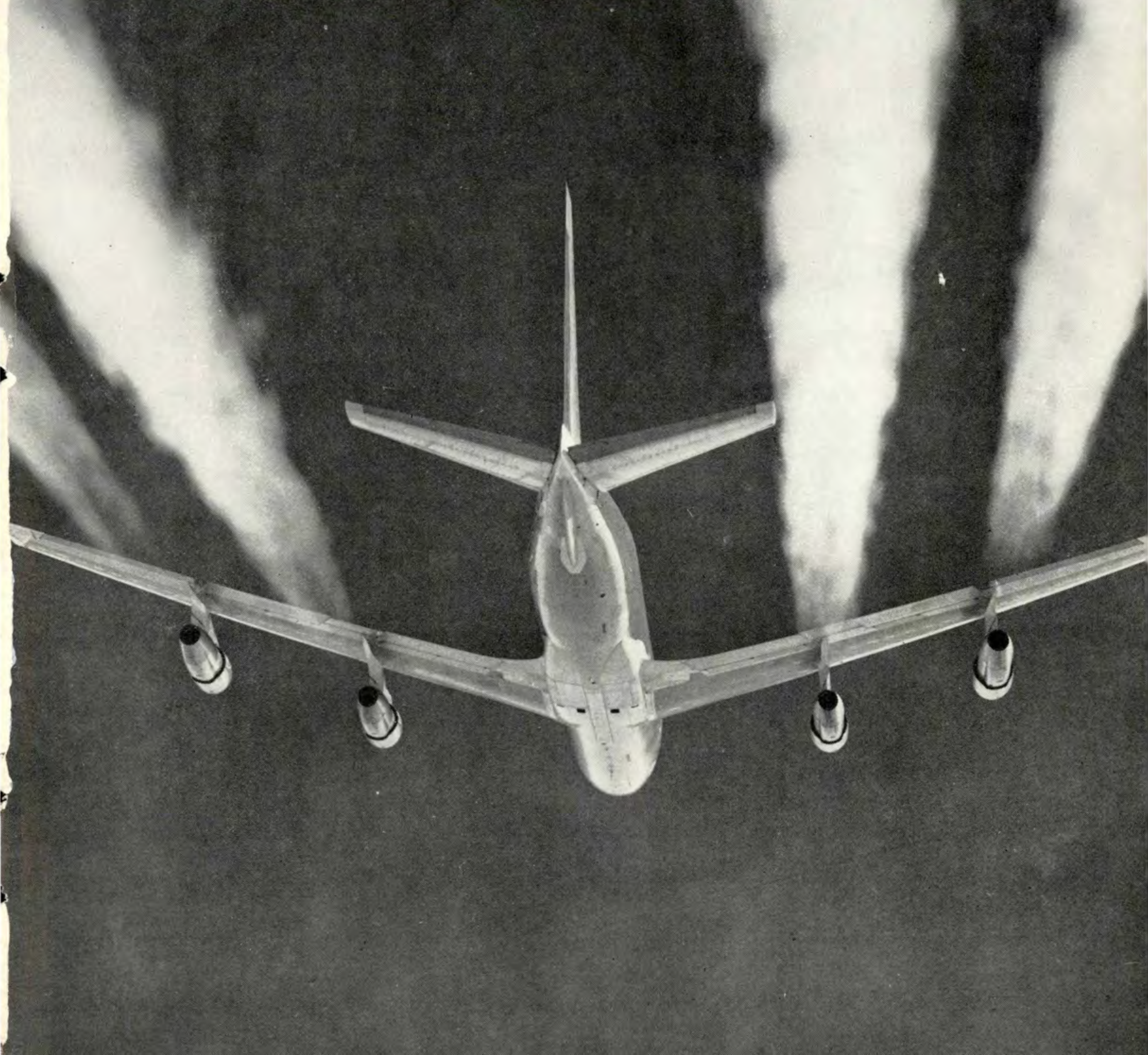
AEROSPACE

SAFETY

UNITED STATES AIR FORCE



NOVEMBER · 1962

IN THIS ISSUE

FALLOUT

Missing Handrail?

I've read the article "The Winning Side" in the August issue of Aerospace Safety and the last sentence is very true. *("The war for flight safety is never over but for 17 years the 4434th has been on the winning side.")* However, seems their war on ground safety was given up some time ago. Notice the aft handrail missing on the Aerostand in picture on page 16.

We enjoy reading Aerospace Safety as several ideas also affect our Flight Safety Program.

Enrique B. Hoffman
Quality Control Branch
Fort Huachuca, Arizona

• • •

More About Guard

The congestion on Air Force-Navy-Army-Air Guard—FAA Common Frequency ("Guard" Channel) is everything you say it is. In fact, it seems to get worse instead of better, despite all efforts to improve the situation.

One relatively unmentioned aspect of unauthorized use of Guard is the fact that it blocks out transmissions on all other channels (when the receiver is tuned as required by regulations), necessitating endless repetitions. This contributes greatly to congestion across the board.

Why would it not be possible to redesign or modify the UHF radio control head so that it would be necessary to break a safety wire to select the "Guard" Channel transmitter position? If this were done, a broken safety wire could be made sufficient reason to turn down an airplane prior to flight until re-safetying was accomplished. Likewise, a broken safety wire after flight would require a writeup in the Form 781 and a written explanation to Operations by the pilot. If this were done, I believe that the misuse of Guard Channel would be dramatically reduced. An even more dramatic reduction could be obtained by rewiring the switches so that selection of the Guard transmitter position would automatically turn the SIF to "Emergency." No one in his right mind would select Guard Channel if he knew that by doing so he would alert the entire Air Traffic Control system by actually declaring an emergency.

Of course, some wag would always tune in 243.0 on the Manual position, but he would have to be the determined type. Perhaps some way could be found to frustrate him, too, with a little piece of safety wire.

Major H. H. D. Hieberg, Jr.
7205 Leesville Blvd.
Springfield, Virginia

Your concern for proper use of Guard Channel is shared by DIG/Safety personnel, as past articles in this magazine well attest. Be assured, your suggestions will be passed to project personnel concerned for evaluation. Your interest in safety, and especially attempts to alleviate problem areas, as evidenced by your letter, is appreciated and encouraged.

• • •

"Nitpickers"

Though it may not contribute much to safety I am sure you heard from many of us "nitpickers" about the "JN4D" pictured on page nine of your September issue. The pictured airplane doesn't show the fifteen-foot difference in upper and lower wingspans given in the specs. It looks like a DeHavilland DH-4.

Capt William R. Moe
Reno Air Defense Sector
Stead AFB, Nev.

Our artist happened to be out of Jenny pictures and put the DH in for atmosphere.

Cover photo: Courtesy
THE BOEING COMPANY, Renton, Washington

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VOLUME EIGHTEEN NUMBER ELEVEN USAF RECURRING PUBLICATION 62-1

C·141 STARLIFTER

TOMORROW'S WORKHORSE

TOMORROW COMES IN LATE 1964 when C-141A StarLifter Cargo Transports begin operational service with MATS. First flight will occur in December 1963. Since the C-141A is to be a *state-of-the-art* aircraft, Air Force and Lockheed engineers are drawing upon millions of hours of operational experience from other jet aircraft to provide a reliable and efficient means of airlift for personnel and equipment.

Representatives of MATS and the Army at the Aeronautical Systems Division C-141 System Program Office at Wright-Patterson AFB, Ohio, provide engineers a better understanding of the operational environments the aircraft will experience. ATC, AFLC and the FAA representatives also take an active part in the management effort. Through periodic visits to Lockheed and the SPO, experienced MATS crewmembers and maintenance personnel are providing inputs to the engineers on ways to improve the safety, reliability and maintainability of the aircraft. To avoid the pitfalls normally associated with development projects, an AF, FAA and Lockheed team makes frequent visits to MATS and airline maintenance bases to obtain the maximum benefit from the experience gained on present aircraft. The objectives are not only to reduce costly and time consuming changes after the C-141A is in service, but also to develop the safest aircraft possible.

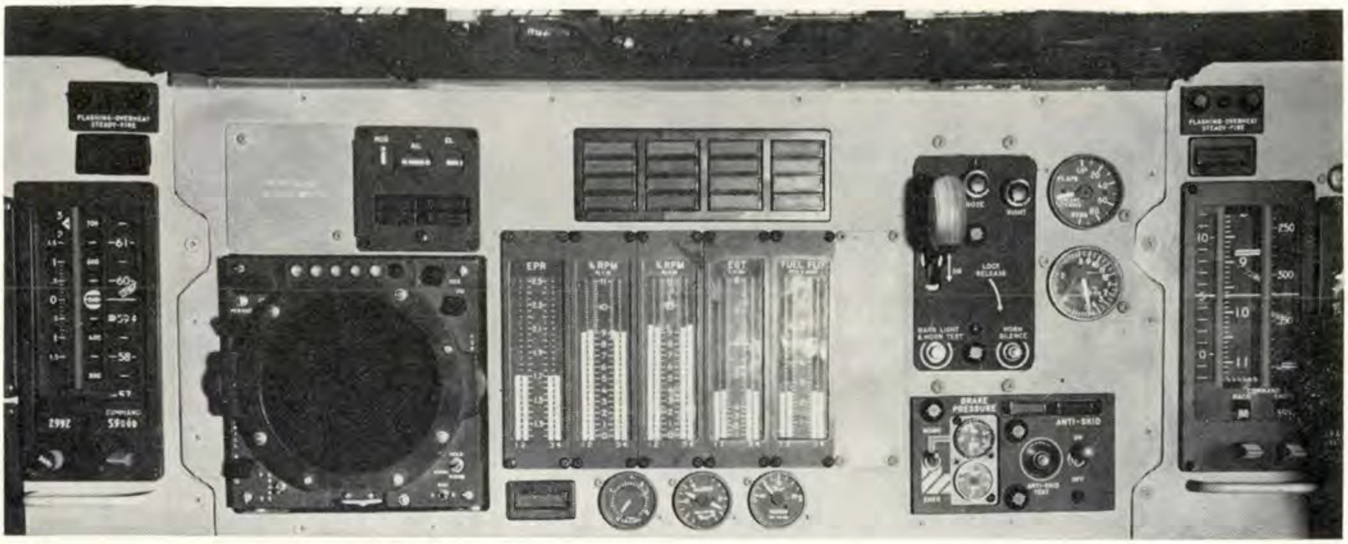
Easily recognizable by its T-tail design and its high wing incorporating a 25° sweep, the StarLifter uses four 21,000 lb. thrust Pratt & Whitney TF33-P-7 turbofan engines.

With a 318,000 lb. ramp weight, the aircraft is designed to transport a payload of over 60,000 lbs. some 4000 nautical miles at a cruise speed of 440 knots. Cabin altitudes of only 8000 feet will be maintained by the pressurization system at a flight level of 40,000 feet.

In the basic configuration, an envelope 9 feet high, 10 feet wide and 70 feet long is available for cargo loading. A 14-inch maximum width safety aisle is provided down each side of the basic cargo envelope for inflight access to the cargo and aft fuselage. The cargo compartment interior is trimmed with fire resistant panels providing thermal insulation and sound proofing. Easily convertible to alternate mission configurations, the StarLifter will accommodate up to 154 troops in side facing seats, or 136 troops in aft facing 16G seats. During air evacuation operations, 80 litter patients and eight attendants can be accommodated. An additional liquid oxygen supply kit can be readily installed within the gear pod during troop carrier operations.

A low level airdrop capability is possible with minimum compromise to its high speed, high altitude performance. The unusual high T-tail design was dictated by the cargo doors located in the aft portion of the fuselage. Any combination of paratroops and cargo can be airdropped including single unit loads of 35,000 lbs. Ninety-eight per cent of the equipment of an Army Airborne Division can be transported and airdropped.

Capt John F. Swearengen, ASD



C-141 *STARLIFTER*

The 463L Materials Handling System rails and rollers integrally incorporated in the cargo floor restrain palletized cargo loads and facilitate egress of pallets during airdrop operations. These same rails and rollers, along with single point refueling, will permit aircraft turnaround in less than one hour. Unloading and turnaround at a forward area base, where refueling is unnecessary, can be accomplished in 15 minutes.

Specifically designed for a short takeoff and landing capability, the StarLifter can operate from bases with minimum facilities. At maximum gross weight, a takeoff distance of only 5300 feet is required to clear a 50 foot obstacle under standard day conditions. Landing over a 50 foot obstacle at 257,500 lbs. requires only 3700 feet of runway. Target type thrust reversers are used to reduce the landing roll. The landing gear consists of dual nosewheels and dual tandem wheels on each main gear. This design, which is predicated on the requirement for landing on minimum operational airstrips, plus the short takeoff and landing capability, will enable the C-141A to operate from a wide range of bases.

At the Lockheed-Georgia Company facility at Marietta, Georgia, and at the System Program Office, engineers are constantly reviewing the detailed drawings of each system and subsystem to spot that one design weakness that someday could lead to an accident. A big assist to this effort is provided by the Federal Aviation Agency. Since the C-141 will be type certificated for commercial use, the FAA is, of course, simultaneously reviewing the design for compliance with the Civil Air Regulations. Through an FAA representative in the SPO daily reports of all incidents and material deficiencies experienced by all U.S. civil carriers are made available to Lockheed and SPO engineers. These reports are closely studied for applicability to the C-141. Using this procedure, the StarLifter design is benefiting from over 1,000,000 hours of annual jet operational experience.

Particular attention is being given to reports of hydraulic system failures and false fire warnings. The FAA, at the Air Force's request, has compiled detailed failure rate data on present hydraulic and fire warning systems so that weaknesses in current systems can be avoided. Through these efforts the "bugs" usually associated with a new aircraft are being eliminated.

The current fire detection system uses an improved continuous wire design which is expected to reduce the number of false indications and unscheduled removals. An optical scanning system is being evaluated for possible installation along with the continuous wire system.

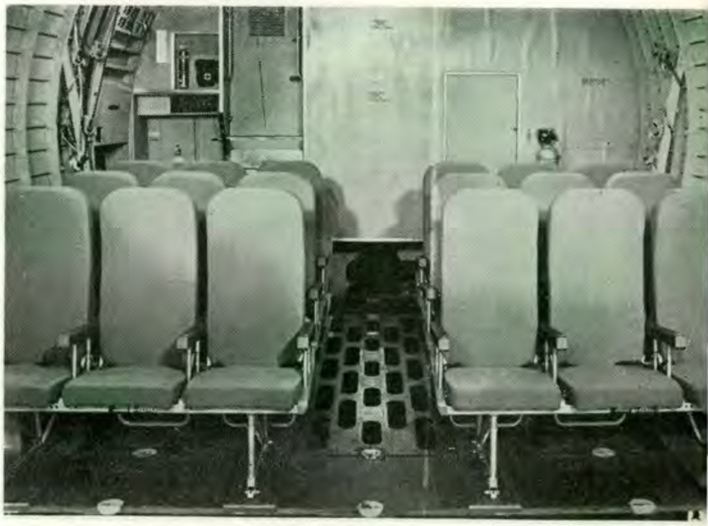
The C-141A contains three separate and independent 3000 psi hydraulic systems. The systems and power sources are designed to insure adequate flow capability under single faults or with two engines inoperative. Two independent systems supplied by engine driven pumps provide pressure to the dual aileron, elevator and rudder actuators. The primary flight controls are designed so that no single failure can cause loss of control of any axis or result in an adverse safety of flight condition. Adequate manual flight control capability is available in the event of the loss of both No. 1 and No. 2 hydraulic systems. Electrically driven pumps constitute the third independent system which supplies pressure for operation of the secondary flight controls, gear, nosewheel steering, etc.

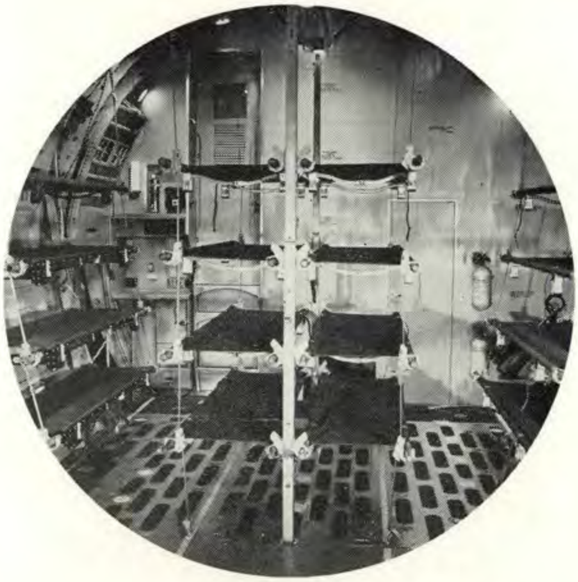
The secondary flight control systems are composed of three trim axes, wing flaps, and wing spoiler systems. The design of the trim flight controls permits only those forces and rates to be applied which will not compromise the primary flight controls or result in unsafe flight conditions.

Active participation by representatives of the Deputy Inspector General for Safety in the mockup inspection and subsequent safety conferences has provided a wealth of information obtained from military operational experience. Specific recommendations resulting from these conferences are analyzed and incorporated in the design wherever possible.

As previously stated, this is a state-of-the-art aircraft. This does not mean, however, that we are designing around today's equipment. The basic ground rule is to provide those equipments that will be available and

Forward view of C-141 cockpit, above, showing warning light panel just above pedestal; details of vertical instrumentation, left. Right, top to bottom, internal view of mockup interior, high density seating for troops, and mockup of litter arrangement.





proven in time for installation on the production aircraft. In other words, have a 1965 model in the year 1965.

Special emphasis is being placed on the cockpit configuration and instrument selection. After extensive Air Force and FAA evaluation, vertical scale flight and engine instruments were selected in lieu of the conventional round dials. An operational test and evaluation of similar flight instruments conducted by the Instrument Pilot Instructor School at Randolph AFB fully supported the decision to install tape instruments. A major advantage of this installation is the elimination of the possibility of misreading the altimeter by 10,000 feet. A dual central air data computer was selected to provide maximum reliability.

The primary engine functional parameters are displayed on both the pilot's instrument panel and the flight engineer's panel. The primary parameters monitored are: engine pressure ratio, per cent of rated RPM of the high pressure rotor, per cent RPM of the low pressure rotor, exhaust gas temperature, and fuel flow.

White lighting was selected for the flight station because of its many advantages over the red lighting found in most present day cockpits.

A takeoff warning system provides the pilot with a safe indication when certain critical items are functioning or positioned properly. When the wing flaps, thrust reversers, elevator trim, spoilers and autopilot are correctly set for takeoff, electrical power is supplied to the flight instruments and all doors are closed, a green light illuminates in the cockpit.

A master annunciator panel in full view of both pilots provides warning of system malfunctions. With all warning lights in a prominent central location, rapid recognition of failures is achieved with minimum distraction.

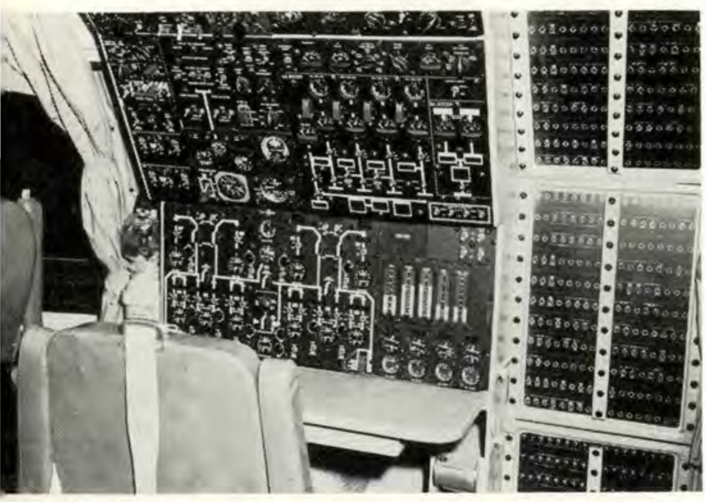
The flight engineer's station contains panels for management of the fuel system, electrical power system,

C·141 *STARLIFTER*

hydraulic system, air conditioning, pressurization and pneumatics, as well as the auxiliary power unit for ground operation. Growth panel space is also provided.

All control panels present a schematic of the system involved and switches, controls and indicators are located in the respective location of the unit they represent. Management of the 150,080 pounds of fuel, contained in 12 integral wing tanks, will allow direct tank to engine feed, crossfeed from any tank to any engine or combination of engines, fuel jettison to reduce weight for an emergency landing, single point refueling and defueling.

Navigation, communication and associated avionic equipment of the latest proven design will be incorporated. Dual installation of most of the C & N equipment will provide an extra margin of safety. The LORAN (C) permits long range navigation by providing determination of aircraft position almost automatically from ground stations located over 1000 miles away.



Flight engineer's panel, top, and navigator's station. Empty panel spaces in latter, provide room for additional instruments as need dictates.

Provisions for installation of certain desirable equipment, not yet fully developed, are being provided. Two of the most important are Automatic Approach and Landing devices. When such equipment is available and meets the reliability and safety requirements of the C-141, it will be installed.

An aggressive reliability and maintainability program insures that the objectives of safety, dependability and accessibility are achieved. The maintainability program is primarily designed to assure a low maintenance manhour to flying hour ratio. Emphasis is placed on providing maximum accessibility for inspection and maintenance. Maintainability engineers and MATS maintenance specialists are reviewing the specifications and design from the flight line mechanic's viewpoint. An initial goal of 12.5 direct maintenance manhours per flying hour has been established.

An operational reliability goal of 90 per cent for a five hour mission with no degradation in mission performance has been established for the C-141A aircraft. The degradation of mission performance is defined as a failure or failures which will result in the loss of a necessary system function. The loss of a necessary system function will not always result in a mission abort. Consequently, it is estimated that only two per cent of the C-141A missions will be aborted due to aircraft malfunctions. Careful selection of components and thorough design analysis are important parts of the reliability program. Redundancy is being provided in critical circuits and systems when necessary to improve system reliability. Significant gains in the reliability of "problem systems" are expected due to reliability review and analysis.

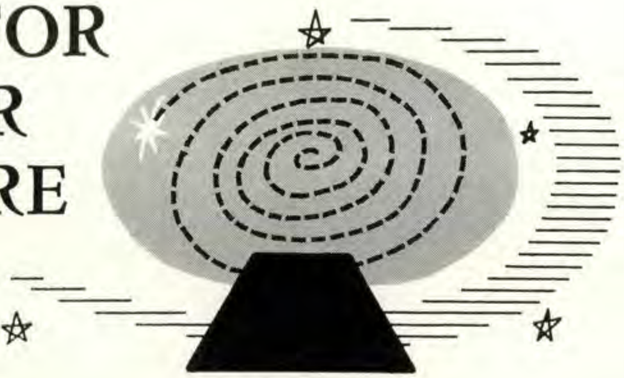
The corrosion problems currently being experienced by inventory aircraft led to a reevaluation of the corrosion protection normally afforded transport aircraft. Present planning is for a lacquer finish to be applied to the entire exterior of the aircraft in addition to a protective coating on interior surfaces. This action is expected to decrease maintenance requirements and lengthen the operational life of the StarLifter.

The aircraft structure is receiving an even more critical review. The fail-safe features of the structure will be demonstrated by analysis and complete static, fatigue and fail-safe test programs. The fatigue evaluation of the airframe will probably be one of the most comprehensive ever undertaken in the initial development of an aircraft type design. Plans call for essentially three complete airframes to be fabricated, one for static tests and one complete airframe plus additional major structural components for fatigue tests.

A first on this program will be the delivery (prior to start of training by MATS) of an operational flight simulator using digital computation with day/night visual attachments. Firmly convinced of the value of flight simulators, the SPO feels that this early delivery is a giant step forward in flying safety and accident prevention.

In two years, when the StarLifter enters the operational inventory, the nation's airlift capability will increase significantly. At the same time, we expect the StarLifter to significantly contribute to the reduction in the USAF accident rate. This reduction will be made possible by the efforts of the C-141A team of AFSC, MATS, ATC, AFLC, the Army, FAA and the Lockheed-Georgia Company. ★

PLAN FOR YOUR FUTURE



Maj Garn H. Harward, Transport Branch, DFS

IN PREPARING MAN for flight in the flying machine, we continually ask, "What can be done to increase the chances for a safe return?" We have taught him the characteristics and limitations of the aircraft, prepared flight manuals for his use, and made available radar and communications facilities as aids for navigation. In fact, we have covered all aspects of flight that can be expected under all conditions from explosive decompression to the use of an emergency ejection capsule.

All of this indoctrination has occasionally been negated by failure of some pilots to use sound judgment, and this failure is most frequently revealed during occasions when pilots have encountered marginal weather conditions.

During the period 1957-1961, 405 accidents occurred wherein weather was a primary or contributing factor. Cause factors were incorrect weather forecasting, inadequate flight planning, failure to analyze en route and destination weather prior to departure, failure to monitor weather en route and failure to consider short range visibility under marginal weather conditions. In analyzing these accidents, one factor predominates: in most of the accidents in which weather was a contributing cause, pilot factor was the primary cause. *This substantiates a long known fact: inclement weather further complicates any aircraft emergency and preparation for any weather situation must be included as a part of any flight plan.*

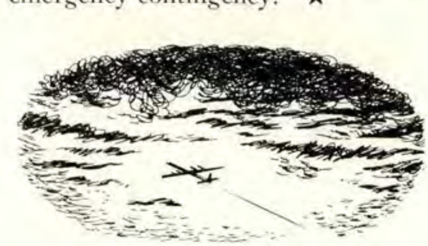
During winter operation, large areas of the earth are plagued with low freezing levels, low ceilings, and limited visibility. In summer months, large areas are frequently outlined in black and red weather warning symbols because of thunderstorms, tornadoes, etc. These weather phenomena regularly take their toll of aircraft and aircrews. In planning a flight into areas reporting unfavorable weather, primary consideration should be given not only to suitable alternate airfields but to minimum en route terrain and the requirement for a possible landing prior to reaching the destination, due to an unforeseen emergency.

Many pilots have experienced that moment of concern while flying IFR when pressurization is lost, the engine changes its familiar hum or the fire warning light illuminates. Knowing the weather conditions at a nearby airport can be comforting even though there may be no immediate requirement to use such knowledge.

The pilot's knowledge of weather phenomena and weather characteristics for a specific area, along with proper flight planning and selection of alternate airfields, are of paramount importance in conducting a safe flight during marginal weather conditions.

The flying machine is reasonably safe until it becomes associated with man; therefore, make your major decisions prior to entering the aircraft, and continue to monitor weather broadcasts throughout the flight by maintaining a listening watch at 15 and 45 past the hour and utilizing pilot-to-forecaster frequency UHF Channel 13.

Proper use of the available weather information, combined with individual proficiency and good judgment, go a long way toward insuring a safe flight under any normal or emergency contingency. ★



BUGS IN THE NOTAMS

It's time for Base Ops people to take another look at their NOTAM displays, according to reports from the field. Several discrepancies have been noted, the following prompting the most complaints:

- Lack of rapid updating of displays
- Poor reviewing of new summaries to insure accuracy.

In the first case the complaint is that sometimes NOTAMs are being delivered all right, but they're not being posted on the summary. Obviously a pigeon-holed NOTAM is not going to help a pilot clearing to the affected base.

On the other hand, in regard to the second point, facilities have been returned to operational status but remained NOTAMed OUT for as long as three weeks. Close review of summaries by Ops personnel would prevent this — the Central NOTAM Facility has no way of validating the accuracy of each NOTAM.

New means and better use of existing methods are needed to reduce the number of aircraft accidents labeled . . .

cause undetermined

IN 1952 A B-50D AIRCRAFT CRASHED into a plowed field after completing a SAC training mission. All personnel suffered fatal injuries. Cause factor—undetermined.

In 1952 an F-86E aircraft crashed during formation simulated combat maneuvers. Pilot was fatally injured. Cause factor—undetermined.

In 1962 a KB-50J aircraft departed for an overseas destination. No trace was found. All crewmembers missing. Cause factor—undetermined.

In 1962 an F-86H aircraft was one of four on a formation navigation mission. Aircraft was observed in a dive and crashed. Pilot was fatally injured. Cause factor—undetermined.

This type of accident continues to present a serious challenge to the effectiveness of the accident prevention program. Circumstances of each were somewhat similar and both single and multi-engine aircraft were involved. Two occurred in 1952; two in 1962, ten years later. The board findings in each: *Cause factor—undetermined.*

In the same ten-year period, the Air Force decreased its major accident rate from 28.0 per one hundred thousand flying hours in 1952 to 6.3 in 1961. This is ample testimony to the overall effectiveness of the Air Force flying safety program in saving lives and preserving the combat operational forces of this country. However, in this period the percentage of accidents for which investigators were unable to come up with a known cause factor remained basically the same from year to year, about 12 per cent. Unfortunately, this category has the distinction of accounting for a disproportionately large percentage of fatalities, 43 per cent in 1961.

The following chart shows breakdown of undetermined accidents for the period 1952-1961.

Year	Nr. Maj. Acdts.	Nr. Undet.	Per Cent Undet.
1952	2,274	180	8
1953	2,075	239	12
1954	1,873	268	14
1955	1,664	229	14
1956	1,466	205	14
1957	1,193	146	12
1958	894	102	11
1959	672	81	12
1960	426	45	11
1961	432	47	11

An accident for which the primary cause factor is not specifically determined represents a blank page in the accumulative history of accident preventive information. Many useful facts are gathered by close, accurate analysis and investigation of all mishaps. Defects not directly contributing to the accident are often uncovered and corrected. The fact remains that failure to pinpoint an exact cause factor leaves the accident unsolved and exposes aircraft and crews to possible recurrence of the same type mishap. Too frequently the pilot as well as other crewmembers are fatally injured and the mishap is assessed undetermined with most probable cause as pilot error. This is true many times in those accidents involving collision with mountains, mid-air collisions and distintegration of aircraft in the air. There are numerous reports of aircraft disappearing at sea with little or no trace of cause information left. We are acutely aware in these cases that something occurred beyond the ability of the pilot to handle. Our scientific and technical resources to find out what happened are relatively as limited today as they were ten years ago.

The Deputy Inspector General for Safety is well aware of this gap in the accident prevention program.

Lt Col J. M. Rodgers
Transport Branch, DFS

He recognizes that scientific advances in accident investigation have not kept abreast of the operational capabilities of modern day high performance aircraft. He insists however that the best job possible be accomplished with those tools at hand and requirements towards improving "the state of the art" be formally and clearly expressed.

First on the list towards technical advancement is the need for a comprehensive air data computing system commonly called the "flight recorder." Accident cause factors are presently determined through the efforts of investigating boards comprised of the most qualified personnel available. Even the more capable boards sometimes cannot determine a primary cause factor after weeks of effort. The current and projected Air Force inventory of high performance aircraft indicates that the capabilities of the most skilled investigation talent will be taxed to derive solutions to those complex mishaps in the future.

In 1958 a B-58 disintegrated at high altitude while on a test flight. Destruction of another B-58 in 1960 gave evidence of tornado conditions and ejection of crewmembers at supersonic speeds. In each of these accidents, those instruments recovered gave no useful information for accident investigation because of impact and fire. Factors such as speed, inertia forces and gyrations encountered by the aircraft could have been determined accurately if a crash resistant "flight recorder" had been installed. There were no survivors to provide data pertaining to these mishaps.

In 1958 the CAB imposed a requirement for a flight recorder to be installed on all large transport aircraft certified to operate above 25,000 feet. The recorder had to be capable of recording time, airspeed, altitude vertical acceleration and headings. The Deputy Inspector General for Safety has also submitted a formal requirement for a similar recorder to be installed on all Air Force passenger-carrying cargo aircraft and the KC-135; and all strategic bombers, the B-58, B-52 and B-47.

Another long standing requirement is that of a crash locator beacon. The files show many cases in which survivors have lived after a crash only to die before rescue was effected. The lack of floatable operational radio beaming equipment on aircraft disappearing at sea has made practically impossible the exact plotting of the scene of this type of mishap. The quick location and rescue of Astronaut Carpenter through his use of the SARAH beacon demonstrated the effectiveness of such equipment. The requirement has been consistently promoted by the Deputy Inspector General for Safety over the past few years.

Still another technical need is the incorporation of imprint recording capability into all aircraft instruments so that prior crash settings can be read and utilized by investigators.

These are a few of the more essential technical improvements which are urgently required to help eliminate the cause factor undetermined accident. On the other hand, there is always room to improve our investigations with the tools at hand. Certainly the number one tool in pinpointing an accident cause is a well organized, experienced accident investigation board. The size of the board may vary from four members to more depending upon the magnitude or complexity of the accident. Even one man can conduct the investigation on some mishaps in which the cause factor is obvious. Within reason, the size of the board is not too important—it is the proper organization and utilization of board members which can provide the best possible investigation and determination of cause factors under the most difficult conditions. Review of accident reports and participation in many investigations by Deputy Inspector General for Safety personnel have revealed some discrepancies which are worthy of mention and which have possibly contributed to the percentage of unsolved accidents.

• DELAY IN ASSEMBLING BOARD MEMBERS. An investigation board should begin work with the least possible delay after notification of an accident. This is true regardless of the weather, day of the week or hour of the day. Assignment of tasks, interrogation of witnesses and review of records can be conducted inside and are imperative within a minimum of time after the accident for best accurate results.

(1) On one accident occurring this year in which five crewmembers were killed and which occurred on Saturday, it was observed that board investigation was not scheduled to begin until the following Monday afternoon. Arrival of Deputy Inspector General for Safety representative early Sunday morning expedited the board organization and assembly to noon Sunday; however, much time had been lost, particularly in obtaining first impression statements from available witnesses and basic organization of tasks and base support.

(2) In a recent mid-air collision, reluctance of appropriate commands to accept investigating responsibility as outlined in AFR 127-4 resulted in ten days elapsing before a board was organized. Early convening and implementation of the accident investigation board cannot be overemphasized. Lines of responsibility are generally clear and unnecessary delay is not warranted.

• NON PRIORITY SUPPORT BY BASE CONCERNED. Commensurate with the tactical mission, an accident investigation should have first priority on the time of the board members and use of base support facilities. Generally, this does not seriously affect normal base operation, but in numerous instances higher command pressure has been required to obtain the commander's support, particularly if the aircraft was not possessed by his organization. In complex accidents or those occurring at remote sites, the full technical and operational assets of a base are required to determine the cause factors of the mishaps.

• ADEQUATE INVESTIGATION. Reviewing agencies have returned reports for re-investigation because of obvious inadequacy or incomplete findings. In some, the board has taken the easy way out by blaming pilot error and has not, at least sufficiently, eliminated other possibilities. In others, components have been disassembled and then put together again for shipment to the AMA for TDR. This ostensibly negates a TDR finding. And, in still other instances, related factors such as weather, FAA records and supervision were not considered in their proper perspective. On occasion, materiel failure has been assessed without sufficient supporting evidence.

In addition to the above areas, there are other considerations which apply to board organization and use.

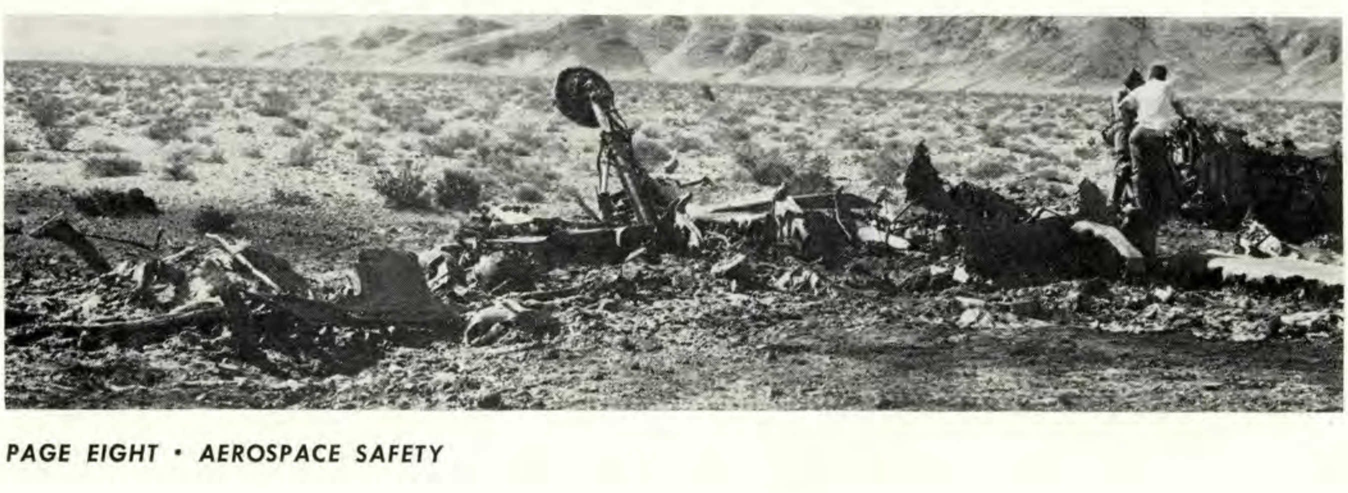
• SPECIAL INVESTIGATION BOARDS (the Expanded Board). If it appears that a cause factor is going to be hard to identify, a commander should use an expanded investigation board as described in AFM 62-5. Commanders have been reluctant to use this type board, possibly because of the extra manpower requirements and the necessary compounded group reports. However, experience shows that better, more complete and accurate findings result from an expanded board investigation which more than outweighs the extra effort put forth. When properly controlled by the board president, the wide-experienced membership of component groups is able to cover every detail or aspect of an accident and determine to a greater extent underlying causes as well as those factors directly involved. Civil aeronautical authorities predominantly go to an expanded board on each accident.

• AIR FORCE/INDUSTRY BOARDS. Several years ago the Deputy Inspector General for Safety organized permanent investigation boards on certain high performance aircraft and on those transporting high-ranking civilian and military personnel. Composed of representation from the concerned command, AFLC, ASD, the appropriate industry and Deputy Inspector General for Safety, the members of these boards are immediately available for convening at the call of the Director of Flight Safety, USAF. Discriminate use of these Air Force/Industry boards has aided in resolvement of highly complex accidents beyond the investigative capabilities of the major commands. Findings of such investigations have, to a great degree, eliminated the unknown factor in these particular accidents and are applied immediately towards corrective action Air Force-wide.

• AVAILABLE TECHNICAL PERSONNEL. It has been observed that some bases and board presidents are not aware of the tremendous amount of technical help available from the AMAs, the Directorate of Flight Safety, industry or even at the nearest Air Force base supporting the investigation. Others have not known how to obtain such technical help or have inadvertently overlooked these services in the conduct of the investigation. Adequate guidance for obtaining this is contained in AFR 127-4, AFM 62-5, and can be provided through the Director of Flight Safety if necessary. Here again failure to identify a cause factor should never be because of lack of qualified board technical membership or lack of assistance from any appropriate organization including industry and lateral government agencies.

The problem of the undetermined cause accident demands the unstinted efforts of all concerned. All accidents should be traced to a reason — a human error, an oversight or negligence; poor design, improper materiel; or excessive physical or technical demands on the personnel or equipment involved. It is essential that commanders, boards and reviewing authorities thoroughly realize the importance to the safety program of accurate cause factor determination and that proper utilization of existing investigating resources is paramount. The Deputy Inspector General for Safety will continue to press for technical progress in aircraft accident investigation. A "flight recorder" is being placed in the new C-141 now being manufactured and ASD is evaluating the feasibility of placing this type instrument in other high performance aircraft. The need for a crash locator, such as the SARAH, has been formally recognized by some major using commands and this requirement is fully supported by the Deputy Inspector General for Safety.

The 1961 Air Force rate slightly exceeded that of 1960 and reflected for the first time in 15 years an increase or upward trend. Continued reduction in the Air Force rate will require preventive action based largely upon data obtained through accurate pinpointing of cause factors of highly complex mishaps—not easily or readily solved. ★



CAPTAIN JOHN B. CUTLER

CAPTAIN JOHN B. CUTLER, 615th Tactical Fighter Squadron, England AFB, La., was flying the number five position in a flight of eight F-100s on a deployment from Myrtle Beach, South Carolina, to Moron, Spain. The flight rendezvoused with KC-135 tankers over Nantucket Sound at 28,000 feet for night refueling.

Captain Cutler completed the night refueling and then discovered that he could not shut off the afterburner. He retarded the throttle to approximately 80 per cent and received a mechanical shut off. He could not maintain flight at this power setting and advanced the throttle. This caused the AB eyelids to open and AB fuel to flow, but the AB did not light. Several attempts to light the AB failed and Captain Cutler found that he had to use full throttle to maintain altitude. This caused the AB eyelids to remain open and AB fuel was pumped overboard.

Refueling was completed approximately 240 miles off the New England coast, and Captain Cutler determined that Otis AFB was the closest base where an emergency landing could be made. He realized that additional refueling hookups would be necessary because of the excessive AB fuel flow, and asked that a KC-135 accompany him to Otis AFB. Because he could maintain only 250 knots, Captain Cutler asked the KC-135 pilot to slow down to his minimum airspeed which was 240 knots. This allowed only a 10 knot differential so Captain Cutler asked the KC-135 pilot to descend during refueling operations to give him additional airspeed. In this manner two additional night refuelings were completed prior to arrival at Otis AFB.

During the letdown at Otis AFB, Captain Cutler experienced another difficulty when at lower altitudes the AB lit and could not be shut off above 80 per cent power. After trying several combinations of throttle and aircraft configuration, he decided that an acceptable traffic pattern could be flown with 82 per cent power, AB lighted, gear, flaps and speed brakes down. By making minute power changes on the final approach and by shutting down his AB at the exact critical moment, Captain Cutler was able to make a successful night landing at Otis AFB. From the time he joined the tanker for his first refueling until he landed, 19,500 pounds of fuel were consumed. This is a rate of 16,200 pounds per hour, or about four times the normal fuel consumption rate for an F-100.

The outstanding professional knowledge and judgment displayed by Captain Cutler during this emergency is a credit to him and the Air Force. Well Done! ★

Major T. J. Slaybaugh

"IMMEDIATELY, SIR." That had been Capt. C. Z. Chumley's reply when the Old Man had called to see how soon he could be off with a high priority part, for want of which an important silo filling job had come to a halt at a northern missile site.

A certain amount of patriotic blood flowed in Chumley's veins, but there were those who contended it was seldom noticed because of a much more evident kind, the kind that now turned his scheming mind to tentatively flight plan a fast turnaround at the site, then an RON at Denver. In that mile high town a former flying buddy of his operated an opulent bistro, the success of which was based on a solid bedrock of two-inch steaks, the biggest drinks in town and a floor show that just wouldn't quit.

His personal equipment preparation for this flight was to root through his Jag until he found a hard hat with a frayed chinstrap, oxygen mask, a greasy flying suit he usually wore when pulling periodics on the Jag and a jacket with a big hole in the left elbow and one insignia missing. He filled out his usual clearance—VFR On Top, Request VFR Climb — finally waved three pins at the crew chief in order to get the chocks pulled, and blasted off. Amazing how much faster when you can go it alone. One thing, he couldn't be accused of not thinking ahead; the blast in Denver had his attention when it should have been on more immediate concerns. Oh, well, a flip of the stick and a muttered "road hogging truck drivers" had enabled him to avoid the C-54 that had made the level pass at him, right down the center of an airway, too.

Now, as he flew along at 39,000, occasionally scanning his Omni between sweeps of the star-dotted sky, he thought again of Denver and shivered in anticipation. He looked at his watch—less than an hour to go. He shivered again and this time turned the heat up.

Sure glad he had put "Immediate Refueling" in the Remarks section —that was snow down there. He shivered and turned the heat up another notch. Son-of-a-gun, it was so cold the airplane was shivering; the instruments were blurred by the vibration. He looked out again — gad, this was bleak country. He said, "C'mon horse," and held the alcohol switch down. "This ought to fix you up. I have to wait 'til Denver. When I get to the Auror . . ."

"Poof!" That's all, just "Poof!" But it was enough to interrupt him

...the Abominable Snowman

in mid-monologue and to stop the shivering. In fact, it had never been smoother, and soon, Chum knew, it would be quiet as it can get in an airplane.

"Flameout!" he yelled, "Mayday! Flameout!" Then, before anyone could answer he switched to emergency channel, flipped the IFF switch to emergency and said again, "Flameout! Mayday! Flameout!"

Response was immediate, "Aircraft calling Mayday, this is Bullfrog, reading you loud and clear. Request your identification, type of aircraft, position, intentions and assistance desired."

"This is Chumley, Captain Chumley, somewhere around Twin Falls at 39,000. I have a flameout." The silence was eerie and Chumley's voice rose with his panic. "I need a vector to Den—, I mean to a suitable field. I'm at angels 39, squawking emergency. Uh, over."

"Roger, Captain Chumley, we paint an emergency squawk, 47 miles northeast of Sod House Omni. Switch to standby for 10 seconds, then come up Emergency again. Mountain Home is eight zero miles."

"Roger, Chumley here, uh, Air Force Jet 55545 going standby 10, Oh, M'Lord . . ."

Chumley had been so busy fast thinking that he had forgotten all about flying the airplane. Instinctively he had been holding back pressure to conserve the precious altitude.

"Air Force Jet 55545, come up emergency. We have lost your squawk.

"Captain Crumley, this is Bullfrog. Do you read?

"AIR FORCE JET 55545, CAPTAIN CRUMLEY — Roger, I see your squawk. Do you read Bullfrog?"

"Roger, Bullfrog."

"Air Force Jet 55545 we have positive radar contact, reading you strength three now. You are now eight . . . excuse me, sir, you are now eighty-two miles from Mountain Home Air Force Base. I was sure you were closer be . . . Steer zero three zero, no wind. Say altitude."

"Two three thousand. ."

"Say again."

"Angels two three . . . I just recovered from a spin. . . had a bit of a control problem."

"That's too . . . excuse me, sir. You are now seventy two miles from Mountain Home."

"I'll never make it. I'm trying for airstarts. Do you have any fields within range that will handle jet aircraft?"

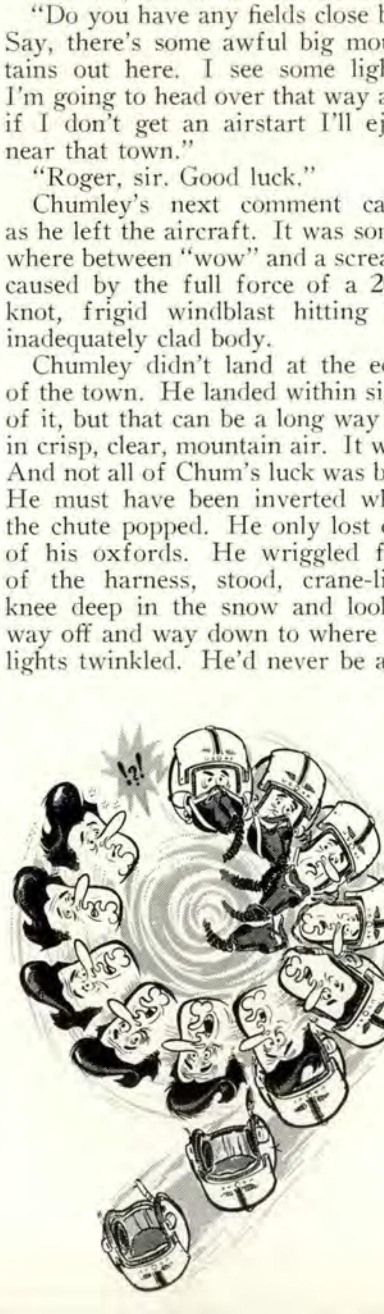
"No sir, I'll double check that."

"Do you have any fields close by? Say, there's some awful big mountains out here. I see some lights. I'm going to head over that way and if I don't get an airstart I'll eject near that town."

"Roger, sir. Good luck."

Chumley's next comment came as he left the aircraft. It was somewhere between "wow" and a scream, caused by the full force of a 200-knot, frigid windblast hitting his inadequately clad body.

Chumley didn't land at the edge of the town. He landed within sight of it, but that can be a long way off in crisp, clear, mountain air. It was. And not all of Chum's luck was bad. He must have been inverted when the chute popped. He only lost one of his oxfords. He wriggled free of the harness, stood, crane-like, knee deep in the snow and looked way off and way down to where the lights twinkled. He'd never be able to hop it, that was for sure.



In the complete quiet of his surroundings, on a bleak mountain side, the significance of his predicament began to soak into the inadequately prepared captain. A lump formed in his throat. A drop of moisture squeezed from his right eye, slowly moved halfway down his right cheek and solidified. He scrubbed the back of his left glove across his nose. The cold was excruciating. He tried to shrink tighter into his skin. His left leg was beginning to cramp and he stuck his stockinged right foot down into the snow. A little sob broke from his lips.

The will to survive had almost flickered out.

Then the crisis passed. The thing that did it, really, was the thought: "What an inglorious way to go. The great C. Z. Chumley, the one whose ingenious escapes from insurmountable difficulties have become legend, giving up here on a mountainside within sight of a town. Must never let your admirers down like that."

Then the bizarre mind that had often been called upon to extricate C. Z. from ill-planned adventures began to click again. He gathered up the crumpled parachute, shook it as free of snow as he could, sat down in the middle and wrapped it around and over him until be became but a small orange and white wad on the smooth expanse of snow. "Let's see," he said, "Gotta keep warm, dry, conserve the old stamina and go about this business of survival just right. Wish I hadn't lost my helmet." He rubbed his ears, awkwardly under the canopy. For the first time since the onset of the emergency his thoughts again returned to Denver. "Never thought I'd see the day, but right now I'd swap that RON for an electric blanket."

In the dusty files of his mind there were a few cardinal rules that had somehow been absorbed during inattentive attendance at survival training classes. He began to grope for these now. It was hard to think of anything but the cold. That was one

thing he'd been told. You think of food or water or warm—whatever you are most in need of at the time. Another was to keep your head, logically work out a plan and follow it. Oh yes, in all those survival films they always opened their survival kits and inventoried the contents. Chum could see them just as if it were yesterday. Snares to catch rabbits, matches in a water proof container, a knife, needle and thread, emergency rations, fish hooks — there were always fish hooks.

Chumley didn't have a survival kit, but he dug through his pockets. He identified by feel a short Phillips head screwdriver, a Jaguar spark-plug, an old cigarette holder, his bill-fold, a comb, some coins, one captain's bars, a sun glasses case, a beer can punch, a rubber band, cigarettes, his lighter, something folded in a piece of paper that, "Ouch!" Chumley made the best find of all—a razor blade.

Now that he had tools he went to work. He wrapped his scarf about his head, then began cutting panels from the chute with the razor blade. First he made a fat cloth moccasin for his bare foot by wrapping strips of chute material around it. He tied this ungainly wad in place with riser cord. "Look like an old-time Roman with the gout," he commented, "but it sure feels better." He took off his oxford, cleaned the snow from his sock and shoe, put it back on, then wrapped this foot and tied the wrappings in place. He cut two more long strips and wrapped his head until only the eyes were left exposed. He lumbered to his feet, pulled what was left of the chute around him as best he could and started toward the lights. You couldn't say walked because he had to go into a sort of spraddle legged shuffle to get each foot by the other. But he made progress, of a sort.

By midnight he had made it to the trees. Of course it was down hill (the best time he made was when he started a small avalanche and slid for 100 yards), but he had to stop every once in a while to re-do the foot lacings. It was slow, cold, discouraging work. But a few lights still flickered down in the valley; these gave him the incentive to keep trying.

But in the trees things were different. The moon had set, and he could barely see. He bumped into rocks, kept walking into branches and before long tripped over a log and went headlong into the snow. He lay there. The cold wasn't so bad here in the woods. He was out

of the wind. He realized how tired he was. Maybe, if he took a nap. NO! Somewhere he remembered hearing that people could freeze to death this way. He struggled up.

Maybe a fire. Sure. Trees everywhere. Why hadn't he thought of that? He broke twigs from the trees, felt around the log until he gathered up some sticks and finally had a pile, liberally mixed with snow, but a pile. He dug out his lighter, took off his right glove, put his thumb on the wheel and flicked, and flicked and FLICKED. Nothing! He blew on the wick and flicked some more. Nothing! Finally he jammed it back into a pocket and said some things that didn't help, but made him feel better.

Until it began to get light Chumley stayed by the log. He did lots of things. He flailed his arms every now and then. He retied his leggings and foot wrappings. He sang all the songs he knew. Periodically he took walks back and forth along the path he made beside the log. And he did a lot of thinking. All his thoughts ran along the same line: a hot, steamy diner he'd eaten at in college; BOQ room beds with lots of extra heavy blue blankets piled on them, and the time he had played golf in the brilliant Palm Springs sunshine.

At first light he was on his way again. Down through the pines he shuffled, miserably cold, and getting hungry. His muscles ached and his vision blurred every now and then. He had to stop and rest more often. The path he left was no longer straight.

He might have made it on his own, but because of one thing he had done right he didn't have to go it all the way alone. His cry of MAYDAY, the use of Emergency on IFF, and his last transmission as to his intentions had triggered a rescue effort that was well pinpointed. Searchers on horseback were out at dawn. Two mackinaw clad cowboys spotted him first. They crossed the trail and one said, "Do you suppose this could be his trail?"

"I don't know, I'd be more inclined to say a drunken hippopotamas made this. But we'd better follow it and see."

A half mile farther on, as they broke out of the trees, they saw Chumley crossing a clearing.

"There it goes—that's the first orange and white snowman I've ever seen. Suppose that's him?"

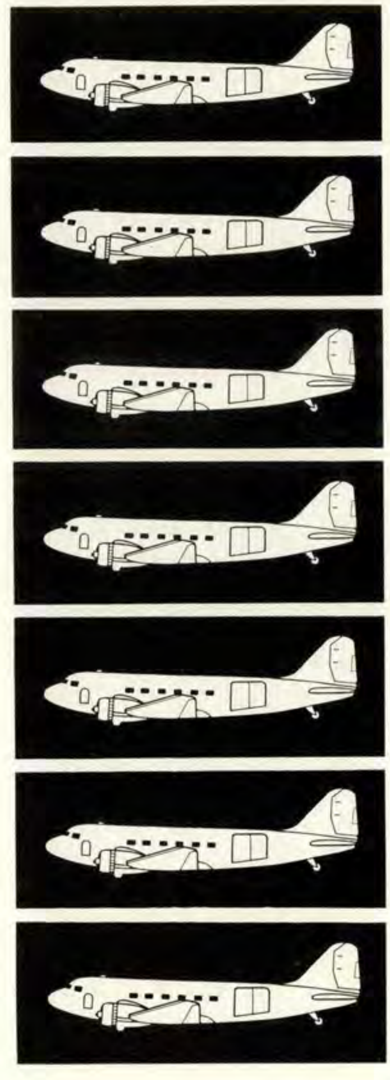
"Yeah, and if we can pick him up without spooking these horses we'd better do it. We can't leave anything like that running around loose." ★

SEVEN PREVENTABLE...

Lt Col Robert P. Paulin, Transport Br, DFS

THERE IS AN ANCIENT FLYING ADAGE, "There are old pilots and bold pilots, but there are no old, bold pilots." A review of C-47 accidents for the first six months of 1962 revealed that not only do we have old, bold pilots flying the Gooney Bird, but some real complacent ones, too!

Ten major accidents have been recorded during the above-mentioned period, which equals the total number occurring annually in 1960 and 1961. Pilot factor was the primary cause in seven of these accidents and all seven were in the preventable category. Here's a quick look at some of the discrepancies occurring in the seven accidents.



• ACCIDENT #1

1. *Improper Preflight Planning*—Pilot had to initiate a missed approach at destination due to heavy ice on windshield.

2. *Crew Coordination*—(a) Copilot turned fuel selectors to empty tanks without pilot's knowledge. (b) Services of a navigator crewmember were not used when aircraft position was not known.

• ACCIDENT #2

1. *Improper Preflight Planning*—Aircraft crashed when both engines failed from oil starvation. Pilot did not pre-heat oil supply after aircraft had cold-soaked for three days in zero temperatures.

• ACCIDENT #3

1. *Improper Inflight Procedures* — Pilot allowed long range fuselage tanks to run dry, causing a vapor lock and fuel starvation to both engines.

• ACCIDENT #4

1. *Improper Preflight Procedures*—Crew chief left the rudder gust lock in place, intending to remove it prior to takeoff.

2. *Failure to Use Checklist*—Pilot failed to check controls for movement prior to takeoff.

• ACCIDENT #5

1. *Improper Takeoff Procedures*—Pilot made maximum performance takeoff with 10-15 knot tailwind.

2. *Crew Coordination*—Full flaps were raised at too low an airspeed causing aircraft to stall.

3. *Violation of Regulations* — Sixteen abnormal practices or deviations from existing regulations were discovered during the investigation.

• ACCIDENT #6

1. *Improper preflight procedures*—Copilot and crew chief neglected to have ice removed from aircraft.

2. *Crew Coordination*—Pilot reduced power to abort takeoff, the copilot applied full power causing the aircraft to become airborne in an unsafe condition.

• ACCIDENT #7

1. *Improper Preflight Procedures*—Pilot did not know actual weight of cargo aboard aircraft. This restricted the aircraft's performance on a low level mission and it crashed when it was unable to maneuver out of a box canyon.

The beginner's typing exercise, "Now is the time for all good men (pilots, supervisors and maintenance) to come to the aid of their country," is very apropos in the prevention of additional mayhem in the C-47.

If supervisors at all levels cannot answer the following questions in the affirmative, then a closer look and tightening up is required:

Are pilots' capabilities being thoroughly evaluated during standardization flights?

Are pilots making maximum use of proficiency and administrative flights to improve proficiency?

Are Flying Evaluation Boards being used to eliminate marginal pilots?

Are pilots using checklists and the information available in the Flight Handbook?

Are pilots receiving proper briefings for the mission? (Routes, weather, restrictions, etc.)

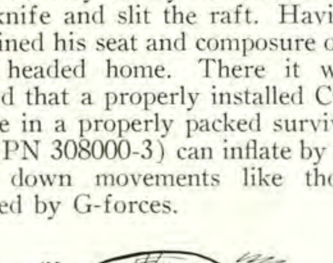
Is proper crew coordination existing between pilots, copilots and flight engineers and is it being monitored?

Are regulations and publications reviewed at periods other than the annual instrument refresher course? ★

CROSS COUNTRY NOTES

...from REX RILEY

• TIGHT SQUEEZE—An unsuspecting Century Series pilot was churning along in the pattern for a rocket firing mission and all of a sudden at 6000′ the life raft inflated. This occurrence naturally made his position less than comfortable, so very calmly he reached for his knife and slit the raft. Having regained his seat and composure our boy headed home. There it was found that a properly installed CO_2 bottle in a properly packed survival kit (PN 308000-3) can inflate by up and down movements like those caused by G-forces.



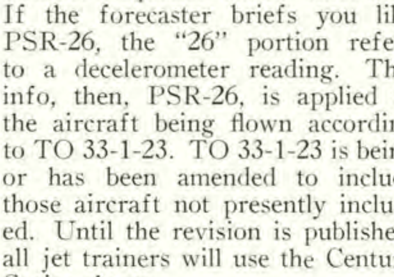
• NOTAMs AND BRAKING ACTION — Maybe you've already noticed that the procedures and familiar terms used last year are not the same when reporting runway conditions and braking actions. So listen real good.

• Braking action will not be sent out as a NOTAM.

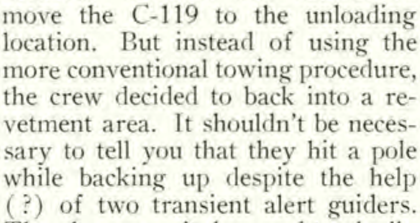
• Base Ops officers will classify braking action as:

WR—Wet runway
SLR—Slush on runway
LSR—Loose snow on runway
PSR—Packed snow on runway
IR—Ice on runway

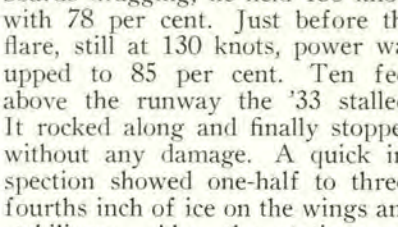
You should understand that braking action is good unless the weather sequence states otherwise. If the forecaster briefs you like PSR-26, the "26" portion refers to a decelerometer reading. This info, then, PSR-26, is applied to the aircraft being flown according to TO 33-1-23. TO 33-1-23 is being or has been amended to include those aircraft not presently included. Until the revision is published, all jet trainers will use the Century Series charts.



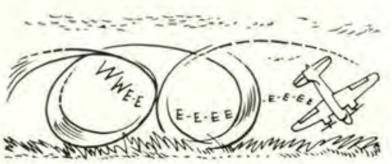
• SAY IT ISN'T SO—A dollar nineteen landed, taxied in and was secured. Then it was decided to move the C-119 to the unloading location. But instead of using the more conventional towing procedure, the crew decided to back into a revetment area. It shouldn't be necessary to tell you that they hit a pole while backing up despite the help (?) of two transient alert guiders. The plane wasn't damaged too badly but the Wing Commander sure did get mad at the pilot.



• T-BIRD TALK—A T-33 incident occurred that might provide a lesson to the rest of us when we're in icing conditions this winter. I expect we've all heard about the perils of ice in the pitot head, structural icing, etc., but how about ice over the static ports? Here's the story—weather was 600 scattered, 900 overcast, eight miles viz in freezing drizzle. Two miles from touchdown the front seat pilot took control. With gear, flaps, and speed boards dragging, he held 130 knots with 78 per cent. Just before the flare, still at 130 knots, power was upped to 85 per cent. Ten feet above the runway the '33 stalled. It rocked along and finally stopped without any damage. A quick inspection showed one-half to three-fourths inch of ice on the wings and stabilizers. Also the static ports were partially covered by ice. Give it some thought when you're faced with a low speed radar approach during icing conditions.



• GROUND LOOP—A ground loop is funny to everyone but the pilot, crew and passengers — add to this list the commander of the pilot. No joking, have you ever ridden through a ground loop, say in the back end of a C-47? Well, Rex did in 1947 and to this day counts it as one of his more frightening experiences. When that starts to go, it's like the game "crack the whip." What brought this on was a C-47 ground loop this past summer. Shortly after the event, Rex landed and got the story from an old buddy who had whirled through this maneuver. He was still quite pale and had an unnatural tremor that I didn't remember. While we were yakking, another yarn spinner came up with a story he swears is true. (Rex checked the records and sure enough it was true.) This tale also is about a C-47 and its intrepid pilot. Seems like this Gooney and crew flew from home to Dobbins AFB, Ga. Upon landing the pilot smartly ground looped. Well, this is an embarrassing and pride-losing achievement but he carried it off so well that they were able to get the airplane checked over quickly and surely. Lo and behold, no damage! So away they all go, back to home base whereupon the pilot once again smartly *ground looped.* Gee, once in a lifetime is enough but twice in one day? It's all true though—even the scraped wing tip and stuff. Just goes to prove—the most farfetched will jump up and bite you when you quit thinking or paying attention.

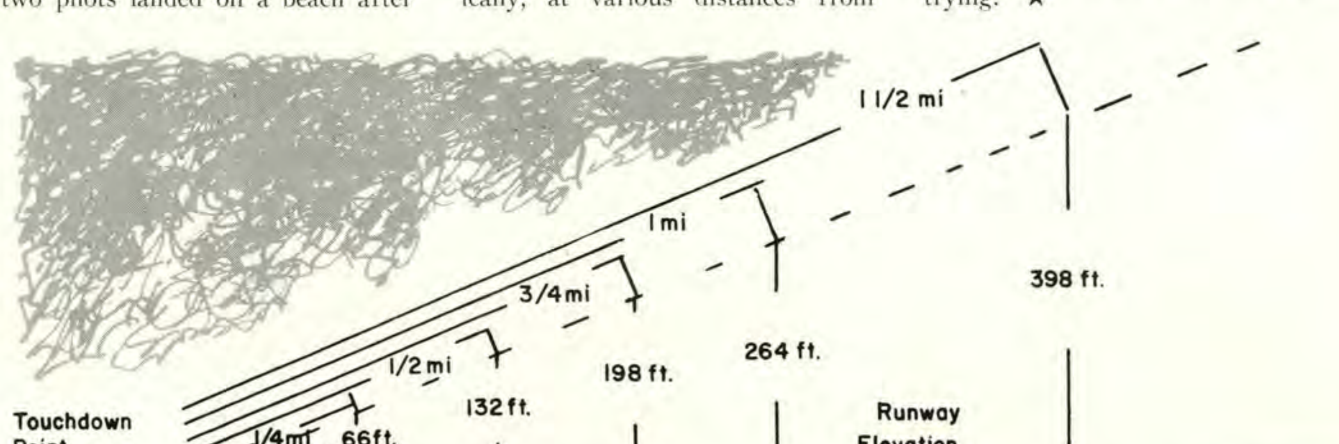


• BATTERY ONLY (T-33) — Despite an all major commands message we still have T-Bird pilots who don't know or are confused on the "Batt-Gen" position and "Battery only" position. In fact, two pilots landed on a beach after their generator went out and they consequently lost TACAN and IFF. It's in the Dash One—"The 'battery only' position must be used when the generator or one of its components has failed and the operation of TACAN and IFF equipment is required."

• GOOD GUY—Weather observer A1C Geoffrey E. Nichols, Detachment 23, 25th Weather Squadron, George AFB. The reason he's a good guy is that he may have prevented a serious accident. A George F-106 was taking off and Airman Nichols noted a puff of smoke come from the main gear. He notified the tower and the tower had the runway checked to find pieces of a blown tire. The pilot was warned and with that warning was able to land with minimum damage. Nice to have Good Guys around, isn't it?

• REPEAT—You may remember seeing the accompanying chart below a few years ago. Very simply it shows a simple two and one-half degree GCA glideslope (or two and one-half degree ILS). Shown graphically, at various distances from touchdown point are the corresponding heights above the ground. So what! Well, this is what—suppose you're inbound to a base with a 500-foot overcast and three-fourths-mile visibility in rain and fog. The local GCA minimums are 300 feet and one-half mile so you stooge along, fat, dumb and happy. Guess what your altitude will be when you finally spot the runway — right again, 198 feet! GCA weather is with us but good. Study this chart a bit with a little imagination. Bet you can find a situation or two that could be dangerous or illegal (descending below minimums).

• BIRD KILLER — The F-86H pilot was on the right wing of his flight commander at 150 feet right after takeoff when these starlings (birds) appeared. At first glance it looked as if the flight paths would not cross but then at least a hundred starlings committed suicide. The '86 got the best of the deal although it was pretty sick. Right after the bird collision the aircraft lost thrust, and picked up vibrations with a loud whining sound. The pilot had to decrease RPM to 85 per cent because of the vibrations. At 150 knots he finally coaxed the '86 to 900 feet, entered the pattern and made a fine type landing. Moral is try to avoid them if you can (but what can you do on takeoff when you're critical?). If you can't avoid 'em it doesn't necessarily mean you're shot down—just don't quit trying. ★



CEILINGS THAT FIZZLE WITH DRIZZLE

DRIZZLE is popularly called "mist." To the pilot drizzle can also mean "missed;" i.e., a missed runway.

One day last winter two fighter aircraft departed from a midwestern air base on a practice intercept. Ceiling and visibility deteriorated rapidly before they returned. In a pre-mission briefing, the pilots were advised that the weather would be deteriorating slowly. However, it was forecast to be better than one thousand overcast and three miles until after their expected return.

The weather had deteriorated more rapidly than expected and, at takeoff, the pilots reported eight hundred overcast and light freezing rain. Forty minutes later, the fighters were cleared for penetration. The weather was then seven hundred overcast, two miles, light freezing drizzle and fog. This condition prevailed when they were passed from GCI to GCA. However, by the time they reached the airfield three minutes later, the weather was down to indefinite five hundred obscured, three-fourths mile, freezing drizzle and fog. They missed their approach. After two more fruitless attempts to land, both pilots successfully ejected; both aircraft were destroyed.

Approximately four months later, a T-Bird departed another midwestern air base for a two-hour flight to the east coast. Prior to departure, destination weather was three hundred broken, six hundred overcast, three-fourths mile in drizzle and fog, and forecast to hold. Upon arrival and prior to penetration, the latest destination weather relayed to the T-Bird was three hundred broken, six hundred overcast, and one and one-sixteenth miles in drizzle and fog. The ceiling and clouds were just as forecast and the visibility a little better, so the pilots thought.

Upon descent, they went into the clouds at 22,000 feet. They were still in solid clouds at the GCA minimum of 200 feet. With the back-seat pilot at the controls, a missed approach was about to be started when the front-seat pilot, acting as observer, located the approach-zone strobe lights by looking straight down. They landed successfully although the slant range visibility was approximately one-half mile when the strobe lights were first spotted.

What happened in these two instances? In the case of the interceptor flight, was the forecast a "bust"? No. The board investigating the accident determined that the forecasts indicated a deteriorating condition of proper degree and were within the current limits of the state of the art. However, the timing was in error. Many times in such situations the timing of the trend is difficult and similar errors result.

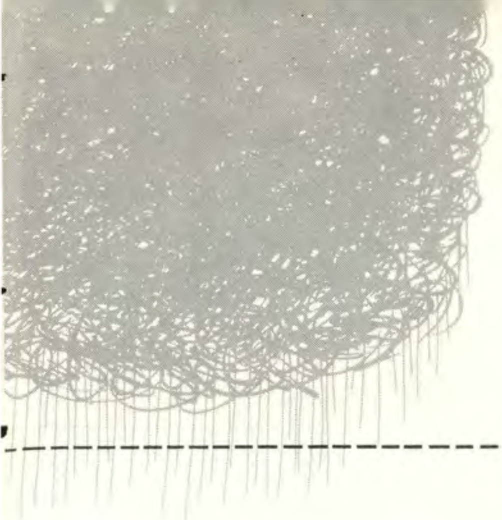
Accurate forecasts are possible as evidenced by the forecast and reported weather for the T-Bird. But —why the difference between the weather reported by the weather observer and that observed by the T-Bird pilot? Was the observer in error? No. Had the ceiling and visibility changed that rapidly? Possibly. Well, then, why had the observer not reported the change? Simple; he could not see the change. Many times, under similar conditions, the pilot experiences weather which is somewhat different from that which the observer sees from the ground or tower.

Both of these incidents are examples that "ceilings fizzle with drizzle." You may say, "This is old hat to me." Probably so, but like many old hats, we've long forgotten about it, because it's still in the closet and hasn't been used.

Let us review briefly one or two of the lessons in weather which you had in aircrew training two years, five years, or even twenty years ago. Drizzle is associated with stratus clouds which in turn are associated with generally stable (smooth) conditions. Remember? Similar conditions are conducive to fog, assuming, of course, there is sufficient moisture. Well, then, what is the difference between fog and a stratus cloud? That's easy; if it's on the ground, it's fog, but, above ground, it's stratus. However, in some places, it is called by both names, for example, the stratus or high fog along the California coast.

Drizzle-producing stratus clouds are usually at least three to four thousand feet thick and are observed with various weather situations. They are common ahead of warm fronts and on the cold air side of stationary fronts behaving like warm fronts. This was the situation when the T-Bird arrived at its destination; a slow-moving warm front was approaching from the south. Such situations as this one occur mostly in the eastern half of the United States.

Stratus clouds are associated also with situations with no fronts present. The most common are the stratus (high fog) which occurs along the west coast, the stratus which extends inland from the Gulf, and the upslope stratus on the Great Plains. In the case of the two fighters, a low moving from the southwest was responsible for the formation of the stratus and associated drizzle due in part to the movement of air up the plains from the Gulf.



Also, stratus may occur in the larger valleys, such as the California San Joaquin and Sacramento Valleys, under stable, stagnant conditions.

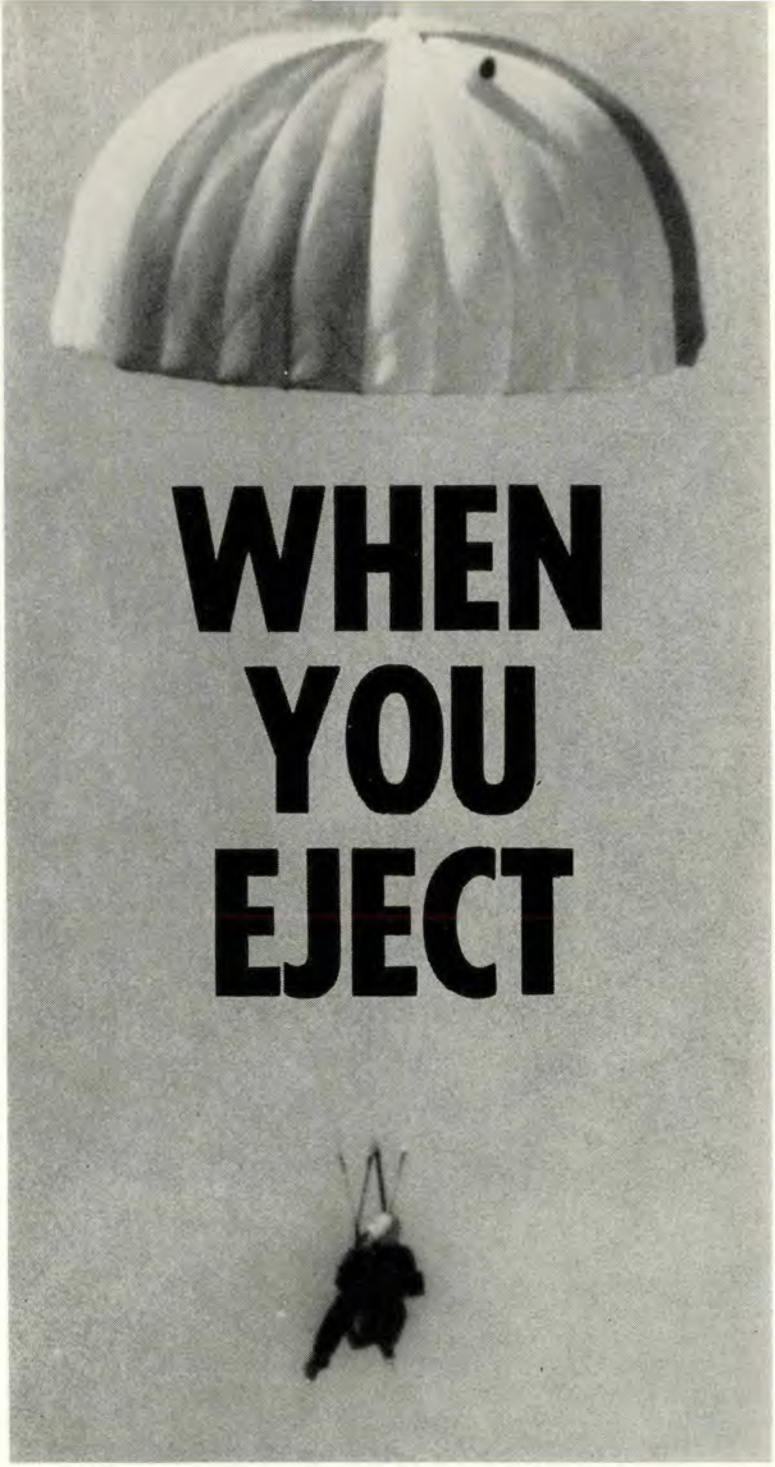
Similar stratus regions are found throughout the world. For example, stratus is common in western Europe and may be caused by conditions similar to those which cause the stratus in the California valleys, along the Gulf coast, and ahead of warm fronts.

Generally speaking, the beginning of precipitation is coincident with the lowering of the ceiling. This is most noticeable with the start of drizzle.

Prior to the beginning of drizzle, the cloud bases are not so definite. Why? Well, forming drizzle droplets and cloud droplets are nearly the same size and tend to obscure differentiation at the cloud base. Drizzle also reduces the visibility. This adds to the difficulty which the ground observer has in determining the ceiling and is the reason why an obscuration and indefinite ceiling are usually reported with drizzle. So, when drizzle and fog are forecast or observed, be on the lookout for an obscured ceiling.

The difference between what the ground observer sees and what the pilot sees has been recognized as a problem for a long time. The Air Force and other governmental agencies have carried out extensive investigations, individually and collectively, in attempts to make the surface weather observations more representative of what the pilot sees when landing. Some progress has been made; however, the complete solution is well into the future. So, remember!

When it begins to drizzle,
The ceilings will fizzle. ★



WHEN YOU EJECT

On the morning of 29 August 1949 a young Air Force lieutenant flying an F-86 at 10,000 feet lost aileron boost pressure and salvoed the external stores. Only the left tank jettisoned and the aircraft immediately became uncontrollable. The pilot ejected between one and two thousand feet at an estimated airspeed of 500 knots while the aircraft was in a descending attitude. Although he received major head lacerations as a result of being struck by the seat, which had become entangled

. . . WHEN YOU




Robert H. Shannon, Safety Officer, Life Sciences, DFS

in the shroud lines, the ejection was successful.

There were two very important aspects of this particular case. First, the pilot survived ejection under extremely marginal conditions—marginal because he did not have the advantage of a rocket catapult to give him greater trajectory height, a seat-man separator to insure rapid and positive seat separation, or a zero second parachute deployment lanyard to provide immediate chute deployment following seat separation. Also there was no automatic opening lap belt and parachute. A positive decision, clear thinking and rapid responses all contributed greatly to the successful outcome of this ejection.

The second outstanding feature is that this was the first reported emergency use of an ejection seat in the USAF.

Before proceeding further, perhaps we should define some of the pertinent terms used in this article. When the Directorate of Flight Safety Research started logging ejection statistics back in 1950, certain ground rules were established which are still in effect. First, to be considered an ejection the sequence must be actuated by the crewmember and the seat/man mass must clear the airframe prior to impact of the aircraft with the ground. A seat that is dislodged and thrown clear as a result of impact forces, either inflight or on the ground, is not considered an ejection. Ground ejections, whether intentional or inadvertent, are not included in ejection statistics. The reason for this is that existing systems do not have the capability to provide safe egress under these conditions. Currently, ground ejections with systems employing rocket catapults and seat/man separators are included provided there is sufficient forward speed for parachute deployment.

A successful ejection is one in which the ejectee survives, regardless of the degree of injury.

An unsuccessful (fatal) ejection is one in which the crewmember sustains fatal injury at any time between exiting the aircraft and recovery. There have been objections from some quarters within the Air Force to the latter classification. It has been argued that it is unrealistic to penalize the escape system in a situation wherein all components of the escape system function satisfactorily and the crewmember drowns or dies of the effects of exposure subsequent to landing.

The success rate of ejection escape is not predicated upon functioning of the system. If this were the case the success rate would consistently run in the upper limits of 90 per cent. Although USAF escape systems are varied and complex there has been a remarkable degree of reliability during actual use.

We have come a long way since that first ejection in August 1949. We have witnessed improvements in escape systems that have reflected a significant increase in the ejection success rate. This is evidenced by the fact that during 1950 through 1958, ejections were approximately 80 per cent successful. From 1959 to the present when fully automatic equipment was generally in use, ejections were 86 per cent successful. Even greater success should be realized with current and programmed improvements such as rocket powered seats and seat-man separation devices.

In spite of these improvements the development of escape systems has not kept pace with the introduction of new aircraft in the inventory. The optimum escape system, that is a foolproof method of getting a crewmember out successfully in any given situation, is apparently not in the foreseeable future. However, DIG/S maintains a continuing program to monitor, recommend and support every effort in this critical area.

As for the personnel elements in ejection escape, there is much to be learned from past experience. Unfortunately we have not profited as much as we should have by this experience. Let's review the overall USAF record for a moment.

The varied, non-standard escape systems employed by the USAF over the years have saved the lives of 1963 persons. This is an impressive record and has much dramatic impact when presented in this light. This statistic loses much of its glamour, however, when it is disclosed that these "saves" were realized from a total of 2401 ejections. What of the remaining 438 cases? Why did almost 20 per cent of the ejections fail to successfully complete the ejection sequence? The obvious answer to these questions is that the unsuccessful cases were the result of ejections attempted beyond

E J E C T

. . . thorough training can mean the difference between life and death.

the performance capability of existing systems. This is true in many cases. The combination of insufficient terrain clearance, unfavorable attitude and airspeed has been, and continues to be the *single most critical factor in ejection escape.*

As previously stated, the answer to this problem lies in research and development. Of immediate concern is the frequent incidence of preventable ejection fatalities. It has been determined through studies of selected periods that *up to 40 per cent of all ejection fatalities were preventable.* The primary factors that contribute to this unnecessary loss of life are:

- Delaying the decision to eject until reaching altitudes too low for successful completion of the ejection.
- Continuing to hold on to seat actuation controls after the release of restraining equipment.
- Failure to use available equipment such as the zero second deployment lanyard, chute arming lanyard, etc.
- Inability to survive parachute water landings.

These very same factors that contributed to fatalities in the early history of ejection escape continue to occur in significant numbers.

The following briefs are representative of current, preventable fatalities:

In February 1962, an RB-66 crewmember ejected from an altitude of approximately 300 feet in level flight. He sustained fatal injuries as a result of hitting the ground while still in the seat. Investigation disclosed that he held onto the seat handles.

In January 1962, an F-104 pilot was fatally injured in an ejection from an altitude of 500-600 feet. The chute was beginning to stream at time of ground impact. Investigation disclosed that pilot failed to attach the parachute arming lanyard anchor to the lap belt, thus negating automatic function of the parachute. The time required to manually pull the parachute D ring was probably the difference between life and death in this case.

In November 1961, an IP and pilot in a T-33 aircraft experienced loss of control. The IP ejected successfully at 2500 feet. The pilot in the rear seat also ejected but sustained fatal injuries on ground impact because of insufficient terrain clearance. It was strongly suspected that the pilot delayed the ejection sequence for reasons unknown.

In still another case in March 1962, two pilots in a T-33 had a flameout at 32,000 feet. Airstarts were attempted down to 4000 feet at which time the decision was made to eject. The rear cockpit occupant ejected successfully at 2500 feet above the ground. The pilot in the front cockpit radioed that his seat would not fire and that he would attempt to land the aircraft in an open field. Aircraft crashed in a wooded area and the pilot sustained fatal injuries. There was no attempt to employ the alternate bailout procedure as outlined in the Dash One handbook.

This needless loss of highly trained crewmembers can and must be eliminated, or reduced in number. If we had realized only a 50 per cent saving of the preventable fatalities, total fatalities would have been reduced by almost one hundred. We must derive the maximum possible benefit from existing escape systems. *This can only be done through realistic and aggressive escape and survival training.*

Mandatory ejection seat training is now required under the provisions of AFR 60-3, and AFR 53-28 specifies survival training requirements. Since these regulations do not outline standardized methods of training, it is the responsibility of each organization to insure that its crewmembers are afforded the best training possible. It is obvious, in the evaluation of aircraft accident reports, that such training is very limited in some organizations. To be effective, escape and survival training programs must include:

- *Training on a more frequent basis.* This headquarters believes that consideration should be given to conducting training quarterly or at least semi-annually.
- *Hardware comparable to that used in aircraft currently being flown should be utilized.* This is particularly important because a pilot may revert to original habit patterns established in previous aircraft flown, if such aircraft employ a different means of actuating the ejection sequence. Delays from this cause can result in the loss of valuable seconds in a low level emergency. Another important factor here is that a pilot may be oriented toward raising the armrest to jettison the

WHEN YOU EJECT

canopy during an emergency landing. Should he be flying an aircraft with a one-motion ejection control, such as the F-106 interim seats, he would inadvertently eject himself on the ground. This is strongly suspected as a cause of death in one instance.

• *Training in actuating ejection seat controls should be as frequent as required to achieve automatic responses.* The value of rapid responses cannot be overemphasized. With an aircraft in an uncontrollable high speed, descending attitude there is precious little time to think about the necessary procedure and then act.

• *A well formulated plan of action in a given emergency should be heavily stressed.* When to, or not to, eject is a decision that must rest with the individual. The many variables usually associated with inflight emergency prohibit established guidelines governing the ejection decision.

• *Prompt action once the decision to eject is made.* Too many crewmembers are lost staying with the aircraft attempting corrective action until reaching altitudes too low for the successful completion of the ejection sequence. The 10 & 2 rule must be adhered to, that is 10,000 feet for an uncontrolled flight condition emergency and 2000 for a controlled flight condition. This is not to imply that a pilot who experiences an emergency at low altitudes does not have a chance. The minimum ejection altitudes depicted in Dash One handbooks were determined through flight and sled tests, but are predicated upon ideal conditions such as level flight, sufficient forward speed for chute deployment, etc. To use these minimums as a guideline for ejection when additional terrain clearance exists is totally unrealistic.

• *Strict compliance with Dash One handbook instructions regarding the use of the zero second lanyard.* Many people regard the zero second lanyard as additional gadgetry. But it has proven its worth! Many crewmembers owe their lives to this equipment and others would be around today if they had used it. There are too many rumors concerning the problem of high speed, high altitude opening shock. In spite of this strong belief by some factions this has not materialized as a major problem area. True, there have been some *isolated* instances of injuries and fatalities attributed to high "Q" forces, and when these occur there is much dramatic impact, but we seem to be more prone to accept a fatality that is the result of insufficient terrain clearance. *This has always been, and continues to be, the largest single cause of ejection fatalities in the USAF.* Ejection experience shows that a very small percentage of ejections are initiated at high altitude or high speed. It stands to reason that if an emergency occurs at high altitude there is time to descend to a lower altitude before ejecting and also to kill off some speed. To elaborate further on this subject, we believe that there is a very definite requirement for a more rapid and positive means of chute deployment in order to enhance the effectiveness of low level escape systems.

• *Use of the zoom maneuver during low-level ejection.* There is little to add to this; the advantage of additional altitude gained through this maneuver is obvious. Also, excessive speed can be significantly reduced. Crewmembers should exercise caution in employing the zoom maneuver, however. The required forward speed for chute deployment must be maintained and angle of climb must not be such that the advantage of the ejection trajectory would be negated.

• *Proper body positioning.* Proper body position is essential to the prevention of injuries on ejection. These usually occur as a result of striking cockpit structures while leaving the aircraft or by absorbing the ejection force with the body flexed forward.

• *A "follow-through" of the ejection phase after clearing the aircraft,* i.e., attempt to manually actuate the lap belt—push or kick clear of the seat—attempt to manually deploy the parachute. It has been determined that it is physically impossible to beat the automatic system. The "follow-through" will result in immediate detection of possible lap belt and chute malfunction or seat separation delays. The continuing need for this training is demonstrated by the fact that in three separate instances during the first half of 1962 the crewmember found himself holding onto seat actuating controls even after the seat separation device had performed its function.

• *Control of the parachute during descent and landing with specific emphasis on operation of the parachute canopy release mechanism.* This is particularly important during all water landings and terrain landings under high wind conditions. Crewmembers are reported to have drowned following water landings because of inability to collapse the parachute canopy. There have also been two cases in which crewmembers were dragged to death following terrain landings. Admittedly, the present release leaves much to be desired, however, progress is being made to replace it with one that is more accessible and easy to actuate.

• *Complete knowledge of survival equipment and survival techniques and procedures.*

• *Good physical conditioning.*

These last two items are extremely important. It is difficult to evaluate a crewmember's physical condition through accident reports, but a lack of knowledge of survival equipment and techniques is usually indicated. AFR 53-28 implies training for selected personnel. All crewmembers must have realistic training along these lines if they are to survive in an unfamiliar environment under adverse conditions. It stands to reason that good physical conditioning and adequate training will result in a better mental attitude in a survival situation.

To put it bluntly, thorough training along these lines can mean the difference between life and death, particularly in the event of an ejection under marginal conditions. ★

WHITEMAN'S PLAN WORKS IN REAL DISASTER

Maj Leonard Berlow and Lt Col Joseph D. McGeary, USAF, MSC, Whiteman AFB, Missouri

THE EXPLOSION of a B-47 at Whiteman on 15 May which injured or killed 22 people was most ironical. It happened that a four-man team from the Surgeon's Office, 2AF, was at our hospital for what we, like all others, considered the drudgery of going through an inspection. At 1200 hours they handed us a problem in which the Base Disaster Plan was to be exercised by simulating receipt of 40 fracture and burn cases. At 1400 a walk-through evidently satisfied the inspectors that the hospital was ready, willing and able to handle a disaster situation. We were quite pleased with our accomplishments—at least in simulation.

Then at 1545 there was a call for an ambulance on the flight line. Were the 2AF inspectors at it again? Even their smoke pots were better than usual with the great black clouds being given off. However, an urgent call soon came back for more ambulance assistance—it was the real thing!

The first indication of trouble was fire along the left side of a B-47 being preflighted on the ramp. When this was detected the three crewmembers left the aircraft by opening its canopy and leaping from the plane's nose. The pilot sustained a broken ankle and the navigator fractures of his ankle and wrist upon impact. The copilot had minimal generalized abrasions. Base fire fighters responded immediately to the burning aircraft and apparently smothered the fire with little difficulty.

During this time our first ambulance arrived on the scene with a Flight Surgeon and two medical technicians. Usual procedure would have been for the Flight Surgeon to report to the Fire Chief who was standing under the bomb bay. However, noticing an injured crewmember, he went directly to his aid. Since the fire had been controlled, base fire fighters descended on the plane to inspect it for any other potential fire hazards.

As the injured navigator was being carried to the ambulance, there was a sudden explosion and fire engulfed all those in the vicinity of the airplane. Actually, only a matter of several minutes elapsed from the time the navigator was placed on the litter to the explosion. Had the Flight Surgeon reported to the Base Fire Chief, there is a great possibility that he, too, would have joined the Fire Chief as a victim of the fire.

The scene was now one in which fire fighters, themselves consumed in flames, were running from the aircraft. Four, still in flames, ran directly to the open doors of the ambulance. This vehicle immediately returned to the hospital. Other medical personnel and ambulances had reported to the scene and fire victims were placed in the ambulances.

We had certain misgivings about Broken Arrow exercises with problems of unrealism and perhaps lethargy by personnel who are forced to act out these exercises over and over again. But people are amazing at a time like this. As casualties came in, Broken Arrow procedures were followed with few deviations. Certainly patients were not stopped after Triage (initial first aid) to obtain names and all the other unnecessary time-consuming information from them. They were taken immediately to areas set aside for Immediate Surgery, Shock and Burn, and Delayed Surgery.

All physicians were on hand except our lone surgeon who was TDY at the time. (One of the 2AF Inspectors was a Flight Surgeon who actively participated in all phases of this disaster.) The hospital command post went into action, and within a matter of minutes, seven nurses, wives of personnel on the base (these were listed with telephone numbers on our Broken Arrow SOP), four physicians, two anesthetists, and four other nurses from nearby localities came to the hospital. The laboratory called in blood donors who were listed in its donor file. Blood types not available from this source were requested through the hospital PA system. The response here, too, was excellent.

Our initial impact was the greatest with eight patients coming to the hospital quickly after the explosion. These were distributed to the various appropriate areas with physicians and nurses assigned to each patient. Seven of the 22 casualties were immediately considered seriously ill, three were dead on arrival, and, of the remainder, three had minor to second degree burns, four injuries, including two fracture cases, and five cases of hysteria. Approximately three and one-half hours after admission, one of the most seriously burned expired.

Twenty-three minutes after the first patient arrived, a call was placed to the Burn Center, Brooke Army Hospital, San Antonio, Texas. Their response was most noteworthy. A team, consisting of 14 members, arrived in two planes at 2226 hours, only six hours, 15 minutes after the first patient had been placed in our hospital. The first plane returned to Brooke with three patients and 11 of the team at 0030 hours. Two physicians and a technician remained to care for the other seriously ill cases. The following morning two more burn victims were evacuated to Brooke with a physician and technician in attendance. The head of the team remained at our hospital to care for the one remaining serious burn case. He accompanied this patient back to Brooke two days after the accident.

One burn victim was unidentifiable. Although eye witnesses placed this particular fire fighter at the scene, and he was now missing, it was necessary that positive identification be made. AFLC, Wright-Patterson AFB, was notified, and the following day an identification

This experience taught us many things. First, there is no doubt that a good plan will be the basis for the way in which personnel act during a disaster.

expert arrived at Whiteman where verification of the deceased was made.

An unfortunate incident occurred four days after the fire. One patient, a 34-year-old technical sergeant fire fighter, who was admitted for smoke inhalation, suddenly died. He was shown to have suffered a severe heart attack, although all tests were within normal limits. Serial EKGs (2), transaminase, and ESR during hospitalization were all reported as normal. This particular patient had previously been on the overweight program and was considered an apprehensive individual.

Some general conclusions our professional staff drew from the initial management of this particular group of burn cases were as follows:

- Delay in emergency tracheotomy should be considered. Not all face burns will require tracheotomy. Those who do may not need it for several hours and the tracheotomy could better be performed under more ideal conditions, thus possibly preventing some of the complications of tracheotomies such as pneumothorax. When indicated, however, an open airway is a must.
- The use of endotracheal tubes is recommended instead of an ordinary tracheotomy tube since edema of the neck may soon make the ordinary tracheotomy tube too short.
- Narcotics should be administered intravenously rather than intramuscularly since drugs may not be absorbed from intramuscular sites until much later because of circulatory impairment. The cumulative action of these drugs may later precipitate respiratory depression.
- Urinary catheters and accurate intake-output records should be maintained as basic information.
- Frequent hematocrits are recommended to adjust the rate of administration of fluids originally estimated by the Evans formula. The per cent of burn may be difficult to estimate at first.
- Although a difference of opinion exists concerning antibiotics, it is our feeling that they should be administered initially in contaminated burns.
- Thorough cleansing and debridement, open treatment of the face and genitalia, and closed treatment of other areas, proved successful in the early management of this particular group of patients.

This experience taught us many things. First, there is no doubt that a good plan will be the basis for the way in which personnel act during a disaster. A plan must be flexible enough to cope with the prevailing circumstances, but having a feeling for the basics of a plan will at least lead those involved in the right direction.

There was one fact that was most impressive. That was the complete absence of sightseers or "do-gooders" at the hospital. Actually, the halls of this facility seemed only slightly more active than would be seen during normal operation. This was attributed to the fact that guards were placed in the street to prevent cars from coming to this area. Only professional personnel and those necessary for the care and treatment of patients were allowed in the hospital. Another factor which contributed to orderly procedures during this time was the removal of the litter bearer pool from within the hospital. These individuals were placed outside the hospital in the ambulance receiving area. As an ambulance arrived, only that number of litter bearers required for the transportation of the patient was assigned to this task. After the patient was taken through Triage to the appropriate area, litter bearers returned to that pool.

Smooth disaster operations were insured because the hospital "minded its own business." We stayed out of the affairs of others designated to perform certain procedures during a disaster. A Personal Affairs office was set up within the hospital to make necessary notifications. The Base Information Officer carried out his responsibility of release to the news media. The Mortuary Officer followed his procedures for the removal and burial of burn victims.

There is no doubt that any Air Force hospital could operate successfully during a time of disaster. *Fortunately*, all do not have the opportunity to test their plans by having the real thing occur. But you can take our word for it, a plan will work—if it's a workable plan. ★

• MISSILANEA

IN ANY DISCUSSION of safety where men and machines are involved, we generally find that the talk ultimately narrows down to two basic points: the "human factor" and the "equipment design factor." It doesn't make any difference what we are actually talking about, whether it be aircraft, missiles, or automobiles, we still find these two factors dominating the discussion. These factors play the primary role in safety. For now, let's take the human factor. This is a variable that we can never rule out.

What is Air Defense Command doing to take the human element out of the safety equation? What really is required is the repeal of Murphy's Law. Until such time as that law is repealed, Air Defense Command will continue to strive to protect all our Murphys from themselves. We are doing this in several ways.

First, we try to insure that our technical data are as "Murphy-proof" as possible. Inasmuch as Air Force policy is "to do things by the book", any deficiencies in the written word can contribute to accidents. Here's an example: Recently I received a military suggestion bearing the following comment from the evaluating

GIVING MURPHY A HAND

Col Charles L. Miller, Hq Air Defense Command, Ent AFB, Colorado

official at the squadron. "The time saved by electronic and mechanical personnel as stated by the suggestors if other means were taken in lieu of security guards is invalid since the maintenance schedule could not support such a program. The four personnel saved by this suggestion are not assigned and the UMD would have to be increased by four if this suggestion was not adopted." How confusing can you get! I am sorry I can't tell you what my position will be on this suggestion as I only have two more years at ADC to figure it out. The point is, I am afraid some of our tech data reads like that evaluation comment. Poor old Murphy. Our role is to insure tech data are not only accurate in necessary detail but readable and understandable by old Murph.

In ADC we have tried to avoid this situation in several ways: By active ADC participation in establishment of TO requirements, pre-publication reviews, and a complete validation and verification program. Finally, and perhaps most important, we have established a TO review board at one of our Air Divisions. This board, composed of working-level technicians from each of the various Bomarc squadrons, including Eglin and OOAMA personnel, reviews each proposed TO change for validity, accuracy, applicability, and for safety implications.

In addition to this function, the TO review board is presently working on a series of checklists to be used by Bomarc personnel who work in particularly critical or hazardous areas. For instance, such a checklist has been prepared for IM-99A fuel handlers and is now under final review. We make full use of the services of AFLC, through OOAMA, in preparation of these checklists. OOAMA has recently prepared for us a checklist covering the operation of the IM-99B roof and erector control unit. In short, if Murphy can read he should be able to understand and follow the tech data we provide him.

The second area is the area of training. In some key positions we are experiencing a large turnover of personnel, creating a critical and continuous training problem. Several of our "Murphys" are unconventional fuel specialists. These people must work in protective clothing which is hot in summer, cold in winter, bulky and uncomfortable at all times. They have the most hazardous job in the Bomarc weapon system. So here we have a large turnover of personnel and a big training problem. What does ADC do to solve these problems? We pin-point the specific trouble areas; give special emphasis to our OJT program for the people concerned; develop special checklists to cover their operations, and keep our tech reps in these areas longer than we normally would in order to assure we have the maximum effective training capability. All of these actions have contributed to reducing the accident/incident potential but are not in themselves the final answer.

Now that we have given Murphy the best tech data possible and have given him specialized training to keep him sharp, the third thing we are doing is to standardize him. ADC's approach to efficiency and safety is "That there is a best way to do anything." We feel that the only practical way of achieving the best way, where the human factor is concerned, is to achieve standardization of performance throughout the command. We feel that through this method we can accomplish our mission in the most effective manner while attaining maximum safety. What we are endeavoring to accomplish through standardization is to provide ADC with properly trained, properly directed, properly equipped, properly supervised personnel. We recognize that 100 per cent achievement cannot be attained; however, we are attempting to achieve as near perfection as is possible. We feel that standardization, in itself, carries the seed of safety. A standard, established procedure, whether in the form of TOs, checklists or system-wide directives is normally the product of many people. It has been reviewed, validated, tested, nit-picked, written, rewritten, and in general, put through the mill. So, we feel a standard procedure is a safe procedure. We recognize, however, that not every operation lends itself to this standardization. In keeping with the ADC belief that there is a best way to do any job, we try to put those "best ways" into common practice by our standardization effort. Strict adherence to TO procedures provides a large degree of standardization. Proper training adds to the measure of standardization.

The frosting on the cake, however, is our ADCAT team (Air Defense Command Assistance Team). This team is composed of specialists from every major staff agency: operations, maintenance, personnel, installations and safety. For example, from the maintenance area alone, we have representatives from each branch in the missile division plus the maintenance standardization branch and the reports and analysis branch of the maintenance management division. This team, from Hq ADC, meets with the Air Division counterparts and covers each squadron like a blanket. Continuity of team effort is assured by having the same members visit each base. Every facet of a Bomarc squadron's operation and maintenance effort is explored. On-the-spot interpretation of division and ADC directives is furnished as required. Personnel are checked for adherence to established standard procedures, and the need for standard procedures in other areas is noted. Safety practices are reviewed. Locally devised procedures are studied for possible system-wide application. Our ADCAT teams seek the "best way" we were talking about a while ago; we think they do a fine job of pointing out which way is the best way to help old Murph.

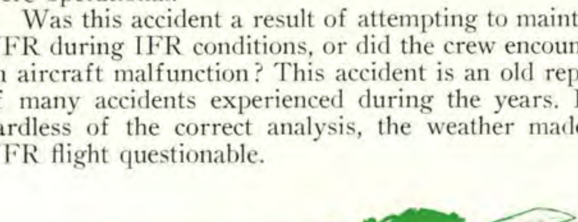
To sum up ADC's thoughts regarding the improvement of our missile safety program: let's keep old Murphy out of trouble by whatever means available to us; let's provide him with accurate written procedures and directives that he can understand; give him effective training; standardize him; make use of ADCAT-type techniques, and use whatever other means that are available to us. ★

IM-99 refueling reflects safety precautions observed during this operation.

AEROBITS

A C-124 AIRCRAFT was on a VFR night proficiency flight. Existing weather was 1500 scattered, 2500 broken, high overcast with 10 miles visibility in light rain showers. Scattered thunderstorms had been reported in the vicinity. The total flight time was approximately 40 minutes during which time three touch and go landings and a missed approach were made at a nearby base. The last voice contact was made as the aircraft cleared the traffic pattern. The aircraft crashed near the crest of a 2100-foot hill. Investigation revealed that the aircraft struck the ground in a nose high, right wing low attitude. The propellers were operating at approximately a cruise setting at impact and control surfaces were operational.

Was this accident a result of attempting to maintain VFR during IFR conditions, or did the crew encounter an aircraft malfunction? This accident is an old replay of many accidents experienced during the years. Regardless of the correct analysis, the weather made a VFR flight questionable.



FUEL GAGE MALFUNCTION—A B-52 recently flamed out two engines although the main tank feeding these engines indicated 15,000 pounds of fuel remaining. Fuel was re-routed to the engines from another main tank and a restart was successfully accomplished. The crew had noticed erratic fuel readings and fuel consumption during the flight, but did not consider it to be significant. After the flameouts it was noted that the main tank gage feeding these engines would not "press to test." The gage was stuck at 15,000 pounds and a transfer valve that routed fuel into the tank had failed in the CLOSE position.

Maintenance personnel replaced a fuel transfer valve; main tank fuel quantity transmitter and indicator, and recalibrated the system.

Any significant deviation from planned fuel consumption and reserve should be recognized by flight crews as an indication of a possible fuel system malfunction. In this incident, a timely "press to test" of the main tank gage would have revealed the gage malfunction.

Lt Col Robert P. Rothrock, Bomber Br., DFS

LOSS OF ALL COMMUNICATIONS immediately after takeoff presented a serious problem for a B-52 combat crew. They could not transmit or receive on UHF, VHF, HF interphone or auxiliary listen, and the call light was inoperative. Fortunately, there was no weather in the area so the pilot elected to remain in the local area while inflight troubleshooting was attempted. When it became obvious that normal communications would not be re-established, the ARC-11 survival radio was extracted from a survival kit, the antenna inserted through the periscopic sextant part, and emergency communications were established with the tower.

AN F-105D was scheduled for a mission requiring a maximum gross weight takeoff. Preparation for the flight had been properly completed by all concerned. The aircraft was rotated and retraction of the gear was started before adequate speed for lift off had been obtained. The ventral fin, tailhook assembly, sabre drain, centerline fuel tank, and left pylon tank fins all left marks or were marked by runway contact. Tire marks as a result of the wheel anti-spin device being activated told the story of premature gear retraction. Fuel leaking from the centerline fuel tank after it made contact with the runway was ignited by the afterburner and gave the appearance of the aircraft being on fire. The afterburner was shut off and the fire went out. However, adequate thrust was not now available to sustain flight and the aircraft hit the water off the end of the runway.

The pilot did not attempt to either eject himself or jettison his external stores although the aircraft was heavily loaded and at a very low altitude (maximum altitude 500 feet). It was the opinion of the accident board that if the external stores had been eliminated the lightened load would have permitted the pilot to regain control of the aircraft and to make a safe emergency landing. At low speed, high gross weight it is easy to raise havoc with the thrust required curve. Had the pilot jettisoned his external stores he would have brought the weight vs. thrust ratio back where it should be to stay airborne without the afterburner.

Lt Col Donald G. Page, Tactical Br, Fighter Div.

AN ALFALFA FIELD may not be the best landing area but when it's all you've got, well—read on.

A C-119 on a low-level, simulated heavy drop mission had been slowed to the recommended airspeed for the equipment drop. As 2400 RPM was applied, the left propeller continued to increase to 2950. Efforts to reduce the overspeed were ineffective and the aircraft commander was unable to maintain altitude, making a landing inevitable. With no prepared field nearby, the pilot elected to land gear down in an alfalfa field about 2400 feet long. A successful landing was made with no damage to the aircraft.

Inspection revealed that the seals on the number four blade torque cylinder had failed. The prop and governor were replaced by a maintenance team and the aircraft was successfully flown out of the field to fly another day.

Maj. Garn H. Harward, Transport Br. DFS

HERE'S ONE WITH A TEMPERANCE MORAL. 'Seems that since T-Birds started the alcohol habit ('twas found that a shot of barleycorn's main ingredient worked as well in warming the throat of the Bird as other throats) the insidious, cumulative effect of regular tippling can cause a flameout in the J33.

J33s are periodically returned for checkups and overhaul at OCAMA. Here's where it was discovered that habitual use of alcohol was contaminating fuel system components. Vital organs of the fuel system have been put on display to exhibit the seriousness of the disease. A conference of T-Bird users was called and an emergency fuel control picked at random and disassembled before this group. An excessive amount of contamination was found throughout the control.

The remedy recommended by the overhaul people was to deactivate the control, thereby cutting off the source of supply, their contention being that the cure was becoming a greater hazard than icing—the original disease. They contended that the new Dash-6 control will not ice sufficiently in the time the aircraft can remain aloft to cause engine flameout.

But the users, more contented with their T-Birds on the alcohol kick than they had been previously, insisted on standing pat until a fuel additive is available at all ZI bases.

A withdrawal program has been agreed upon, however. Pilots are being instructed to not use the alcohol system after landing their aircraft. It has been determined that this last shot is most detrimental. The "one for the barn" lingers in the fuel system and is the one that really contaminates. In addition, a compromise has been reached on the suggestion that the patient be checked twice as often. Instead of a checkup every 200 hours, as was formerly the case, OCAMA and ATC are going to sample some aircraft at 100 hours.

Since these after effects of alcohol came to light, it has also been agreed that a flushing procedure for engine fuel system accessories is necessary. This is under study. Further, the overhaul contractor has been advised to overhaul all fuel system components except the starting control. This is an interim measure until the de-ice system can be deactivated. There is suspicion too that this prolonged "elbow-bending" is having another serious effect. OCAMA is investigating the relationship between fuel system contamination and turbine bucket failures. There is some fear that heat concentration due to fuel system contamination can cause build-up on the turbine buckets and subsequent bucket failure.

The cure, of course, is removal of the supply. But users are of the opinion that things are better now than they were before and they have agreed to abstinence only when an additive is provided that will satisfy as well as or better than the alcohol. (For a more thorough discussion of the problem, we recommend "Back To Where We Started," Aerospace Accident and Maintenance Review, March 1962, as good reading.—The Editor) ★

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TSgt Grady D. Hoyle, NCOIC of base FOD program, reflects on three months collection of foreign objects picked up on Bitburg AB, Germany, taxiways and ramps. Pointing out that a small piece of safety wire ingested by a jet engine could cause 70 thousand dollars in damage, TSgt Hoyle urges all personnel to "pick it up" when you see something on the ground.

IT'S THAT TIME—

TRACKS IN THE SNOW. Path of T-33 that touched down 35 feet to side of runway and 1700 feet short when ice buildup turned windshield opaque.

THE PATTERN—snow, freezing rain—that led to the accident pictured in photographs on these pages is an old one. It is the same pattern that led to accidents when the Army flew the mails in 1934. It has been a regular contributor to accidents every winter since. Last winter there were the B-47s on oil burner runs that experienced engine flameouts from ice ingestion. And, as was the case in 1934, all the planes and all the crews didn't make it.

This pattern, the pattern of history, stacks the odds pretty heavily against a few luckless Air Force pilots for the winter of 62-63. For this reason, here again are reminders on the hazards of snow and freezing rain.

As a starter, here are a couple during the air mail flying days:

• Accident investigators are of the opinion the pilot flew into the ground while flying by instruments and unable to see the ground during a night flight in a local heavy snowstorm.

• The pilot, carrying the mail, made an emergency parachute jump at approximately 4:00 A.M. A snow storm was encountered and, while trying to pick up a beacon, the pilot found himself in a spiral to the right just as the auxiliary tank ran out. The ship went out of control when the motor failed as the pilot attempted to change gas tanks. Knowing he had lost considerable altitude, the pilot pulled back the stick and bailed out. It was snowing very hard, with temperature four degrees above zero.

During the mail flying stint, which lasted from February 7 to May 19, there were 66 forced landings and 12 pilots killed.

Since those days there have been many changes, Anti-icers and de-icers have been developed. Forecasting capability has expanded tremendously. Better communications are available. Widespread educational efforts have attempted to warn all of these typical winter hazards. Airplanes have improved.

But there are two important elements that haven't changed—the weather and the pilot. Man can see no farther through a given snowstorm in 1962 than he could in 1934. And when he is flying an aircraft down final, the fact that he is trying to distinguish landmarks while moving at 135 knots instead of 35 knots doesn't help much either.

Here are some of the pertinent events that led to the illustrated T-Bird accident.

The flight was a routine nav mission from a southern base to a midwest destination. A standard weather briefing was obtained and noted on the aircraft clearance. Investigators reported that "safe" weather was forecast for destination and alternate. Nearing destination, weather reports were received from an en route station and Center. Review of the time sequence and a comparison of the weather reports received by the pilots indicates that the report received from the Center contained a freezing rain notation. There is no explanation as to why the pilots failed to receive this notation. A normal penetration was begun with approval of destination Approach Control. During the penetration the only recent and accurate weather information was received by the flight. The information included the existence of light freezing rain. This was

AGAIN

ICED WINDSHIELD is shown in photo taken immediately after the accident. Ice built up in freezing rain despite use of normal and auxiliary defrosting equipment.

received after being committed to the penetration.

The pilots stated that the windshield and side panels were noted to be iced over after breaking out below the clouds. A low viz approach was executed to the active, followed by a missed approach and several orbits of the field in an attempt to burn off the accumulated ice. The windshield and side panels were completely iced over upon breakout from the clouds and, although both normal and auxiliary windshield defrosting systems had been turned on five to 10 mintues prior to penetration, ice continued to build up. When the pilot noticed this, and that ice was beginning to spread back along the canopy, he decided to land. On final he maintained sight of the runway by using an angling approach and crabbing to the right. Touchdown point was approximately 35 feet to the side of the runway, 1700 feet from the end, in 12 to 18 inches of snow. Runout distance was approximately 900 feet, and through two three-to-four foot snowbanks along side of another runway.

Investigators made note of the facts that a weather advisory was received by Base Operations 50 minutes after the start of the advisory period and that this advisory was passed to Flight Service five minutes later. No evidence could be found to show that the local control tower was advised of the freezing rain forecast contained in the advisory. There is no indication to show that any attempt was made to utilize the pilot to forecaster service available at the destination.

The pattern hasn't changed much, really. And the means of prevention of such accidents is about the same — the big difference being that alert pilots and support personnel today have a better means of communicating.

Want to NOT be involved in such a winter accident? Here are some suggestions:

- Don't fly in freezing rain.
- Don't attempt approaches in blowing snow or freezing rain.
- Do check most carefully with the forecaster when conditions are marginal.
- Do listen to en route stations for weather advisories.
- Do use Channel 13 every time there is any doubt as to weather conditions.
- Do divert to an alternate where weather is better.
- Do make pilot reports whenever weather is noted to have deteriorated from that forecast.
- Do use all approach aids available, especially at night — ILS, GCA, mobile controls.
- Do write up all hazardous conditions — the next guy may not be as lucky as you.
- Do expect winter weather problems; it's that time again. ★

(We realize that some missions may be necessary, no matter what the weather, but accident history discloses that many accidents in the past occurred on missions that could have been diverted or delayed.—The Editor)

WINTER FLYING CHECKLIST

- **Are you adequately clothed and equipped for the area you are flying in, or to?**
- **Is the aircraft free of frost or snow?**
- **Are the flight instruments thoroughly warmed up before takeoff into subzero temperatures?**
- **Do you know the complete anti-icing and de-icing system of the aircraft?**
- **Do you know how to detect and combat carburetor icing and jet engine icing?**
- **Do you know what to do when encountering severe icing, freezing rain, and extreme turbulence?**
- **Do you know the value of inflight reports of unusual and unfavorable weather conditions, particularly heavy icing, turbulence?**
- **What is the correct technique for landing, or after landing, on snow or ice? With crosswind components?**
- **Are you familiar with oil dilution systems, and do you cooperate with maintenance personnel in using them?**
- **Are you physically fit?**
- **Do you understand cold weather survival technique?**

Flight & Missile Safety Sentry, AFSC, Eglin AFB.

It's that time—again

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