, provide aerial surveillance in their sector of America's radar defensive network.

The air defense team of the ANG played a significant role during the Cuba missile crisis in 1962. ANG's air defense was ready—within telephone call of active duty—to contribute to the massive military force in southeastern United States.

Chase F-101B flies alongside C-130 carrying drone during William Tell meet.

Lonely site at Shemya, Alaska, westernmost land radar site.

California radar site. "Are you wearing your seat belt?"

The ADC Guard units have maintained a consistently fine flying safety record and their performance during William Tell meets (ADC's intercept and weapons delivery competition) has been outstanding.

SOUTHEAST ASIA SUPPORT

For the first time in the history of aerial warfare, a task force of Aerospace Defense Command EC-121 Warning Stars and radar crews are showing pilots their way to targets. In Vietnam, "Warning Star" crews are directing fighter pilots against military targets and Communist MIG fighters.

The modified Lockheed-built Super Constellation has proven its adaptability to a combat environment. The aircraft and crews are the first units of the Aerospace Defense Command to be deployed in the Republic of Vietnam.

This Air Defense Task Force, assisted U.S. Air Force fighter pilots in their first Communist MIG fighter kills in Vietnam. On the powerful radar scopes within their EC-121, radar operators tracked the MIGs while weapons control officers vectored F-4C Phantom fighter pilots in for the kills.

THE PEOPLE

So far we've talked about hardware, inanimate objects that without human genius and human sweat would be merely wondrous works of art sitting dumbly by and accomplishing nothing. But what about the people who operate, nurse and care for these vastly complicated machines? In the final analysis ADC is simply people doing a job and these machines are their tools. ADC's people are like people anywhere, except for their specialized training which qualified them for their vital jobs. They have to be fed, housed, trained, protected and employed for best results.

Aircrews, as we have said, are in constant training, flying daily, and deploying to Tyndall AFB annually for weapons delivery. Every three years they renew their survival knowledge and are brought up-to-date on the latest in survival techniques and equipment at the Life Support Training School with units at Perrin and Tyndall. Many ADC crews put in a lot of hours flying over water. To keep them sharp on water survival the school provides realistic training employing the parasail. The men are hauled aloft to 300-400 feet in a specially rigged parachute towed by a motor boat. At the suitable time the tow rope is disengaged and the "survivor" is lowered to the water by the parachute. This gives the man a good taste of the real thing under controlled conditions. Improved ejection and survival success rates reflect concentration on these areas. For example, in 1962-63 ADC had 68 ejections, 15 of which were over water. Fifty-two attempts were successful for a rate of 76 per cent. Three aircrewmen drowned. But in 1965-66, 37 of 42 ejections were successful, 88 per cent, and only one man drowned.

When a pilot joins ADC one of his first jobs is to learn to fly his assigned aircraft. For F-102 training he will go to Perrin. F-101 and F-106 training is conducted at Tyndall. In these schools he learns more than just how to fly the aircraft. He must also master night and day-high, medium and low altitude intercepts; infra-red and radar attacks, SAGE and manually controlled intercepts. By the end of the course he is ready to assume his place in a squadron committed to defense of his country.

Another highly specialized job in ADC is that of weapons controller. He and the aircrews make up the team that must work smoothly in order to effectively accomplish the intercept mission.

Weapons controllers are trained at the Air Defense Weapons Center at Tyndall AFB. There the controller spends weeks mastering skills that enable him to direct a supersonic interceptor to an equally fast target.

A goal many weapons controllers aspire to, but only a few achieve, is that of Master of Air Defense. To get this coveted rating the controller must be rated as expert and must have accomplished 800 live intercept missions. Then he must pass oral and written tests on aircraft control procedures and regulations, ground radar characteristics, and the capabilities and characteristics of all ADC interceptors. Passing grade is 95 per cent. Finally he is required to conduct a live mission in which he must position five interceptors on two targets within eight minutes.

Most of the Masters of Air Defense are weapons controllers, but there are a few radar intercept officers (backseaters in the F-101) and pilots who have received the rating.

There are few glamorous jobs in ADC, but there are hundreds of people performing vital tasks at hundreds of remote radar sites. Some of these people work at sites near highly populated urban areas, and going to work in the morning is a routine drive-the-freeway operation. For the most, however, life is austere in some of the most inhospitable areas in the world.

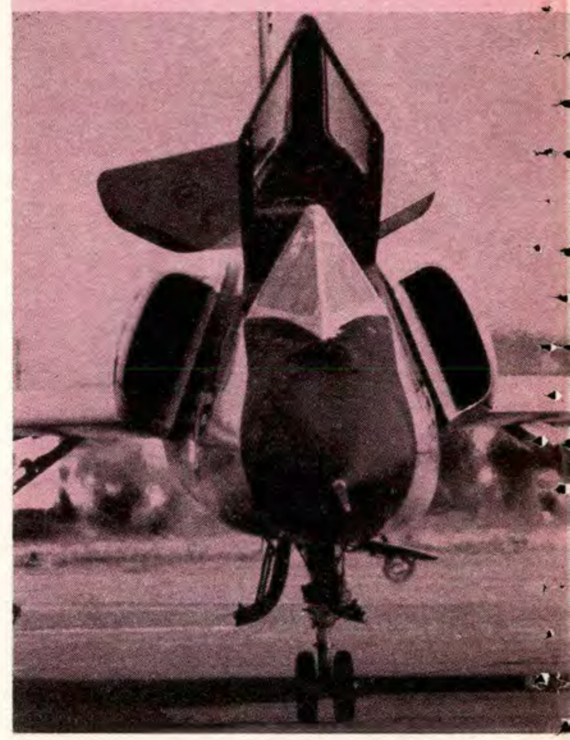
Shemya Island in the Aleutians is the westernmost outpost of the SPACETRACK system. A bleak, treeless rock 1400 miles southwest of Anchorage, Alaska, but only 280 miles from Komandorski, Russia, it is home to the men who man the station's radars. Fog alternates with high wind, snow and sleet to furnish some of the world's worst weather.

By contrast a site at Ajo, Arizona, is generally clear, hot and dry but just about as remote. Of course, one can take a bus, or drive, to Gila Bend, Tucson or Yuma for a change of scenery. Therein, however, lies a problem. About 35 per cent of ADC's people are assigned to remote locations. For three years, through 1966, they accounted for 75 per cent of ADC's private auto fatalities. Then in 1967 something dramatic occurred. Not only did ADC drastically reduce the number of private motor vehicle fatalities, the number among remotely assigned personnel dropped to 11 out of a total of 39—less than 33 per cent. Apparently this resulted from a concentrated effort in which 250 people were trained for additional duty safety assignments. Another factor that undoubtedly had something to do with reducing fatalities was an aggressive seat belt program. Ninety-six per cent of radar squadron personnel, at last count, had seat belts installed. Of course, a belt is so much excess baggage if it isn't used. Sixty per cent of all Americans killed in private autos in 1967 were sitting on their seat belts.

TRAINING DEMANDS

Like all commands these days, ADC has a tremendous training effort going. As an example, at the end of 1966 the Command had 68 per cent manning at the 5, 7, 9 levels and 200 per cent at the 3

Weapons controllers learn demanding job during training at Tyndall AFB, Florida. Below, F-106 taxiing at ADC base.



Quality maintenance is ingredient of effective flying safety program. Maintenance man checks afterburner. Checklist in hand, supervisor oversees missile loading, pilot checks tailpipe during preflight. Bottom photo shows aircraft lined up on flight line at Tyndall AFB during William Tell.

level in the aircraft maintenance field. This was a big OJT challenge that ADC met. During 1967 5091 airmen were upgraded and manning at the 5, 7, 9 levels exceeded 90 per cent.

Aircrew turnover also was high, particularly among pilots, as they left for SEA tours. Many returnees assigned to ADC were inexperienced in interceptors or needed refresher training. Nevertheless, the command had the lowest aircraft major accident rate in its history, 4.4 per 100,000 flying hours.

Traditionally ADC has placed great emphasis on accident prevention stressing education and motivation. It publishes an excellent safety magazine and has produced a highly praised series of programmed learning texts covering a variety of subjects for self study by command personnel.

In the flying safety area, reporting is pushed as an effective medium toward accident prevention. In addition to standard reports required by Air Force regulations, special incident reports on select items are used to gather data on suspected problem areas.

Safety fighter project officers from ADC Headquarters visit their assigned bases twice a year. One of their tools is a seven-item checklist of accident causes against which they survey the unit. The list is flexible and specific items change from time to time depending on recent experience. At unit level special surveys of important items are conducted periodically. For example, one of these might be an analysis of the procedures being used in spectrometric oil analysis.

The number of missile loadings and downloadings makes this an area of major concern. Good training and frequent drills keep the crews sharp and help keep the number of damaged missiles to a minimum.

THE FUTURE

ADC is the Air Force command which is the major component of the North American Air Defense Command. Its sophisticated radar, communications system, computers and fighter-interceptors guard all approaches to this continent. But Aerospace Defense is subject to constant change. The frontiers of the state of the art of yesterday are relegated to obsolescence today. There is one certainty: dependence on the tools, skills and concepts of the present will not solve the problems of the future.

ADC is future oriented. It has to be. Current fighter interceptors are adequate to cope with the manned aircraft of any nation. But in an age when Mach 2 is taken for granted and satellites orbit the world, complacency can lead to disaster. That is why ADC looks to the future!

Why every satellite is kept track of from the time it is launched, and its future position is carefully plotted.

Why a limited capability for destroying orbiting satellites exists and must be continually improved.

Why a sea-launched ballistic missile detection capability is coming into being.

Why many other programs geared to the future are being actively pursued. ★

the **I.P.I.S.** *approach*

By the USAF Instrument Pilot Instructor School, (ATC)) Randolph AFB, Texas

On 23 March 1968, IPIS celebrated 25 years of service to the aviation community.

The Flight Director

FINAL APPROACH MODE

THE pilot flying an ILS final approach without pitch and bank steering bars must mentally compute the pitch and bank corrections required to intercept or maintain the glide slope and centerline. When using the flight director, pitch and bank steering bars perform this function for the pilot. *The bars represent the proper aircraft attitude required to correct to or maintain the glide slope and localizer.*

In the FINAL APPROACH mode, the computer uses pitch angle and glide slope error inputs in addition to the localizer error, course error and bank angle inputs used in the INTERCEPT mode.

Localizer error is measured in the same manner as in the INTERCEPT mode, except that smaller localizer deviations will displace the bank steering bar from a "centered" position. As lateral displacement, wind or range change, different heading corrections are required to properly correct to the centerline. The computer solves this problem by electronically measuring the rate that localizer error changes. This measurement, called beam rate, is used to modify a given localizer error signal so that an appropriate bank angle/heading change command will be displayed by the bank steering bar.

The total effect of localizer error and beam rate on the displacement of the bank steering bar is dependent on the setting of the steering gains in the computer. These steering gains are set for optimum at one position of the final approach. If the computer is set for optimum gain at the outer marker, the bank steering bar will be extremely sensitive to deviations at the middle marker, and less sensitive outside the outer marker. As a compromise, the steering gains are usually set for optimum between the outer marker and middle marker. Later model computers have automatic changes of gain setting for the different phases of an ILS approach. This feature greatly enhances the approach path stability of the aircraft all the way to touchdown.

Course error is used in the same manner as in the intercept mode except wind drift compensation is now displayed by the bank steering bar. This is accomplished by decreasing any course error being received to zero over a period of approximately ten seconds. For example, if a wind requires 15 degrees right drift correction to maintain centerline, the 15-degree difference between the head of the course arrow and heading of the aircraft is electronically "washed out" to zero in about ten seconds. The computer will now consider the 15-degree course error to be zero. Further measurement of course error will be made from this new reference point. The pilot can demonstrate this same process mechanically in the final approach mode by changing the course set in the course selector window by any number of degrees. In about ten seconds, the bank steering bar will center since the computer "thinks" a drift correction is required to maintain centerline.

Bank angle input—The computer is now shifted in gains so that a 15-degree bank angle, instead of 25 to 35 degrees, will be the maximum bank angle commanded by the bank steering bar.

Glide slope error is measured in the same manner as localizer error. Glide slope error will command a maximum pitch change of 10 to 17 degrees depending upon flight director setting.

Pitch angle input is measured in the same manner as bank angle input with 10 degrees of change in pitch attitude offsetting maximum glide slope error. Also, the reference pitch attitude of the aircraft is washed out over a time period much like the wind drift compensation in course error. This is a necessity because of airspeed, configuration and wind changes. In other words, the aircraft will not have the same pitch attitude for every approach or even throughout the same approach.

In Figure 1, the position of the aircraft in relation to the localizer centerline is exaggerated for clarity. Position 1 shows the aircraft on the center line with localizer and course error at zero. A wind from the right drifts the aircraft to the left of the centerline (position 2). Localizer error causes the computer to position the bank steering bar to the right. As the aircraft is banked (15 degrees maximum) toward the bank steering bar, bank angle input causes the bank steering bar to move left to center (position 3). As aircraft heading changes, course error and localizer error inputs to the computer are changing, causing the computer to command a decreasing bank angle as the localizer centerline is approached. This decreasing bank angle command is designed to keep the aircraft from overshooting the centerline. Course error sensed by the computer is "washed out" allowing the bank steering bar to command a heading that compensates for wind drift (position 4). The bank steering bar will be centered when wings are level, course error, localizer error, and beam rate are all zero. If all these conditions are not satisfied, the computer continues to provide bank steering deviations until all inputs are zero.

Pitch commands are computed in essentially the same manner as those for bank in the final approach mode. Basic pitch gyro signals are compared to glide slope displacement to provide steering commands to intercept and maintain the glide slope.

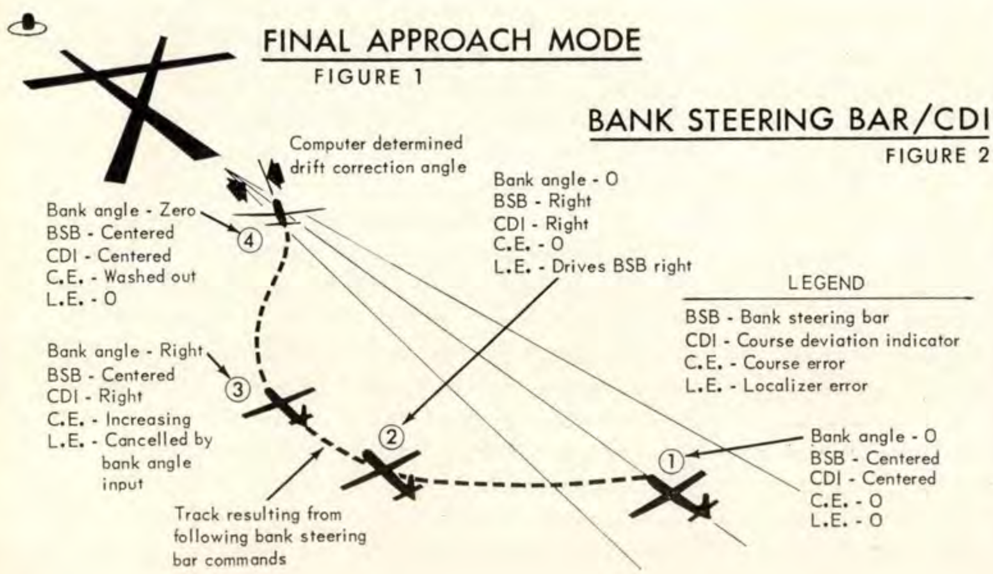
The final approach mode should not be selected until the aircraft is established on final approach. This is done either manually or automatically by the computer. Flight manuals for aircraft with computers that are manually switched to the final approach mode will sometimes specify limits to this mode, e.g., established on localizer course before switching. IPIS recommends being within 15 degrees of final approach heading as well. The reason for this is the restricted rate of heading change imposed by the 15-degree bank command limit. In addition, course error washout removes the effect of the 30 to 45-degree intercept angle command which is present in the intercept mode. Neglecting the 15-degree heading limitation can cause an excessive intercept angle or, possibly command a 360-degree turn when the aircraft is displaced far enough from the localizer centerline.

Pitch steering bar commands should not be used until the glide slope is intercepted. After reaching the glide slope intercept point, keep the steering bar centered. If large errors are allowed to build up before making proper corrections, the computer will be constantly behind and "S"ing in both pitch and bank will result. If the pitch and bank steering bars are kept centered, but the flight path of the aircraft is erratic or diverges a large amount from the glide path or localizer, then disregard the steering bars and control the aircraft by basic instrument procedures and reference to the raw data displays (glide slope indicator and course deviation indicator).

Proper use of the steering bars greatly enhances the pilot's ability to fly a precise ILS approach to lower minimums with less effort than with any other system. Course and glide slope deviation indications are instantaneous. Equipment improvements will undoubtedly provide usable signals below present minimums. We should, in the relatively near future, realize the capability of making safe approaches in near zero visibility conditions. ★

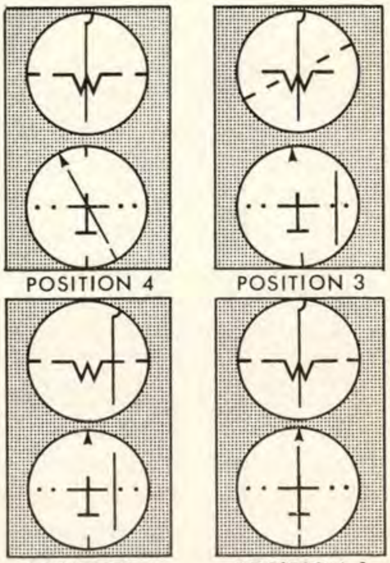
FINAL APPROACH MODE

FIGURE 1



BANK STEERING BAR/CDI

FIGURE 2



REX RILEY'S CROSS COUNTRY NOTES

PRIOR TO PENETRATION they agreed that the rear seat pilot would fly the approach, and the front seater would take over and land when the runway came into view. Clearance to descend to 10,000 feet and make a VOR/ILS penetration was received. The pilot descended to 16,000 feet, passed over the VOR station, and headed for the ILS inbound track. While the rear seater was rechecking the ILS frequency the front seat pilot called for "Pull Up" because he noticed a light glow and saw trees directly ahead. The warning was too late, however, and they struck the top of a tree.

My first reaction was to ask "What were they doing all this time?" It was probably yours, too. It is much easier to answer the question of what they weren't doing. Well, it's a leadpipe cinch they weren't cross-checking altimeters between cockpits at pre-arranged altitudes, and the man in front did not know what his partner was doing. Obviously, he thought his buddy was "tuned in" and flying the ILS glide slope and localizer. The need for crew coordination is probably the key to avoiding such nasty situations. In order to achieve this type of effective coordination we must plan carefully. Plan to tune the radio, check the identifier and have the other pilot check it and confirm it. Then you won't need a recheck. Have the other guy call passing pre-arranged altitudes like 15, 10 and 5 thousand. Do these things and the guesswork will be eliminated. Use that other crewmember if you're lucky enough to have one. Certainly no pilot of a single seater would start a letdown on a station he hadn't even tuned in.

In case you are wondering, these men recovered and made a safe landing with relatively minor damage to the aircraft.

If you're by yourself, planning becomes much more important. A pilot recently wiped one out because he failed to:

- Proceed to a suitable alternate with sufficient fuel to accomplish a safe landing;
- Keep himself informed concerning the deteriorating weather conditions at the destination airport;
- Plan completely and include navigation and fuel data from destination to alternate, and
- Use all available approach aids.

Can you imagine making a GCA without tuning in the ILS, VOR, and TACAN for a backup, if there is one available? That's as bad as not getting some assistance from that guy in the other cockpit or seat. If it can make your recovery safer or more efficient, plan for it.

HOUSING FOR BAK-12 MACHINERY. At Tyndall AFB our attention was called to housing for the BAK-12 barrier machinery. Sheet metal enclosures protect this equipment from the elements and it looks like a good idea. The building is painted orange and white for visibility. According to the safety people, plans for the building can be obtained from base engineering.

THE AIR FORCE CONTINUES to lose men and equipment because of improper stowage of combustible articles. Don't think your type bird is immune; burning of personal and aircraft equipment has occurred in fighters, bombers, transports and trainers. The only sure fire method to nip this trend in the bud is by having complete knowledge of the location of heater ducts, air outlets, and heat generating electronic devices. Then, use this savvy by strict avoidance of stowing combustible items near such heat sources.

Every Air Force unit that either flys, maintains, or supports aircraft operations should conduct a one-time survey to insure that the minimum quantity of combustible material is stored or carried aboard aircraft. Pilots must check this item carefully on every preflight.

BIRDSTRIKE. Until such time as windshields provide bird protection there are going to be some occasional instances of birds entering cockpits the hard way. Last year and in 1966 there were fatalities to pilots from this occurring. In January, this year, a student in a T-37 nearly got it. Apparently both he and the IP saw the bird—a buzzard—but could not take evasive action in time. The IP ducked and the student turned his head to protect his face. A piece of bird and some plexiglass hit the student's visor and tore it off. Fortunately, he received only a small cut. According to the report, the student would have been severely injured had his visor not been down.

About the only protection pilots have from bird collision in some of our aircraft is their visor. Therefore, especially in areas with large bird populations and if you are flying a jet, putting the visor down should become as automatic as fastening your harness and hooking up your zero lanyard. The visor carries no ironclad guarantee against birds but it does offer some protection and just might save your life.

HERE'S AN ITEM from the morning message traffic that contains two important points for discussion:

(1) An intermediate headquarters told a subordinate unit that one of their OHRs was not valid. But the last paragraph of the message tells the story. It read: "Although inclined to agree that VFR climb/descent is undesirable, we do not believe an OHR is the proper vehicle to forward recommendations for a change in procedures that are recognized world-wide."

There's little doubt about it, an OHR won't go to the people who determine international traffic rules, but it IS the right vehicle to spotlight a problem so that someone who does know the right channels can start the paper work rolling in the proper direction. The message writer at the intermediate command is slamming the door on future OHRs. If he believed the OHR made a valid point, why not start the action himself?

(2) Did the OHR make a valid point? Are IFR climbs and descents during VFR weather safer? They could very well be *less* safe, particularly when an aircrew is placing more attention on their instruments and the SID or terminal approach plates than on attempting to spot other birds in the sky.

That radar controller *doesn't have* to call out all traffic (and is unable to when he's really busy) and he frequently adjusts his scope to paint beacon traffic only. That calm voice from the ground gives you a feeling of security, but in VFR conditions below FL240 (or 180), keep on the lookout for other traffic. ★

FLYING THE PHANTOM

DON'T LET LOSS OF CONTROL PUT YOU IN A FIX... KNOW THIS MAX PERFORMANCE DOLL AND HANDLE HER GENTLY FOR BEST RESULTS.

Major Lloyd G. Wayne, Directorate of Inspection, DIGIS

THE accident record of the F-4 during last year caused many pilots and senior commanders to doubt the safe flying characteristics of the aircraft. This maximum performance weapon system should be respected but not feared. We all know that fear is a product of the unknown and respect comes through knowledge and understanding of a given condition or circumstance.

During 1967 the USAF had 67 major F-4 accidents of which 16 (24 per cent of the total) were attributed to pilot error from loss of control. A review of these 16 accidents shows that there is a lack of comprehension resulting in improper flight control inputs during a critical phase of flight. For example, three accidents occurred in the landing phase.

- The aircraft was two miles on final approach with gear and flaps down in an asymmetrical configuration (two unexpended CBU pods on right outboard wing) when the tower closed the runway due to a landing emergency. A go-around was initiated. The aircraft commander retracted the gear and flaps and immediately started a right turn into the heavy wing. The aircraft continued rolling right to nearly inverted. A loss of lift occurred due to wing flap retraction and increasing bank angle into the heavy wing resulting in aircraft stall and subsequent crash.

- Traffic pattern entry was made at 1800 feet AGL and 280 kcas. After about 90 degrees of turn in a pitchout to the right the pilot felt the aircraft burble slightly. As the aircraft continued in its turn, left aileron was applied to begin the rollout onto downwind. The aircraft continued rolling to the right. Not realizing what was happening, the aircraft commander applied full left aileron attempting to roll out, but this action aggravated the condition even more, and the aircraft continued rolling to the right with an increased yawing motion. This adverse yaw caused loss of control at an altitude too low for recovery and the crew ejected.

- During a right hand pitch at 1500 feet AGL and 300 kcas the aircraft commander established a 70-degree bank stabilized turn. After 45 degrees of turn he increased back pressure to regain lost altitude. A slight buffet occurred and the AC applied left aileron to reduce the right bank. The aircraft began to yaw and rolled further to the right with buffet increasing. Throttles were advanced to maximum power and flight controls neutralized. The right roll and yaw continued and the AC then reapplied left aileron. The nose of the aircraft suddenly sliced downward and the crew ejected.

The remaining 13 accidents complete the inflight spectrum of maximum performance maneuvering: In-trail demonstration of adverse yaw, spatial disorientation during night refueling, split-S maneuver on second transition flight, simulated SAM break, slow barrel roll type maneuver to effect a join-up on lead aircraft, practicing rudder-rolls, allowing aircraft to get into an excessive angle of bank with flaps retracted at slow airspeed while attempting to retract the malfunctioning landing gear, and two loss of control conditions in simulated air-to-air combat training.

Accident board findings read like this: Primary cause—pilot error in that aircraft stalled while descending from 11,000 to 7500 feet. Improper recovery attempts used.

Or pilot let aircraft get into an attitude from which he could not recover.

Or pilot allowed aircraft to descend to an altitude combined with low airspeed, high angle of attack, and high sink rate from which recovery could not be effected.

Or pilot did not follow established procedure published in tech order for recovering aircraft from uncontrolled flight.

These findings indicate that some pilots did not know their aircraft or their own capabilities. If you are to become an old and bold fighter pilot, first learn everything about this wonderful flying machine and then establish your limits. As you gain more jet fighter experience and you become more confident in your ability in the F-4, then your capabilities will become the same as those of your aircraft.

Most of these loss of control accidents were the result of adverse yaw. Improper flight control inputs during a critical phase of flight can put this aircraft into a post-stall or spin condition, but the proper recovery techniques will allow the F-4 to fly safely away and bring you home.

If we first look at some basic aerodynamics and then discuss recovery techniques maybe you'll be on your way to becoming an old-bold fighter pilot. The F-4's flight envelope can be considered to be from 50 kcas ballistic trajectory to the Mach 2 plus dash, and angle of attack from 5 to 24 units with no flaps and 27 units with full flaps. Throughout this flight regime the F-4 is considered safe as long as the correct flight controls are employed. The important point for the fighter pilot is to recognize the pitfalls along the way and know how to stay in a safe flight condition at all times. An understanding of the lift phenomenon with respect to angle of attack, bank angle and wing flap retraction might be a good place to start.

ANGLE OF ATTACK vs LIFT

Angle of attack is a function of airspeed, G loading and gross weight. Do we understand how this angle of attack affects the aircraft flight conditions? Sure, we have a turn, climb and descent concept, but can we discuss these maneuvers in terms of lift? Lift is one of the four forces required for a stabilized level flight condition. The other three forces are drag, weight and thrust (Fig 1). If the aircraft is at a constant speed in straight and level flight, the four forces are in equilibrium which means no acceleration (vertical or horizontal). The lifting force always acts perpendicular to the thrust-drag line, whereas the weight vector will be pointed toward the center of the earth.

Now let the flight path angle change from zero degrees (horizontal to the earth's surface) to 30, 45, and 60 degrees *down* in the vertical plane. With a *stabilized* dive angle and airspeed, we find that the lift required is equal to the weight of the aircraft times the cosine of the dive angle (Fig 2). The earth's gravitational force is always working in the vertical plane; therefore, the weight component that must be equalized by the lifting force is less than the weight of the aircraft.

If your bombing scores have been good, then you understand that the aircraft must be in a stabilized, unloaded (less than one G) condition when the bomb is released. Also the G meter would read 0.86G for that 30 degree dive angle or 0.7-G for that 45 degree dive angle. These release conditions allow the bomb to depart the aircraft in its natural flight trajectory for a given dive angle. If the aircraft is not at the proper G for a given dive angle, the bomb at the release point will have two accelerations; one due to gravity and the other due to the plus or minus G factor. Hence this bomb trajectory will result in a long or short drop.

When we establish a stabilized climb angle we find that the lifting force is again less than the aircraft weight (Fig 3). The lift required is equal to the aircraft weight times the cosine of the climb angle, just as it was for the dive condition. This means that the aircraft must be unloaded to maintain a stabilized climb angle just like the dive bomb run. When the climb angle increases, the lift decreases and at the 90-degree climb angle, zero lift is required. This, of course, is zero G in a ballistic trajectory. The G meter or accelerometer in the instrument panel measures G loading perpendicular to the longitudinal axis of the aircraft, or thrust line vector, and for this reason the G reading is in direct relationship to the amount of lift at any given time. For example, if we read 5G with an aircraft weight of 40,000 pounds the lifting force is 200,000 pounds, and for a 0.5G reading the lifting force would be 20,000 pounds. Now let's look at a bank condition.

Many pilots ask the question, why do we have a loss of lift when we roll into a bank? If we have not changed the G loading of the aircraft as we roll into the bank, we have not lost lift, but we do have an apparent loss of lift because our lifting vector is not opposite to the weight vector, as shown in Figure 4. The fourth diagram shows that we must increase lift with bank angle to prevent loss of altitude. The reason for this, of course, is that the lift vector is always perpendicular to the thrust-drag line and the wing surface area. As the bank angle increases, the required wing lift to remain at a constant altitude increases rapidly. To prevent loss of altitude in an increasing angle of bank we increase back stick pressure, and as we approach the 90-degree bank point the only lifting surface we have to maintain altitude is the positive angle of the fuselage with respect to the relative wind. Therefore, bank angle must be decreased to maintain altitude.

The effective lift has been discussed with respect to dive angle, climb angle, and angle of bank. The last lift consideration will be with wing flap extension and boundary layer air control (BLC).

The F-4 has a high wing loading very similar to the F-100 and the F-105. But with boundary layer air control and flaps the final approach velocities can be decreased 22 to 24 knots. A landing velocity of 130 knots is very desirable for a century series fighter, but this slow approach velocity can also be dangerous when a malfunction occurs. If one engine is lost on final approach, to prevent a stall, the flaps must be retracted to one-half position and the airspeed increased 12 knots. On a go-around the final approach velocity must be increased by 24 knots with the flaps fully retracted. We had accidents occur last year after takeoff and on go-around with flaps retracted. An aircraft lost after takeoff had flaps retracted and the pilot was unable to get the gear up. He slowed the aircraft to attempt gear retraction and inadvertently rolled into a steep bank. This resulted in loss of control and loss of an F-4. The second accident occurred on a go-around with flaps fully retracted and an immediate bank angle, which resulted in loss of control and again loss of an F-4. The lesson to be learned here is to maintain flying airspeed when you retract the flaps. Do not turn as the flaps are being retracted at slow velocities. Do not retract flaps while attempting to raise a malfunctioning landing gear. Any large bank angle while the flaps are being retracted may result in loss of control in the F-4.

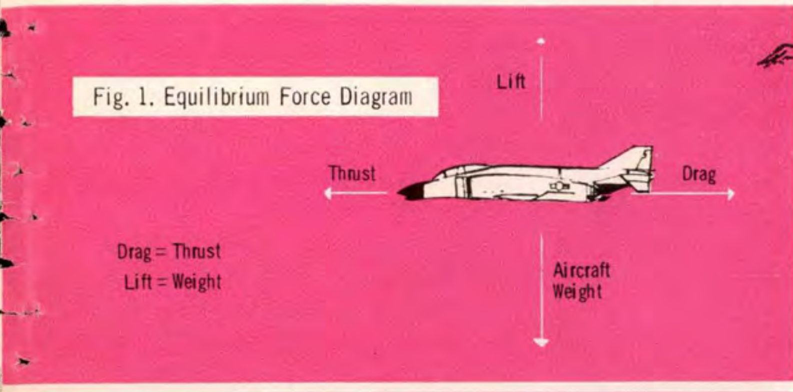


Fig. 1. Equilibrium Force Diagram

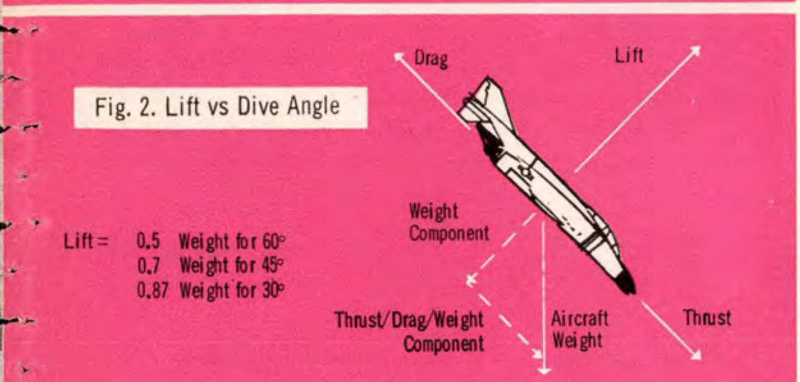


Fig. 2. Lift vs Dive Angle

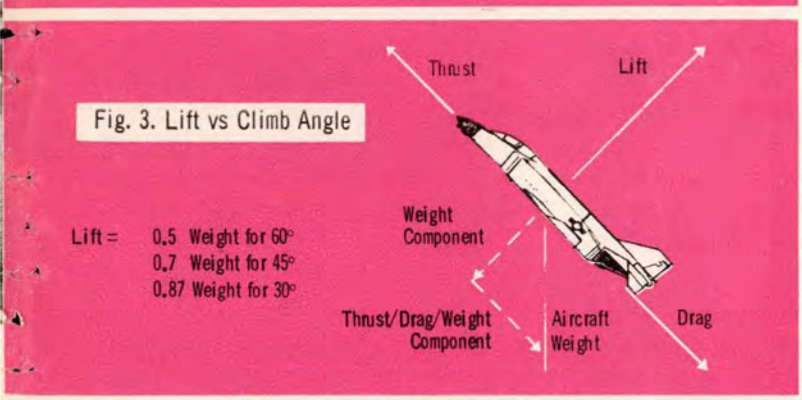


Fig. 3. Lift vs Climb Angle

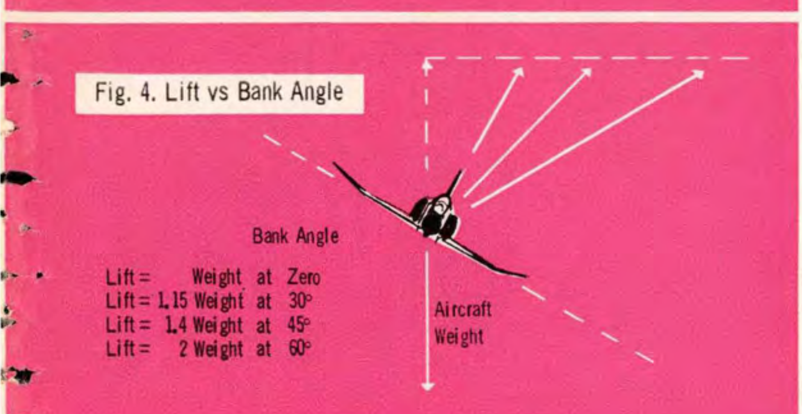


Fig. 4. Lift vs Bank Angle

FLIGHT CHARACTERISTICS

The flight characteristics of swept wing high performance aircraft like the F-4 are characterized by two significant factors: *angle of attack* and *static margin*. *Angle of attack* is defined as the angle formed by the chord line of the wing and the relative wind or aircraft flight path. *Static margin* is a physical measurement of longitudinal stability, the distance and percentage of MAC between the center of gravity and the aerodynamic center (which is the normal point of lift). Both of these factors are thoroughly covered in the F-4 flight manual, and all F-4 pilots should have a complete understanding of static margin and angle of attack. The flight characteristics of the F-4 will be discussed here in the hopes that a word, thought, or phrase may help save an F-4 and its crew.

We can divide the aircraft maneuvering phases into three areas: low, medium, and high angle of attack. Low angle of attack, approximately 5 units, results in minimum induced drag or zero lift. Two very important maneuvers are accomplished in this flight regime. The first is maximum performance acceleration, accomplished by a gentle pushover to 5 units angle of attack, which provides minimum drag and allows gravity to aid aircraft acceleration through this maximum drag area of 0.92 Mach to 1.2 Mach number. This technique provides the minimum time, fuel, and distance to accelerate from a sub-sonic Mach number to the optimum supersonic climb schedule.

The second maneuver occurs when we find ourselves at a low airspeed and a high pitch attitude. The angle of attack indicator becomes the primary recovery instrument. As we neutralize the rudders and ailerons, we unload the aircraft to 5 to 10 units angle of attack which reduces stall speed to nearly zero. At this point the aircraft becomes a ballistic projectile and the recovery can be accomplished safely at any airspeed. If you have failed to recognize your condition and find the airspeed rapidly decreasing with a very high pitch angle, you may lose control of the angle of attack due to insufficient airspeed to provide stabilator effectiveness. If you find yourself in this condition, neutralize flight controls, place the stick forward of neutral, and check your angle of attack indicator to determine what corrective actions will be necessary. In medium angle of attack maneuvering, from 5 to 15 units, we will find normal aircraft response to flight control movements such as elevator for pitch, aileron for bank, rudder for turn coordination.

The third phase of flight—high angle of attack maneuvering above 15 units—will bring out the swept wing high performance aircraft characteristics. The primary flight characteristics exhibited at high angles of attack are adverse yaw, which is yaw due to roll, and dihedral effect, which is roll due to yaw.

Adverse yaw was the biggest factor in F-4 loss of control in 1967. Until the pilots understand this phenomenon and can live with it, adverse yaw will continue to cause many accidents. Adverse yaw is produced when the pilot uses ailerons in an attempt to roll the aircraft while at a high angle of attack. The yaw is in the opposite direction to the intended roll. At very high angles of attack aileron inputs generate almost pure aircraft yaw response (induced drag from the down aileron exceeds the directional stability being generated at these high angles by the vertical stabilizer/rudder.) Aileron deflections at the point of loss of control will cause a rapid spin entry. At the first indication of adverse yaw the pilot should neutralize the ailerons. A very natural tendency is to raise the wing with the aileron. *This must be avoided.*

DIHEDRAL EFFECT

The *dihedral effect* is a result of rudder deflection. Attempts to yaw the aircraft with rudder will produce roll in the same direction as the yaw. The dihedral effect becomes more pronounced at higher angles of attack. The yaw produced by rudder deflection generates roll and will provide the highest obtainable roll rates at high angles of attack. All high performance maneuvers such as high G barrel rolls, rudder reversals, etc., are all controlled maneuvers with minimum excessive yaw inputs. The yaw produced by ailerons or excessive rudder results in a loss of energy which greatly degrades the maximum performance of the F-4 and in many cases has resulted in loss of control.

Maximum performance maneuvering can be defined by the available G throughout the aircraft flight envelope. Three factors determine maneuvering capability: stabilator effectiveness, and structural and aerodynamic limitations. At high Mach numbers a decrease in stabilator effectiveness occurs resulting in full aft stick position without reaching structural or aerodynamic limits. At high subsonic velocities the available G is greater than the aircraft G limitations; therefore, maximum performance is limited by the aircraft structural design. At lower airspeeds maximum performance becomes a function of angle of attack, 19 to 20 units, which will give you maximum performance G for any given airspeed. The aerodynamic limitation, or stall, will not occur until 24 units angle of attack has been reached. This is clean configuration, wings flaps and gear up. But as the airspeed decreases toward zero, stabilator effectiveness again becomes a factor. We find at very slow airspeeds the angle of attack is difficult to maintain and the difference between 10 to 24 units angle of attack may be a decrease of one to two knots indicated airspeed. Therefore, maximum maneuvering becomes very limited below 200 kcas with flaps up, and a recovery must be initiated to prevent aircraft stall.

For a fighter pilot to fly in a safe atmosphere he must understand the stall characteristics of his aircraft and be thoroughly familiar with the recovery techniques. The general stall characteristics of the F-4 will be covered in three categories: normal stall, accelerated stalls and inverted stalls.

The normal stall or landing configuration stall is characterized by a wide band of buffet warnings. At 40 knots above the stall speed, onset buffet occurs increasing from moderate to heavy buffeting immediately preceding the stall. At 22.3 units angle of attack, pedal shaker will be activated. However, in most cases, this pedal shaker cannot be recognized due to the heavy airframe buffeting. Wing rock starts about 10 knots prior to the stall and can amount to as much as 30± degrees at the stall. The stall is characterized by a slight nose up-pitch and/or a yawing motion or slice in either direction. The angle of attack at stall is between 27 and 28 units with the landing gear and

flaps down. The recovery technique for this stall is very simple. Unload and neutralize controls, positioning the stick forward of neutral to 5 to 10 units angle of attack.

In the accelerated stall a rapid application of aft stick will cause immediate heavy buffeting, wing rocking with a fairly high frequency and large amplitude of roll oscillation, and aircraft stall. If flight controls are promptly neutralized the aircraft will recover from the stall, but, on the other hand, if the controls are not repositioned, the aircraft will wind up into a spin very rapidly with this additional energy. So it becomes necessary to recognize accelerated stalls and take prompt action to neutralize the controls and release the back stick pressure so the aircraft can fly out of this stall condition.

The inverted stall can be obtained by full forward stick movement while the aircraft is in a vertical maneuver or an inverted climb of greater than 20 degrees nose up. This stall is characterized by moderate buffet at the stall with no distinct yaw or roll tendencies. To recover from the inverted stall relax the forward stick pressure, neutralize aileron and rudder, and maintain 5 to 10 units angle of attack until recovered from this unusual attitude.

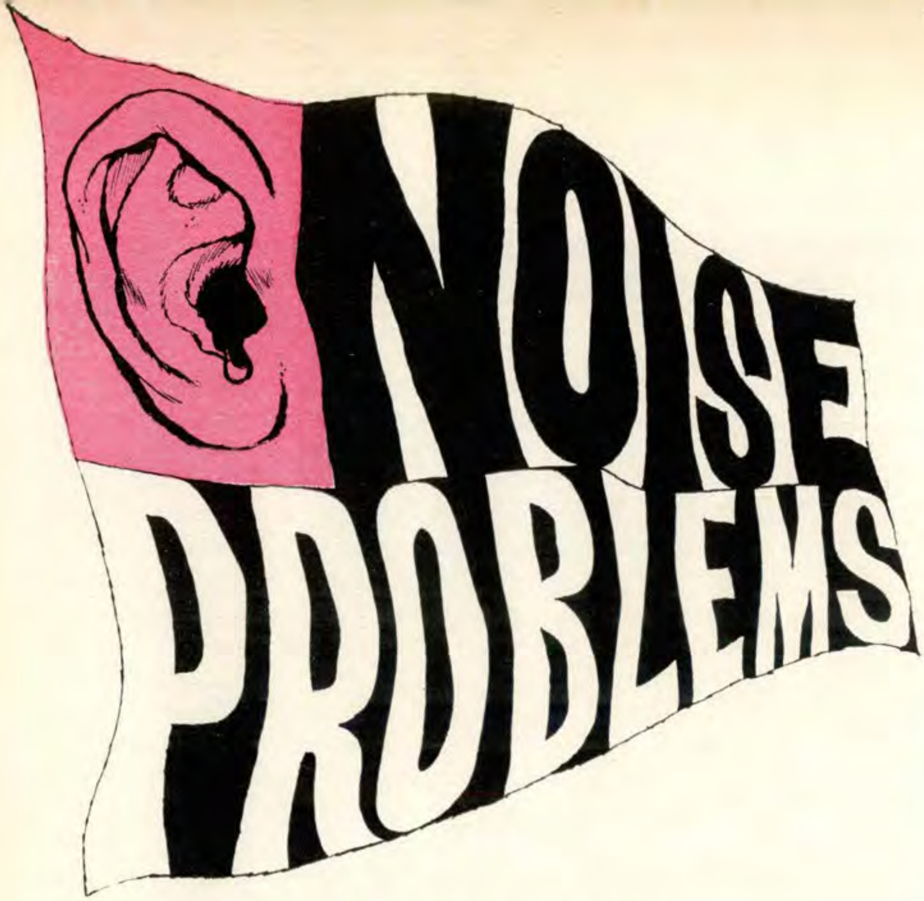
POST STALL

One of the most critical and demanding phases of flight in the F-4 would be the post stall condition. Nothing can be gained by stalling the airplane and a great deal of energy is lost during this stall. You've made one mistake in allowing the aircraft to get into a post stall gyration. The monkey is on your back to find out whether you will make a second mistake or be able to affect a recovery and bring the aircraft home.

In review, we find there are probably three main causes for this post stall condition. Two of these are excessive angle of attack for the airspeed and configuration, and adverse yaw while at a high angle of attack, which causes a great loss of energy due to induced drag. The F-4 has a very large surface area resisting forward motion. This is evident when the throttles are moved aft in flight. To put this large mass in a side slip condition, adverse yaw if you will, increases the effective surface area considerably resulting in exorbitant energy loss.

The third condition would be the accelerated stall—a rapid flight control input causing boundary layer air separation, resulting in a stall. All of us at one time or another have been in this condition and most of us have found the solution. First, we must recognize the condition. We should have an understanding of the situation and unload the aircraft neutralizing the aileron and rudders. Then wait. All of these actions are very natural except waiting. If you are like a bull in a china closet while you are strapped to this stovepipe, a solution to your problem most probably is not available. We have the fighter pilot that gets into maximum performance maneuvering flight and, without realizing exactly what he is doing, he puts in 15 yards of stabilator and 5 yards of aileron and then cannot understand why he gets into an adverse yaw, post stall gyration and spin condition. The key to this solution is slow, smooth, and precise control to maintain a safe environment. After the rudders and ailerons are neutralized and the aircraft unloaded, the angle of attack of 5 units, which is zero lift, becomes primary for the recovery. A very slow rudder roll not to exceed 45 degrees per second may be accomplished if you feel that the attitude is too uncomfortable, but this roll is not necessary. The aircraft is in a ballistic trajectory as long as you maintain zero lift and keep flight controls neutralized. You will find that large stick displacements and slightly higher stick rates in pitch axis are required to maintain zero lift. Once your finesse has established the proper trajectory all you can do to help the recovery is wait. As the airspeed approaches 200 kcas in a nose low attitude a gradual increase of angle of attack up to 18 units, allowing the airspeed to build up to 300 kcas, will result in a smooth recovery.

It becomes very important for each pilot to know his own capabilities and to have a thorough understanding of the F-4's flight envelope. Don't get in too deep. Remember, never use aileron with the stick in your lap nor start a bank with slow airspeed while the flaps are retracting. I leave you with a final word. To be safe, don't fly low and slow because she's a maximum performance doll and should be shown the proper respect. ★



Lt Col Moses R. Box, Directorate of Aerospace Safety

DURING the early design of the LGM-25C Weapon System, the effects of noise and vibrations on the Titan II missile during launch were recognized. The launch duct of the silo was designed with an acoustic liner to absorb energy and prevent destruction of the missile. Contracts were let for construction of the launch facility with an acoustic liner in the launch duct, but none in the exhaust duct. Even after construction had begun, investigation into the noise problem continued. The need for exhaust duct liners was first discovered during one-sixth scale model firings using an in-silo launch configuration. The need for this liner was later confirmed during full scale test firings at Vandenberg AFB. Had a Titan II missile been launched without the exhaust duct liner, the noise and vibration would have destroyed the missile as it emerged from the silo.

The Titan II noise problem was recognized and corrected, but noise still creates problems at missile facilities. One of the primary problem areas is related to the effect of noise on the human being.

In discussing the problem of noise, a good place to start is by defining noise. Webster defines noise as "sound that is noticeably loud, harsh, or discordant." AFM 127-101 describes it as "sound that forces unwilling attention or causes an unpleasant or emotional reaction, or gives a person the distinct feeling of relief upon cessation." This latter definition implies that there is more of a problem here than the physical damage which may result directly from the noise and vibration. A psychological as well as physiological hazard is introduced by noise.

The psychological hazard associated with noise results from irritation and annoyance to the individual. Noise levels only slightly higher than normal are often annoying. This annoyance will increase as the noise level increases. Pulsating noises are more noticeable than continuous noise. These distractions may not be intense enough to permanently injure hearing, but may cause irritability, fatigue, confusion, or destroy the ability to concentrate.

Vibrations on the body create fatigue, while the irritation to the ears and nervous system causes the individual involved to hurry to complete his job and get away from the unpleasant environment. These psychological effects, if not the primary cause of accidents, are often a contributing cause.

Noise levels not sufficiently high to induce injury to the human body, nevertheless may adversely affect speech communications. "Masking" refers to one sound interfering with or blocking out another. AFM 127-201 points out that at noise levels 12 decibels below speech, 80 per cent of the words are understood. As the noise level increases to that of speech, only 40 per cent of the words are understandable; and with noise levels 6 decibels greater than speech, only 10 per cent of the words spoken are understood. The masking of speech and warning sounds by other noises results in hazards where orders or warnings are not heard or understood.

Naturally, the ear is the organ which is generally physically damaged by noise. This delicate instrument not only acts as a highly sensitive microphone, but also has the ability to filter out background noise and judge pitch and musical qualities as well. Damage to the ear may cause temporary or permanent loss of hearing. Safety standards for frequent exposure must take into account the frequency range of the sound, its duration, the suddenness of onset, and the individual susceptibility of the persons involved. Pain to the ear is a warning signal of injury to tissue but sound produces aural pain at a level that is usually much higher than the level at which permanent hearing is lost. Most damage to the ears occurs below the pain threshold.

Before proceeding any further, a definition of the term "decibel" (db) is needed. This term is borrowed from electrical communication engineering and originally represented the loss in power in a mile of standard cable at 860 cycles. When used to express a noise level, zero decibels is a sound pressure of 0.0002 dynes/cm^2, or the approximate threshold of man's hearing. This unit of measure gives a reference for discussing the intensity level of various noises.

Temporary hearing loss could amount to a dulling of the sensitivity of an individual's hearing due to excessive exposure to noise. This temporary loss is due to a shift in the hearing threshold. As an example, exposure for eight hours to a steady-state noise of 85 to 95 db will show a 10 db shift in hearing for noise with a frequency above 1000 cps. The significance of this temporary lessening of hearing lies in its effect on communication. Warning systems, signals, etc., will become less efficient, and this may result in a serious error by an operator or technician.

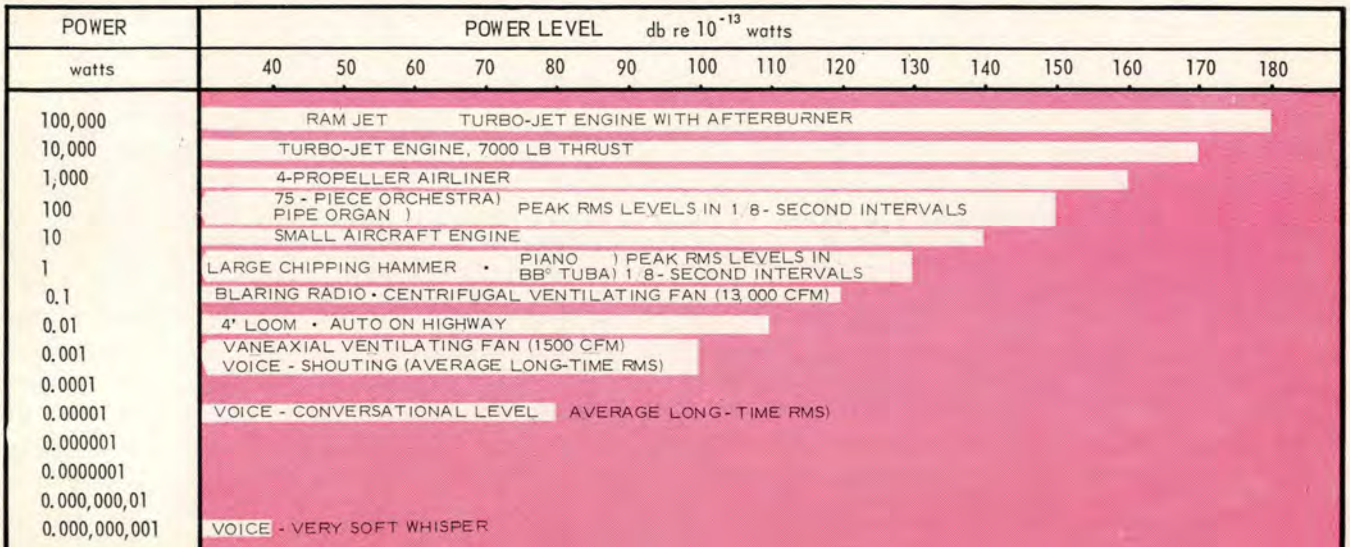
Recovery from a temporary threshold shift depends on the amount of shift and the time interval after the noise stops. When the shift is less than 40 db, recovery will be at the rate of log t, where t is time after cessation of the noise. A shift of 40 db requires a recovery time of approximately two hours. Shifts greater than 40 db result in a longer recovery period with the rate of recovery becoming linear in time after the first two hours.

Permanent loss of hearing due to noise is generally the result of destruction or damage to some part of the ear. Instantaneous noise levels of 150-160 db will result in the eardrum being broken and the bones of the middle ear being pushed out of position. Acute pain will result to the ear at 140 db; however, the noise must usually be sustained to cause damage. Permanent impairment of hearing is influenced by the length of time the ear is exposed to the noise. Cumulative damage may result at 90 db where that noise level is sustained on an eight hours a day, five days a week basis.

The noise level chart from AFM 127-201 is included as a part of this article. It is a good reference to give you an idea of the noise levels to expect around various pieces of equipment. But noise problems which can affect a man's hearing for the rest of his life should not be determined by interpreting a chart. Where the Safety Officer thinks there is a possibility that noise problems may exist, assistance should be requested from the Medical Service physicians and engineers who can evaluate the situation through both environmental and clinical measurements. On most bases the starting point for obtaining assistance in this area is the Base Bioenvironmental Engineer who is assigned to the base hospital.

Where high energy levels could exist, a program to monitor the area should be established so that personnel will be protected when noise levels become excessive. Areas of known high noise levels should be posted in such a manner that personnel entering the area are aware of protective devices needed. People should also be instructed on the use of, need for, and the protection afforded by protective devices. Those assigned to work in areas of hazardous noise levels should receive a preassignment audiometric examination with follow-up periodic examinations to detect damage prior to its becoming extensive. Vibration producing equipment should be shock isolated and enclosures should be provided to separate the equipment from the operator where possible.

Noise damage to the human ear is often permanent, so don't wait for damage to occur to identify your problem. Take preventive actions now to identify noise hazards or, where known danger exists, to protect against them. ★



RAMP SAVVY

TAXI accidents aren't confined to the big birds; all sizes are having an ever-increasing number of ground type bashes. With military aircraft operations continuing on a large scale, ops and maintenance personnel must work together if we are going to stop this seemingly endless drain on our equipment dollars.

Some live training certainly is in order: (1) For operations personnel, a transient alert or transient maintenance man should demonstrate *all* of the most used ground signals with an explanation of exactly what they mean. This would surely be more effective than having pilots look at diagrams and read descriptions. (2) For maintenance men, all potential wingwalkers should get demonstrations of reflex and system log times for brake operation. This would help to make them aware of the lead time required for rendering an effective ground-to-cockpit signal. These are just a couple of items that need attention.

To illustrate the double-barreled problem, here's one misfortune that happened in the closing moments of 1967. A transport had just landed and was met by the "follow me" vehicle. The driver had been told exactly where to park the aircraft, which had an IP in the right seat watching the action. As the bird approached the parking area, the marshaller stopped it and removed a chock and fire bottle from the hardstand to be used. He then signaled the aircraft to move forward. Just after starting to roll again the pilot noticed a yaw to the left and saw that his left wingtip had struck a concrete building. His nosewheel was on the taxiway centerline when the accident occurred. Primary cause: operator factor, in that the pilot failed to insure adequate clearance. Contributing cause: transient alert personnel led the aircraft through an area of reduced clearance without wingwalkers.

There are two very important points here: (1) Yellow centerlines *do not* necessarily mean sufficient clearance and (2) ground personnel *must* know what type aircraft can safely use each and every area of their station. More training? You bet!! Maintenance personnel must know those taxiways and parking areas like the backs of their hands. This particular transport was a C-47—a relatively easy bird for pilots to judge clearance from the cockpit. How about the really big ones? Their drivers need even more help from the alert troops. If the bird won't fit, the alert men *must* know it.

Speaking of the really big ones, here is what happened to a C-124 recently. With the aircraft commander in the right seat, the pilot eased the bird out of its parking spot and started to turn left into the taxiway around a C-124 parked on the next spot. The aircraft commander realized that a turn back to the right was necessary and cautioned the pilot to slow down and start the turn. Shortly afterward the wingwalker signaled for a right turn, the top hatch scanner called to go right, and the A/C called for brakes. Both actions were taken but not before the left wing had struck the nose and they had gone beyond the other aircraft. The following remedial action should serve as an excellent training guide for all base operations and maintenance units.

"The use of proper and timely signal procedures (for wingwalkers) will be covered in detail in maintenance roll call briefings and safety meetings. Particular emphasis will be placed on the importance of giving a STOP signal in lieu of a turn signal when it is apparent that an immediate turn is required to provide the necessary 10-foot clearance. An additional parking spot labeled 'C-124' has been located to the rear of the present one. The taxi line that previously depicted the center of the taxiway has been relocated 13 feet closer to the ramp edge. The new line will provide four feet of ramp surface outboard of the main gear and proper wingtip clearance for aircraft up to the span of a C-124, provided any parked C-124 aircraft has its nosewheel on the new spot. Aircraft such as the C-133 that are larger than the C-124 are restricted from any operation on the ramp and will be parked on taxiways."

The point to stress here is that even though taxi lines and parking spots are altered, transient alert and maintenance men must stay completely aware of airdrome capabilities.

The problem is serious now, but imagine the cost in repairs and downtime when multi-million dollar C-5s, F- and B-111s and other follow-on aircraft start occupying our ramps. A few dollars worth of training, when the need is indicated, can save thousands. That's a pretty good return on the investment. ★

KEEP YOUR GRIP IN RESCUE...

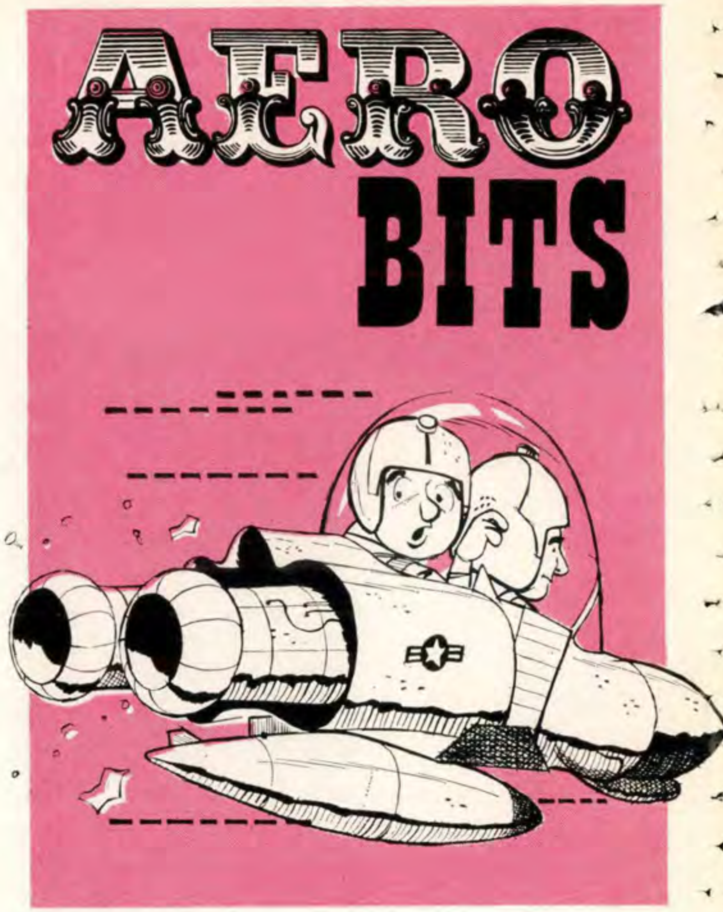
There's a reason for the photos on this page. Not long ago a pilot who successfully ejected from a damaged fighter in the Tonkin Gulf was lost during the rescue attempt. Perhaps he was excited, maybe he didn't know, or had forgotten, how to conduct himself in the sling. Study the simple points made here and remember them. Then, when the chips are down, you will be able to help your rescuers help you.

TF 5800—RESCUE is a new film on the subject. It has some good stuff for both rescuers and survivors.

ABOVE Photo on left shows proper position of body in sling. At right, survivor level with helicopter door, back to the chopper. Let rescue men do the work. **Don't let go of your grip to help.** Both photos illustrate proper hand grip.

LEFT Once you're inside the aircraft the rescue men will take care of you. Let them place you securely inside and remove sling. They know their business.

RIGHT Proper positioning and grip on jungle penetrator. Don't let go of your grip to help yourself. Hang on until you are safely inside and your hands are pried loose. Remember, you can't fall out of the sling or off the penetrator unless you relax your grip. **So, don't let go!**



"NO DEFECT NOTED: OPS CHECKED OK"—How many times have you seen this corrective action used for a pilot's write-up? Enough times to make it a sore subject between Ops types and Maintenance. Having looked at it from the operations side of the fence for a number of years, I was brainwashed enough to believe that our maintenance organizations were sorely lacking knowledge, enthusiasm, initiative, devotion to duty, and all those other little goodies that make up a highly efficient organization.

I have now been assigned to the maintenance side of the fence for nearly two years, serving as maintenance test pilot on T-37 and T-38 aircraft, as OIC Flight Test Section, and now as Quality Control Officer. This by no means qualifies me as an expert in the maintenance career field, but it has helped me to become more appreciative of the wrench-benders' problems and frustrations. For example, consider the following: The pilot's write-up was "TACAN inoperative." Comm/Nav's corrective action was: "No defect noted—ops checked OK." The next pilot who flies the aircraft is going to be highly critical of Maintenance if he has the same malfunction, and Maintenance will be highly critical of Ops if a sortie is lost and the same write-up appears.

The obvious questions left unanswered are: Was the TACAN inoperative on all channels or just one? Was it inoperative in Azimuth, DME, or both? Was it intermittent, unreliable, or completely inoperative? Were other aircraft having similar difficulties at the same time? Did the Comm/Nav repair man perform a complete check of the TACAN system, including the antenna? Was this a repeat write-up? Was troubleshooting and repair done in accordance with technical order procedures?

There is absolutely no substitute for communication. Pilots must communicate all the information pertinent to the discrepancy in their write-ups, concisely and to the point. Also, the repair man must state the full corrective action taken. If he finds a loose connection, the corrective action should so state.

The manhours wasted and the unnecessary parts installed cost you and me, taxpayers, millions of dollars each year. We may never be able to eliminate this problem, but we can chip away at it by striving to eliminate those repeat write-ups.

Maj Henry A. Proctor
Quality Control Officer
3500 PTW, Reese AFB, Texas

AWARD-WINNING SAFETY FILMS—Two USAF films and an FAA film received special recognition in 1967: "Moods in Safety" and "Traffic Safety Community Workshop" were selected by the National Committee on Films during Expo 67, and the Bronze Plaque was presented to Maj Gen William B. Campbell, Deputy Inspector General for Inspection and Safety. Out of 106 entries, the film "Moods in Safety" placed second. This film emphasizes emotional stresses that create accident situations. "Traffic Safety Community Workshop," which placed in the top ten, describes the cooperation of civil and military authorities to combat common traffic problems.

The FAA Film "Density Altitude," directed at general aviation pilots, received special recognition as an outstanding safety film at the National Safety Congress in Chicago. It describes pitfalls faced by a general aviation pilot operating in high temperature-high elevation areas. Action revolves around a cross-country in a light plane. This 16mm film is stocked in FAA's Film Library, Oklahoma City.

Other USAF films available to your local film library or film servicing activity are:

FR 761 CRASH SURVIVAL. 33 min, B&W. Tells how the use of personal equipment and observance of safety rules were major factors in saving the life of an officer in a T-33 crash that killed the copilot.

•

TF 5803 C-130 NUCLEAR AIRLIFT. 24 min, Color. Shows method of handling, checking, loading, shoring and transporting nuclear weapons in the C-130 aircraft according to nuclear safety standards. SECRET RESTRICTED DATA film.

•

TF 5954 ORDNANCE DELIVERY PROCEDURES SAWC. 23 min, Color. Explains techniques for computing effective weapons delivery in special air warfare aircraft. Covers speed, range, angle of attack, altitude and wind correction factors. FOR OFFICIAL USE ONLY film.

•

TF 5993 RESCUE AND YOU IN SOUTHEAST ASIA. 23 min, Color. Demonstrates to AF pilots how to increase chance of survival when downed in combat. Explains necessary teamwork between pilot and helicopter rescue crews for a successful pickup. CONFIDENTIAL film.

•

TF 5998 MAC AIRLIFT OF NUCLEAR WEAPONS. 20 min, Color. Indoctrinates C-141 aircrews in procedures for handling and transporting nuclear weapons. Reviews safety regs. SECRET RESTRICTED DATA film.

•

TF 5522g MAN AND SAFETY — TOOLS. 28 min, Color. Enacts accidents on the ground and in the air to show how misuse of tools can lead to disaster. Points out importance of selecting and correctly using proper tool for specific purpose. Tells need for an individual safety plan of action for every person. (Article "Arctic Ordeal," July 1966 *Aerospace Safety*.)

For ZI installations, AF films are available at the Film Library Center, Aerospace Audio Visual Service (MAC), 8900 So. Broadway, St Louis, Missouri 63125.

For overseas: AF Film Library (Europe), APO New York 09666; AF Film Library (United Kingdom), APO New York 09218; AF Film Library (Latin America), APO New York 09825; AF Film Library (Alaska), APO Seattle 98742, and AF Film Library (Far East), APO San Francisco 96323.

Films should be ordered through local base film libraries which either stock or have expeditious channels for obtaining desired subjects. Activities not serviced by local base film libraries may order from the AF Film Library Center or appropriate overseas central film library.

THE LANDING WAS SMOOTH BUT TAXIING WAS ROUGH. A Thud pilot rolled out Nr 3 on downwind with most of his attention on Nr 2. He was a bit close and riding jet wash. The local low frequency radio beacon was sending out a coded signal that was partially blocking tower's UHF as well as the sounds from the gear warning horn. Mobile was busy checking to see if 2 got a good chute. Horrendous scraping noises followed.

This is a classic gear-up landing sequence, most of which start with the pilot concentrating on something to the extent that he flies the aircraft by habit. Or something comes up that distracts him at a crucial point in the landing sequence. Almost anything that's just a little out of the ordinary can set things up. Then, if the pilot doesn't have a system of double checks or has slipped into the habit of looking at the gear indicators only to see that they are all alike, and if the other safeguards fail (and they always seem to fail under such conditions) he'll join the club.

Many pilots secretly believe that they are perceptive enough to sense the difference between a proper final and a gear-up configuration. But you can't. Once slowed to approach speed, most birds have about the same sink rate and require about the same amount of power regardless of gear position. If you doubt this, set up some practice final approaches at altitude.

The only practical answer to the gear-up problem is to get in the habit of really checking the indicators, to check them when you first extend the gear and to check them again just before you are committed to touching down on the concrete. You should also make it a point to make a third check any time you encounter something unusual during the early part of the landing sequence. Alert tower operators manage to get through the cockpit fog once in a while, or many more of us would have joined the club some time back. It usually never dawns on the pilot why the tower guy calls for a go-around until he reaches for the gear handle.

LtCol Karl K. Dittmer
Directorate of Aerospace Safety

MADISON AVENUE MEDICATION. Although the general public is drug conscious—aircrew members must avoid the temptation to let Madison Avenue huckstering perform such legendary feats as, "Shrink swollen membranes" and "Relieve tension fast." One popular cold remedy that contains five medically proven ingredients is available at the local drug store or the base exchange without a prescription. Some of these five active ingredients in an aircrew member can change him from a cold sufferer to an aircraft accident statistic. Many of the readily available cold remedies can produce such interesting side effects as vertigo, dizziness, blurring of vision, etc. Most cough remedies contain from nine per cent to 15 per cent alcohol and that beats 3.2 beer by a long shot, in fact it makes a pretty good short shot. The Flight Surgeon is available with drugs, if needed, and will advise you if the drugs prescribed preclude flying. He is trained to determine if the illness or the drugs should prevent flying. Let him do his job—he doesn't fly the aircraft, don't you treat the patient.

AFSC Safety Management Newsletter

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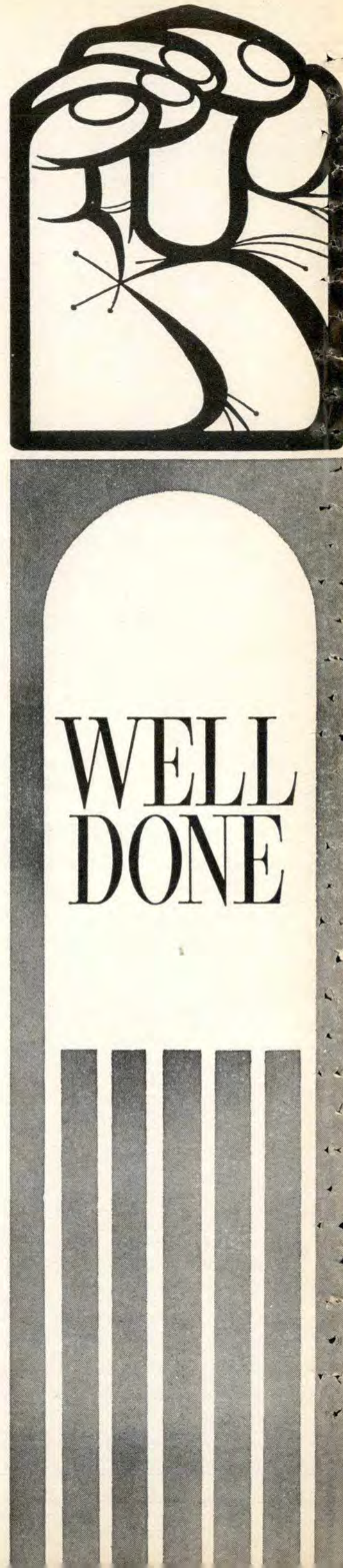

2000 LETTERS

By now you should have at least two thousands letters from members of the 1370th Photo Mapping Wing (MAC) informing you that you omitted "The Best in MAC" in your article in the December issue.

However, do not be too concerned. Our Wing will just go quietly on—receiving "Outstanding Unit Awards."

LtCol William G. Watts, Jr
Commander, 1375th M&C Sq
APO San Francisco

Sorry about that. Congratulations and keep up the good work.

COVER PICTURE: August 1967

This letter is in regard to the August 1967 edition of AEROSPACE SAFETY MAGAZINE. The cover has a picture of an F-105. I wonder if you have a picture like that or could tell me where I might get a print? My husband has just returned from SEA where he flew the F-105 out of Takhli. He has commented on the picture so often I would love to get a copy and frame it for him. Thank you.

Anne M. Balog
(Mrs. George Balog)
718 Pine Glen, Craig AFB, Al

A copy is on the way.

COVER PIC: August 1967

I note in several issues of AEROSPACE SAFETY there have been requests for copies of the August 1967 cover pic. If you could fill one more request, I should appreciate it.

As a new Flying Safety Officer, the magazine is now read more carefully and is even more useful to me than it has been in the past. It fills a definite need and is doing a very good job of spreading the safety word.

Thank you for the magazine and picture.

Capt John E. McMahon
49 FIS, Griffiss AFB, New York

Yep, that August cover pic has been a best seller! A copy is in the mail. Your kind words about Aerospace Safety are appreciated.

MAIL CALL

Have just finished reading Mail Call in the January 1968 magazine. To heck with reprints of planes with concrete tied to the tail, and F-105/MIG-21 cover shots! How about a photo of the Mail Call girl? I think I'm in love with her.

2/Lt Robert G. Berlin
Safety Officer, Supply Services Sq., 840 CSGp, Lockbourne AFB, Ohio

Get in line, Bob.

☆ U.S. GOVERNMENT PRINTING OFFICE 1968 301-215/7

Maj Robert H. Dubberly

1st Lt Philip E. Jach

SSgt Melvin P. Wolpert

459 TROOP CARRIER SQUADRON, APO SAN FRANCISCO 96368

On 14 March 1967 Major Dubberly as Instructor Pilot, with First Lieutenant Jach, co-pilot, and Staff Sergeant Wolpert as flight engineer, took off in a C-7A with 17 passengers. As the aircraft was climbing through 4500 feet a slight smoke odor was noticed by the crew. All instruments and circuit breakers were monitored with no abnormal indication noted. The side cockpit windows were closed and the smell diminished. Approximately 10 minutes later an acrid smoke odor was again detected. Smoke in the cabin was now affecting the passengers' eyes but the smoke source could not be located. Because the intensity of eye irritation was increasing, Sergeant Wolpert opened the aft cargo door to help alleviate the smoke.

Lt Jach started a descent. While the aircraft was passing through 5000 feet the Nr 1 engine fire light for zone 2 and 3 illuminated. Engine inflight fire procedures were accomplished but the propeller would not feather. Both fire extinguisher bottles momentarily diminished the now blazing fire which was burning well aft of the firewall and back toward the left wing. Maximum power was applied to Nr 2 engine and a 300-400 foot per minute descent was the best performance attainable.

At 1000 feet, attempts to lower the landing gear proved unsuccessful; the gear controls had been burned away by this time. With maximum power on Nr 2 engine, Nr 1 propeller windmilling, and zero flaps, Major Dubberly and Lt Jach continued the approach. By now many pieces had burned off the Nr 1 engine nacelle and flames were engulfing part of the wing.

Major Dubberly took control of the aircraft, crossed the end of the runway, and touched down on the fuselage. The aircraft slid 657 feet and came to rest on the centerline of the runway. All power was turned off and the 17 passengers and crew evacuated the still burning aircraft.

Subsequent investigation cited enemy action as the cause of the fire. Because of Major Dubberly's and Lt Jach's crew coordination, skill and professionalism, and Sergeant Wolpert's outstanding ability in rebriefing and controlling the passengers, all aboard escaped without injury. WELL DONE! ★

WELL DONE in '67

1967 was a year that offered the Air Force more challenge, in many areas, than any similar period in recent history. By almost any yardstick, it would have been easy to predict that the aircraft accident rate would have soared and that, at best, we would merely have held our own in another accident-producing area — the privately owned automobile.

Now the final figures are in and we are all gratified that 1967 turned out to be a very good year as far as the number of accidents was concerned. The overall and major aircraft accident rates were among the lowest in Air Force history and the number of lives lost in automobile accidents was reduced by 21 per cent.

Most of the credit for this exceptional performance should rightly go to the people most involved — the aircrews and maintenance people who actually operate and maintain our aircraft, and to our whole Air Force family for showing such a dramatic reduction in automobile accidents.

There is no question that our jobs have been much more demanding during the past couple of years. Most of our flying last year was done in Southeast Asia with the built-in hazards that a wartime environment there presents. Even here at home our jobs have been tougher. Many pilots have trained into aircraft that were new to them, and some of these transitions have been rather drastic, such as from transports or big bombers into single engine fighters. Others have made the jump from big, fast, complex aircraft into FAC airplanes and the A-1. Some, of course, have gone the other direction — from fighters to transports.

What was true for the aircrews holds for the maintenance people, many of whom have had to learn different types of aircraft, engines, and aircraft systems. I think also, that a lot of safety people deserve credit for their part in the success we enjoyed in 1967. Most of them in SEA have been working a seven day week and the problems they spotted and corrected certainly had an influence on the reduced number of accidents in the theatre last year.

Broadly speaking, safety is a team achievement — something that results from concern at the top that works its way down to the lowest echelon with each interim level assuming its responsibility. So it is difficult to single out any one group for special credit. Nevertheless, I want to take this opportunity to congratulate the men who are at the business end of the safety program. You are the ones who operate the equipment and who keep it going. You are the men who suffer the consequences of a mistake, an oversight or a poor procedure. You are the men we ask the most of and I take my hat off to you for an outstanding job.

Frank K. Everest, Jr.

Brig Gen USAF
Director of Aerospace Safety