flying

SAFETY

APRIL 1990

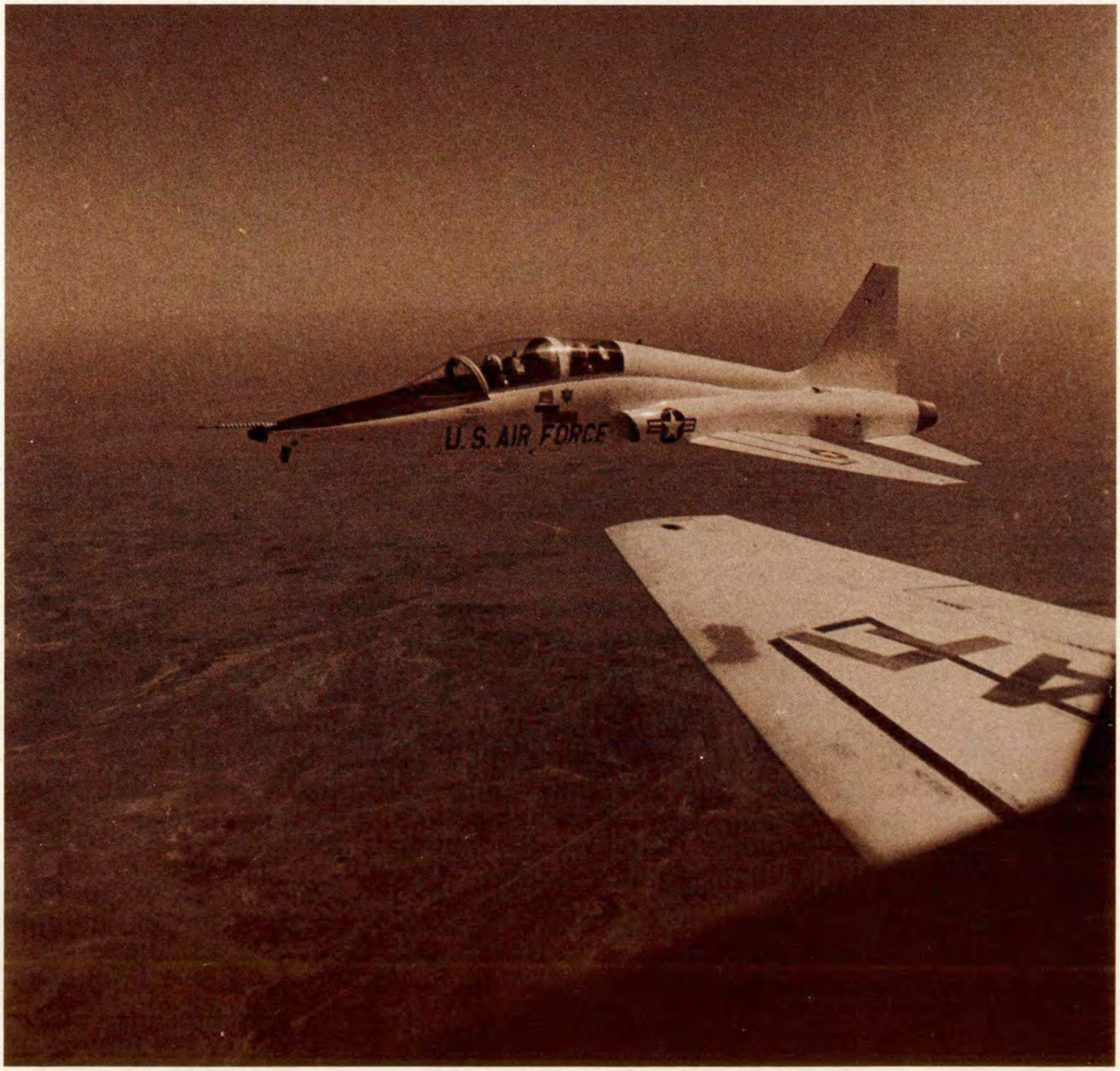
Trainers 1989 Mishap Review

FY89 USAF Ejection Summary

Why Did I Eject?

Mountain Waves

THE TRAINERS



THERE I WAS

■ The mission was briefed as a four-ship day, surface attack mission as part of a Cope Thunder scenario. Our target was Cubi Pt NAS with Marine F/A-18s as red air and USAF F-15s as blue air. Our package consisted of 12 F-16s and 4 RF-4Cs, running in to the target area from the west at 500 AGL to a planned 30-degree popup attack. I was no. 2 in a two-ship of F-16Cs at the rear of the package, and the takeoff (mil power) and departure went as briefed. Nos. 1 and 3 aborted prior to takeoff.

All went normal, and our ingress from our overwater IP was unopposed by any red air. At 4-1/2 miles from the target at 500 AGL and 540 KCAS, I actioned 30 degrees to the left (north) and pulled the nose up to 45-degrees nose high and selected full afterburner as briefed for the planned 30-degree attack.

As I passed through 7,000 feet, the aircraft yawed hard to the left, and I heard a loud thud in the rear of the aircraft. I then got a fire light, the aural "Warning! Warning!" and heard numerous calls on guard to check engine. I retarded the throttle from AB to idle, looked out the back of the aircraft and saw thick, white smoke and some fire coming from the base of the rudder. The fire light went out when I retarded the throttle, and my leader rejoined on me and confirmed the fire was out but that I was trailing some smoke.

I pulled the nose back through the horizon, and when I rolled wings level, I saw I was at 11,000 feet, directly over Cubi Pt NAS, our intended target. I planned on doing an SFO to the east runway, and my leader confirmed my idea on victor. The SFO went normally until the base turn, when I got a hydraulic/oil pressure warning light and saw my A system was down to almost zero. I rolled out on a 4-mile final at 240 KCAS and crossed the threshold at 220 KCAS, touching down about 2,500 feet down the runway. I applied full braking and was ready for a barrier engagement but was able to stop in the remaining runway, turn off the active, and shut down.

When I got out of the aircraft, I walked around and saw the bottom portion of the rudder, servo, engine spacer ring, and top half of the nozzle were burned away. There was also a large hole in the top of the engine, and the aircraft was dripping large amounts of hydraulic fluid. The Navy fire crew was excellent and responded quickly to the situation.

Later, I learned the engine, General Electric F110 GE 100, had a defect in a small bolt which caused a loss of cooling when I selected afterburner. Since both hydraulic systems are routed through the rudder in the F-16, I was depleting both systems during the flameout approach. I landed with 10 percent B system and zero A system, enough for about another minute and a half of controlled flight.

I also discovered that if I had reapplied power to the engine after retarding it to idle, I wouldn't have had much useful thrust and only a few minutes of hydraulics anyway, due to the hole in the engine. And, I also learned I could have done a few things better during this emergency, such as a quicker extension of the landing gear with uncertain hydraulics, and a faster egress from a known burning aircraft.

The bottom line is, I was fortunate enough to bring this one back to look at so it won't happen to anyone else in the future. This could happen to you. ■

UNITED STATES AIR FORCE **flying** SAFETY MAGAZINE

AIR FORCE SPECIAL PUBLICATION 127-2 APRIL 1990 VOLUME 46, NUMBER 4

CONTRIBUTIONS

Contributions are welcome as are comments and criticism. No payments can be made for manuscripts submitted for publication. Address all correspondence to Editor, *Flying Safety* magazine, Air Force Inspection and Safety Center, Norton Air Force Base, California 92409-7001. The Editor reserves the right to make any editorial changes in manuscripts which he believes will improve the material without altering the intended meaning.

page 8

page 16

page 20

SPECIAL FEATURES

REGULAR FEATURES

PURPOSE — *Flying Safety* is published monthly to promote aircraft mishap prevention. Use of funds for printing the publication has been approved by Headquarters, United States Air Force, Department of Defense, Washington, D.C. Facts, testimony, and conclusions of aircraft mishaps printed herein may not be construed as incriminating under Article 31 of the Uniform Code of Military Justice. All names used in mishap stories are fictitious. The contents of this magazine are non-directive and should not be construed as regulations, technical orders, or directives unless so stated. **SUBSCRIPTIONS** — For sale by the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402. Changes in subscription mailings should be sent to the above address. No back copies of the magazine can be furnished. **REPRINTS** — Air Force organizations may reprint articles from *Flying Safety* without further authorization. Non- Air Force organizations must advise the Editor of the intended use of the material prior to reprinting. Such action will ensure complete accuracy of material amended in light of most recent developments. **DISTRIBUTION** — One copy for each six aircrew members. One copy for each 12 aircrew support and maintenance personnel. Air Force units must contact their base PDO to establish or change requirements. AFSP 127-2 is entered as a publication at the Second-Class rate (USPS No. 586-410) at San Bernardino Postal Service, 1900 W. Redlands Boulevard, Redlands, CA 92373 and additional entries.

T-37

LT COL WALLACE W. COATES
Directorate of Aerospace Safety

■ Since 1956, the T-37 has been the Air Force's primary jet trainer. This stalwart little aircraft has performed admirably for over three decades and will, most likely, be with us through the end of the century. Although it's one of the oldest aircraft in the inventory, the T-37 is one of the most active. With a monthly utilization rate of nearly 45 hours per aircraft, USAF T-37s fly over 300,000 hours annually.

The current fleet of 642 T-37s is controlled entirely by Air Training Command which operates them at the five undergraduate pilot training (UPT) bases; at Sheppard AFB, Texas, for Euro Nato Pilot Training; at Mather AFB, California, for undergraduate navigator training; and at Randolph AFB, Texas, for pilot instructor training. In addition, ATC detachments at SAC bases throughout the CONUS use T-37s to support the accelerated copilot enrichment program.

Mishap History

Since entering the inventory, USAF T-37s have flown over 10.3 million hours. During this time, there have been 128 Class A mishaps which destroyed 125 aircraft and resulted in 73 fatalities. The

lifetime Class A mishap rate for the aircraft is a remarkably low 1.24 mishaps per 100,000 flying hours.

A breakdown of T-37 Class A mishaps shows nearly 80 percent were due to operational factors. Over half of the ops factor mishaps are categorized as pilot-induced loss of control which is probably not too surprising for a primary trainer. For mishaps attributed to logistic factors, engine failures account for the majority. Recent history confirms the continuation of these trends. In the last 2 years, there have been two Class A mishaps, one in each year. The mishap in FY88 was attributed to pilot-induced loss of control. The mishap in FY89 was due to a catastrophic engine failure.

FY88 Mishap

For the sake of review, let's look at the FY88 mishap, a typical loss of control. During the pullup for an Immelman, the pilot grayed out and lost consciousness. The aircraft stalled, then entered a left spin. When the pilot regained consciousness, he recognized the out-of-control situation and attempted to apply spin prevention procedures but was unable to effect a recovery. He ejected successfully.

FY89 Mishap

Shortly after liftoff from a touch and go, the crew heard a loud bang and experienced a loss of thrust. Smoke began to enter the cockpit, and the left engine fire warning light illuminated. The IP took control of the aircraft, began a climb, and accomplished critical action emergency procedures. When the fire light did not go out and smoke continued to enter the cockpit, the crew accomplished a successful ejection.

Current Problem Areas

In assessing reportable incidents which occurred during the last year, physiological mishaps are obviously a continuing problem in the T-37. The unpressurized cockpit, a limited air-conditioning system, and the exceptionally high G onset capability all contribute to a physiological incident rate which is significantly higher than other USAF aircraft. G-induced loss of consciousness (GLC) is a particular problem. Nearly 80 percent of all reported US Air Force incidents of GLC occur in the T-37. Major aircraft system changes to alleviate these problems are not likely. Good physiological training, proper use of life support equipment, proper rest and diet, and emphasis on proper anti-G straining maneuvers appear to be the only practical answers.

The answer to the T-37 GLC problem is up to the pilot! Good physiological training, proper use of life support equipment, proper rest and diet, and proper anti-G straining maneuvers are the practical answers.

Mishap Forecast

When will the next T-37 mishap occur? What will be the cause?

As the aircraft becomes older, is a logistic-related mishap more likely? Three of the last four mishaps were logistic related, but overall, the aircraft is extremely reliable with only 18 log mishaps since 1962.

An ops-factor mishap? Certainly the odds would indicate this, but there has been only one ops-related mishap in the last 5 years.

Air Training Command has predicted there will not be a T-37 mishap in FY90. This obviously is a desirable goal, but is it really likely? Yes! Between September of 1986 and June of 1988, T-37s went 21 months without a Class A mishap. Undoubtedly, there was some luck involved, but there was also a lot of hard work and attention to detail that paid off. Operators and maintainers of the aircraft will need to exert the same kind of effort in the future to prevent mishaps and improve on an already excellent safety record.*

Life Extension

How long will the T-37 be around? Current plans call for acquisition of a primary aircraft training system during the late '90s. In the meantime, the T-37 will need life extension to meet pilot training requirements. At present utilization rates, some aircraft will reach their safe service life of 18,000 hours within the next few years.

In 1986, San Antonio Air Logistics Center, the supporting ALC for the T-37, devised a structural life extension plan (SLEP) under which fatigue-critical structure in the wings, wing carry through, empennage, and horizontal stabilizer will be replaced. This program will extend the structure a minimum of 5,000 hours without the need for major reinspection.

SLEP, however, extends only the airframe structure. As time goes on, other systems will become more antiquated, more difficult to support, and less consistent with those of current Air Force weapon systems. It is unlikely, even with costly subsystem upgrades, the T-37's useful life can be extended much past the end of the century.

The Challenge

Meeting Air Force pilot training requirements with a 30-year-old aircraft is a stiff challenge. It's a challenge the people of Air Training Command will face for most of the coming decade. Meeting that challenge will take the continued combined effort of everyone involved. The continued effort to minimize risk in all aspects of operating and maintaining this aircraft will keep the remarkable safety record of the T-37 intact. ■

*At the time this article went to press, there had not been a T-37 Class A mishap in FY90.

T-38

LT COL WALLACE W. COATES
Directorate of Aerospace Safety

■ On a cool February morning in 1962, Major Walter Daniel took off from Edwards AFB, California, and set a time-to-climb record to 12,000 meters (39,372 ft) for jet aircraft. He was flying a new, advanced jet trainer built by Northrop, the T-38 Talon. Twenty-eight years later, at Columbus AFB, Mississippi, undergraduate pilot training students who were not born until years after that record was set, continue to fly the very same T-38 in which Major Daniel set his record.

For nearly three decades, the T-38 has been the premier aircraft for military pilot training. Designed in the mid to late 1950s, with flight characteristics consistent with the century series fighters, the T-38 is still the hottest trainer in service. Its performance and smooth, responsive handling have earned it the reputation as the Air Force's sports car. Over 54,000 pilots, from all over the world, have earned their wings in this remarkable training aircraft.

Today, approximately 70 percent of the USAF fleet of 847 T-38s is used by Air Training Command for undergraduate pilot training. In addition to ATC, TAC uses the Talon for lead-in fighter training. SAC, AFSC, and AFLC also use the aircraft in various training and support functions.

Mishap History

Since it became operational, the T-38 has accumulated over 10 million flying hours. During this time, there have been 180 Class A mishaps which have destroyed 172 aircraft and resulted in 131 fatalities. Operational factors account for the majority (109) of these mishaps, 58 were logistic related, and the remaining 13 were classified as undetermined or miscellaneous. The lifetime Class A mishap rate for the aircraft is 1.7 mishaps per 100,000 hours of flying time.

Recent Class A and B Mishaps

In FY89, there were two T-38 Class A mishaps and one Class B mishap. The following is a summary of those mishaps.

The Class B mishap occurred during the planned full-stop landing at the conclusion of a weekend cross-country training mission. During the transition to landing

The T-38 Talon is a twin-engine, high-altitude, supersonic jet trainer. It is used in a variety of roles because of its design, economy of operations, ease of maintenance, and exceptional safety record.

from a localizer approach, the mishap aircraft entered a high sink rate and impacted the ground 1,500 feet short of the runway threshold. The aircraft sustained major damage to the landing gear, nose section, wings, and horizontal stabilizer. Both aircrew members egressed safely with only some minor injuries.

One Class A occurred while the aircraft was recovering from a training mission. As the result of a disconnect in the rudder control linkage, the rudder failed hard over. The aircraft entered an uncontrollable roll with heavy side slip which the pilot was unable to control. Both crewmembers ejected. The pilot's parachute failed to inflate, and he was fatally injured. The second crewmember's ejection was successful.

The other Class A occurred on an instrument training mission for an upgrading T-38 pilot. During a localizer approach, the aircraft descended through the minimum descent altitude and impacted the ground 2 miles short of the runway. The nose gear collapsed, the aircraft slid, yawed to the left, rolled over, and began to break up. The upgrading pilot ejected after impact, but was well outside the safe envelope and received fatal injuries. The instructor pilot ground egressed with only minor injuries.

The T-38 needs as little as 2,300 feet of runway to take off and can climb from sea level to nearly 30,000 feet in 1 minute.

Problem Areas

For the past several years, Class C and HAP reports have shown a high incidence of engine flameouts and cabin pressurization problems. In FY89, we saw improvement in both of these areas. Better maintenance procedures for the pressurization system have resulted in improvements to system reliability. Likewise, changeout of the actuators on the fuel shutoff valves has cut down the number of flameouts.

As the aircraft become older, an issue of increasing importance is ensuring structural integrity. Fatigue and stress corrosion cracking is occurring in various components of the airframe structure, wings, and landing gear. Identification, inspection, and repair or replacement of these components is, and will continue to be, a major maintenance effort for the remainder of the aircraft's life.

Life Extension

The top logistic program for T-38 life extension is Pacer Classic. This integral program of airframe, engine, and avionics updates is aimed at extending the operational life of the T-38 well into the 21st century. Two of the three major efforts under the program, replacement of magnesium flight control components and strengthening of the dorsal longeron, are currently in work. The remaining major effort is work on cockpit enclosures. This includes new cockpit longerons, replacement of the cockpit floor, a new birdproof windscreen and instructor windshield, improved canopy latching mechanism, and new windshield frame. These modifications are scheduled to begin in FY91.

Future

In spite of the two Class A mishaps, FY89 was a successful year for the T-38 community from a safety aspect. The Class A mishap rate, as it has been for almost the entire history of the T-38, was well below the overall USAF rate. There is, however, always room for improvement. At the time this article went to press, there had not been a T-38 Class A. You're off to a good start. Continue your efforts at mishap prevention, and make this the first mishap-free year for the T-38. ■

The T-38 Talon has swept-back wings, a streamlined fuselage, and tricycle landing gear with a steerable nosewheel. Two Independent hydraulic systems power the ailerons, flaps, rudder, and other flight control surfaces.

FY89 USAF EJECTION

SUMMARY

MR ROBERT L. CAMPBELL
Directorate of Aerospace Safety

■ During FY89, 46 aircraft with escape systems were involved in mishaps. The mishaps involved 71 crewmembers who had the capability to eject—15 ground egressed with minor and major injuries, 6 failed to eject, and 50 made the decision to eject. There were 16 fatalities—5 out of the envelope, 1 drowning after ejection, 6 that did not eject, and 4 system failures. The overall ejection survival rate for FY89 was 80 percent, below the overall Air Force rate of 82.5 percent (1949 - 30 Sep 89). Figure 1 shows the aircraft involved in mishaps during FY89.

The chart shows the number of ejections for the A-10, F-15, F-16, and the number of fatalities due to collision with the ground (no attempt to eject).

Figure 1
Ejection Records
1 Oct 88 - 30 Sep 89

Mishaps	Acft Type	Ejections		No Ejections	
		Successful	Fatal	Successful	Fatal
2	B-1B	8	0	0	0
15	F-16	10	1	3	2
3	F-111	4	2	0	0
5	F-15	2	1	1	1
9	A-10	5	0	1	3
3	T-37/T-38	3	2	1	0
6	F-4	7	3	3	0

Figure 2
Aces II Ejection Rates
8 Aug 78 - 30 Sep 89

Acft Type	Total	Successful	Rate *	Fatal	Rate *
A-10	30	24	80%	6	20%
F-15	26	24	92%	2	8%
F-16	90	82	91%	8	9%
B-1B	12	11	92%	1	8%
Totals	158	141	89%	17	11%

*averaged

Increased Survivability

Since the first Air Force ejection in 1949, improvements in technology have increased the survivability of aircrews and reduced their injuries during the ejection sequence.

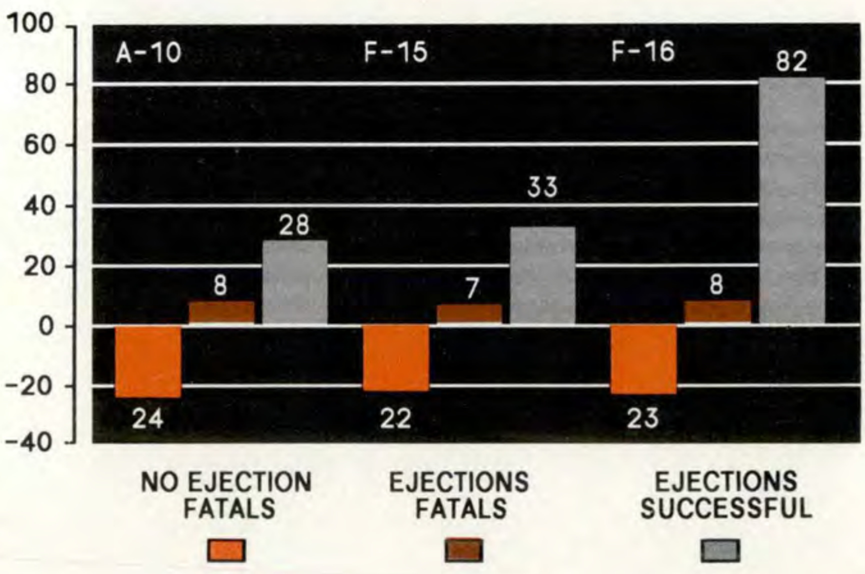
In the early seventies, the Air Force selected the Advanced Concept Ejection Seat (ACES II) to meet future Air Force requirements. The ACES II system was subsequently installed in the A-10, F-15, F-16, and B-1 aircraft.

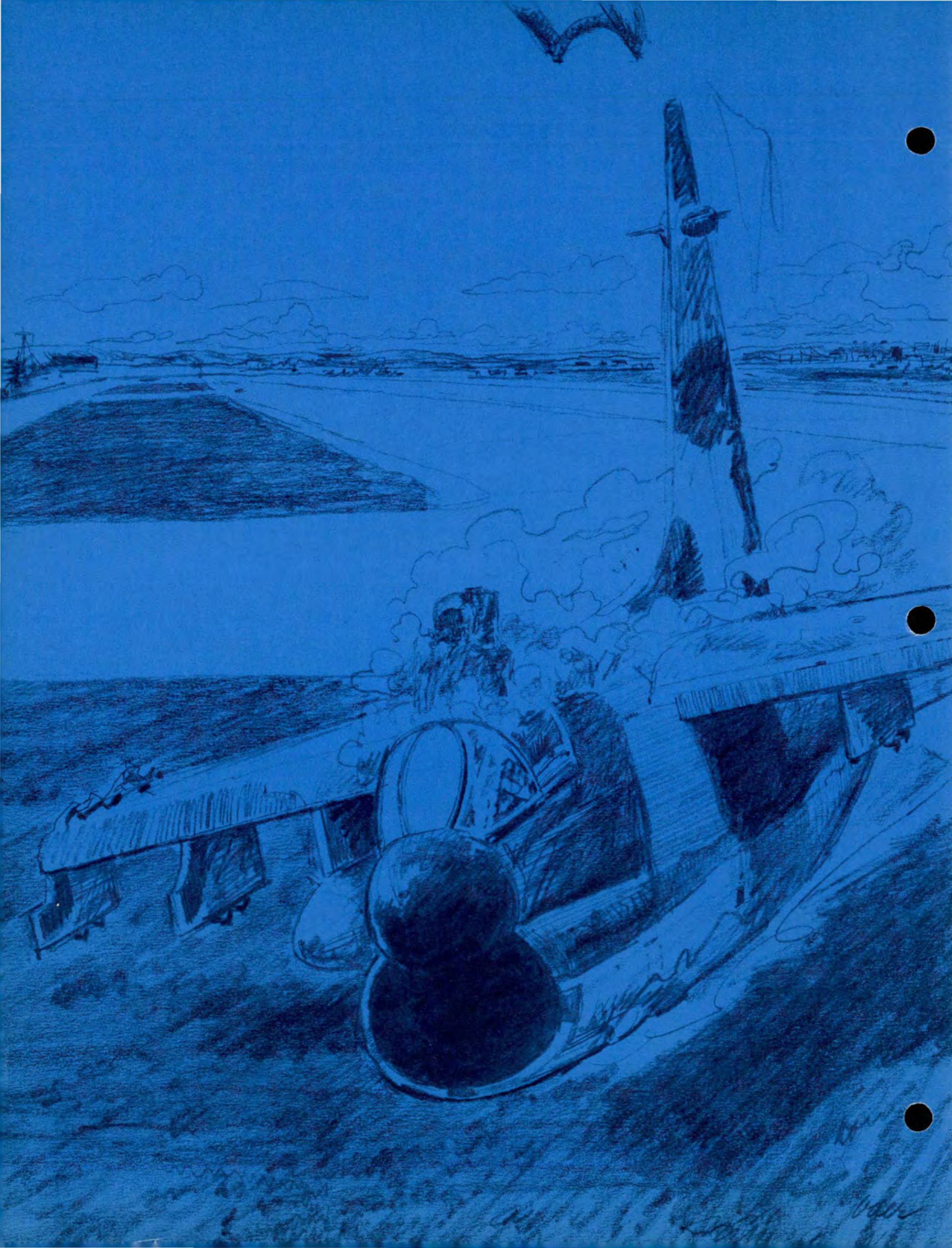
The ACES II is a lightweight, high performance escape system configured for optimum performance for a 0 to 600 knots escape envelope. The performance of the ACES II has greatly improved the survivability of aircrews (figure 2).

The Leading Cause

Out-of-the-envelope ejection and collision with the ground continue to be the leading cause of fatalities in escape system-equipped aircraft. Be prepared to use your escape system and make a timely escape decision. Safe flying! ■

FIG 3. EJECTION HISTORIES





Why Did I Eject?

MAJOR ROBERT FINKENSTAEDT
Oklahoma City Air Logistics Center
Tinker AFB, Oklahoma

■ I don't know. It came time to leave and I left.

It was one of those days when everything seemed to build up on me. The IG team was here inspecting our operation. I had spent most of the morning watching my aircraft ETIC slip until the weather was below test flight minimums. Just after I decided to use the airplane to give one of my crew chiefs an engine run recertification, the weather began to break. I filed my flight clearance, fought with B-52 and KC-135 crews for the attention of the SOF, grabbed my equipment, and headed for my airplane.

After fixing several preflight discrepancies, I monitored the engine run check and finally climbed into my aerospace machine at takeoff time. I think you can see by now that my normal flight was quickly turning to a shambles. Although it had nothing to do with the final outcome, experience has shown me once things start going wrong, they never get any better, and extra attention should be given to flying the airplane.

When things become nonstandard, be careful! My hopes for a relaxed taxi were dashed by a lot of traffic trying to get off after the weather break, an inertial measurement set (IMS) running south until its hat floated, and an automatic maneuvering flaps fail light. I should have given up right then, but I still had hopes of salvaging the mission, and because of a 20-minute wait in the arming area, I was able to coax the IMS back into the state.

Finally cleared for takeoff, I breathed a sigh of relief, lined up on the runway, and did my pretakeoff checks. I started my takeoff roll and watched with disgust as my TOT climbed past my nondouble datum temperature limit. Turning on double datum had no effect on the TOT, but it was now within limits, and I turned my attention to getting off the ground. After one last look at the TOT and airspeed, I began my rotation. The nose came off the ground, and as my mains lifted off, the aircraft went into a hard right yawing roll.

"...so I pulled the handle with my left hand while still holding left aileron and rudder.

The rocket shot me up the rails, forcing my eyes closed. I remember saying. "Come on, chute, please open!"

I immediately kicked off the automatic flight control system and put in full left rudder and some left aileron. I estimated I was about 20 feet off the ground, in a 90-degree bank (anything over 45 degrees seems like 90), and at a 45-degree angle to the runway. I was headed toward two big maintenance hangars, one of which housed my flight test office. I knew the aircraft had no intention of flying, and I was too low and at too great an angle of bank to eject.

As I approached the edge of the runway, the aircraft started to stall, and the left wing dropped back to below 20-degree bank. I knew I was close to the edge of the ejection envelope, but that looked like my only chance, so I pulled the handle with my left hand while still holding left aileron and rudder.

The rocket shot me up the rails, forcing my eyes closed. I remember saying, "Come on, chute, please open!" And just after that, I felt the tug of the chute opening. I was looking directly down at the aircraft as it hit the parking apron, cartwheeled, and exploded. My next thought was to get away from the fireball, which was uncomfortably close. I pulled down on the back risers to move backwards, and shortly thereafter, landed on the cement parking apron, executing a "perfect" PLF—feet and tush (expletive edited).

I released my chute, which was dragging me toward the fire, and took stock of myself. Other than a very sore rear end, I was okay. I looked back at the now wildly burning aircraft. I wondered how I ever got out and what had happened to cause the crash.

As it turned out, the right outer wing had folded and was torn off the aircraft at liftoff. The outer wing was found less than 1,000 feet from where the aircraft left the runway. Witnesses said I ejected with about 10 feet of altitude in about a 15-degree bank and had 1-1/2 swings in the chute before landing on the ramp.

continued

Why Did I Eject? continued

In retrospect, ejecting in a slight bank probably kept me from landing in the fireball. Close, yes, too close, but everything worked as advertised—as I knew it would. I think that is a partial answer to my opening question.

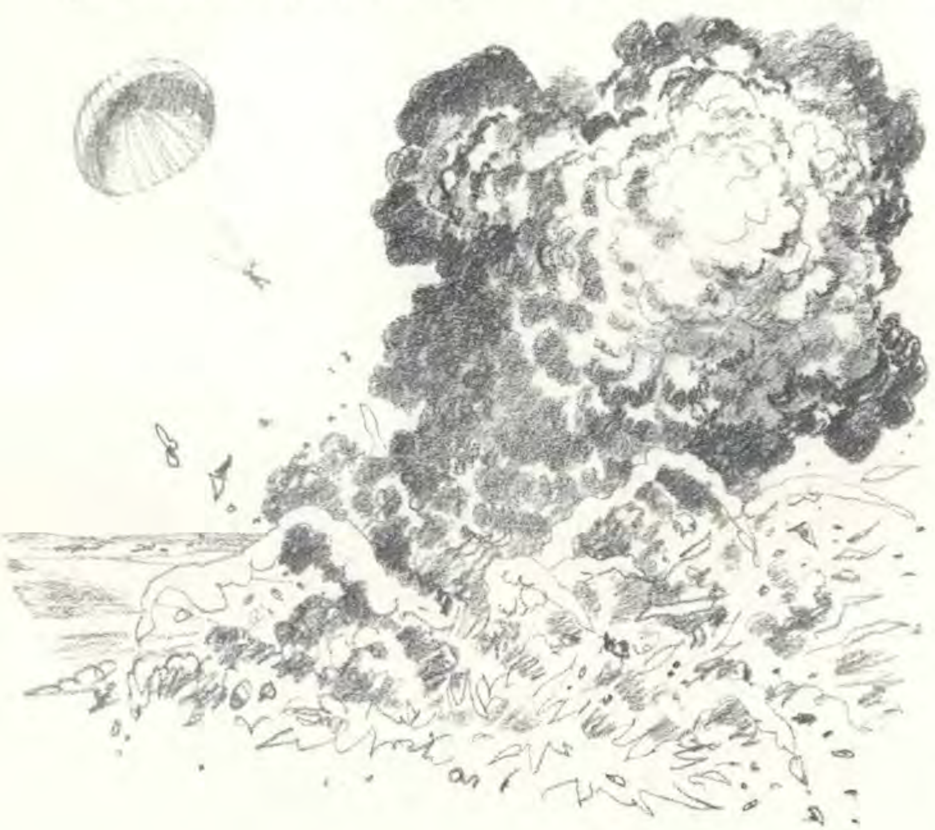
Now that the excitement is over and I've had time to reflect on what happened, I think there are two main reasons for my survival, not including all the luck I have saved up for years and heavily borrowed on for the next 100 years. The first big reason is the ability to recognize when the aircraft is no longer controllable and a crash is inevitable. I have flown single-seat fighters for most of my 18-year career, and I know from experience when I have control and when the aircraft has control. Situations can develop during a flight which require immediate action.

Most of the time a think-react criterion is the best course of action. In some situations, your thinking must be done beforehand since your time to think before reacting is considerably reduced. This usually occurs while you are close to the ground, that is, takeoff, landing, low level, or weapon delivery.

I divide my takeoff into three parts: From start to nosewheel rotation, from rotation to liftoff, and from liftoff to 200 feet. After 200 feet, I should have more airspeed and time to spend thinking before I react. Runway environment (buildings, ditches, barriers), airspeed, aircraft structural abilities in off-runway conditions, and previous problems with the aircraft are all part of my memory.

In this case, I knew the grass was soft, and once off the runway at high speed, the aircraft would probably dig in and break up. Even if I did regain control, I would be headed toward the maintenance hangars which I couldn't have cleared. Once I knew I was going off the runway, my decision was made. I suggest all pilots understand their aircraft and think about what can happen in uncontrolled situations.

The second reason for my survival, and the one I credit with being counted on the side of successful ejections, is my undying (pardon the pun) faith in my ejection system. I knew the capabilities of my system, and I knew I couldn't successfully eject during my initial bank. Fortunately, I was able to get the aircraft reasonably level before it hit the ground. I had no idea what the bank angle was when I left since I wasn't looking at the attitude indicator, but I felt I was okay, and that was the best I could get.



Why do I have such faith in my ejection system? Because I know fighters crash, but very seldom do you hear of an unsuccessful ejection when initiated within the ejection envelope. I have said many times, "If the aircraft doesn't want to fly—fine. I will walk back and get another." I know, for instance, I have a 0/0 seat that will shoot me up over 175 feet, and it will take the parachute 2 to 3 seconds to get full deployment. Will it always work within these parameters? Of course, it will. There is no other conclusion unless you like toasty toes. Did I know when I pulled the handle I was in the envelope? Of course not, but I did know I was close, and I had a better chance relying on the seat and parachute than the airplane. Besides, sudden stops give me headaches.

Some of the things I do to ensure my seat works are: I always check for clearance to the handle before I taxi since there is not much room to reach it. I preflight the chute and seat carefully prior to getting in the cockpit, including the chute inspection booklet. I know most of my parachute packers and visit the parachute shop occasionally to watch them pack. It increases my confidence in the chute when I see how careful they are. Once you realize the seat and chute can someday save your life, you will take the extra time to be the final inspector of your system and gain the confidence to say, "My chute will always work." ■

Adapted from January 1983 *Flying Safety*

IFC APPROACH

My Instrument Question Is:

MAJOR BILL STANFORD
The Instrument Flight Center
Randolph AFB, Texas

■ As the focal point for Air Force instrument flight procedures, the Instrument Flight Center has received numerous inquiries on instrument-related topics. The following questions were submitted to us, and we hope the answers will increase your understanding of instrument procedures and techniques.

QUESTION: *You're heading toward your next filed point and running early on timing. The navigator asks for turns left and right of track for timing. As the copilot calls the ARTCC to make the request for deviations, the nav tells him, "Never mind, we have an automatic 10-mile corridor!" You're the pilot. Who is correct?*

ANSWER: Score one for the copilot! AFR 60-16, *General Flight Rules*, para 8-11, states, "Unless authorized by the controlling agency, aircraft operating in controlled airspace under IFR on all routes, published or unpublished, will fly along a direct course between navigational aids or fixes defining the route." You DO NOT have a corridor you can freely wander in. If you want to make turns, turn short, or overfly points for timing, you must ask permission from ARTCC, even if it is only by 1 mile. Failure to request this course deviation may result in a loss of separation from other airborne sheet metal—commonly referred to as a midair.

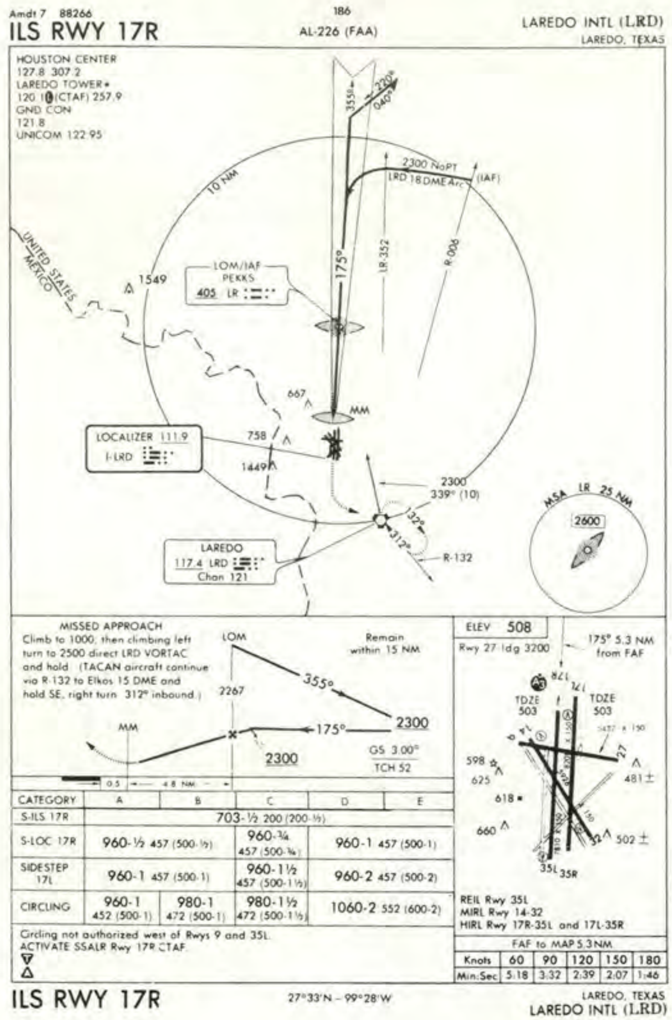
QUESTION: *You are cruising back to the home drome at 6,000 feet when ATC instructs you to "climb and maintain 7,000 feet." Now, at 7,000 feet, you are curious about the traffic which might have caused the change in altitude. You ask the controller for "traffic information." The controller's reply is "No traffic report." What's going on?*

ANSWER: Referencing the *Airman's Information Manual* (AIM), para 263, Amended Clearances, in this case, the controller acted to prevent a traffic conflict which would have occurred at a distant point. Thus, there is no longer any traffic to report.

QUESTION: AFM 51-37, Instrument Flying, *does not recommend using the middle marker (MM) as the sole means of identifying the missed approach point (MAP) on nonprecision approaches. Can you use the outer marker (OM) as the sole means for identifying the final approach fix (FAF)?*

ANSWER: Yes, but you need to review the approach carefully to keep yourself out of trouble. We don't recommend using the MM for the MAP because you won't know if the MM will work until you see the light or hear the tone. You can visually see VOR, DME, or TACAN information or time yourself to the MAP. If any of these fail between the FAF and the MAP, you can execute the missed approach safely. Since the least obstacle clearance provided by TERPs is while approaching the MAP on final, it is critical that you are able to identify the MAP. If your sole means of identifying the MAP is the MM and either the transmitter or your aircraft equipment fails, you will not know when you reach the MAP, causing you to exit the obstacle clearance area and unknowingly be in danger of hitting an obstruction. continued

IFC APPROACH: My Instrument Question Is: continued



In the case of the OM-defined FAF, you have greater obstacle clearance along this segment, especially if you don't descend as you proceed along the final approach course. But you should have a backup point along the course to tell you when you have missed the OM indications designating the FAF. This is not a backup FAF but a point which tells you that you've missed the FAF and must discontinue the approach. In the case of the ILS RWY 17R at Laredo International (figure 1), the terminal routing indicates the Laredo VORTAC is approximately 10 nm from PEKKS. If you were on the localizer inbound with no OM indication by 9 DME from the Laredo VORTAC, it would be time to discontinue the approach. You would then execute the missed approach procedure and contact Laredo tower or Houston Center.

With good glide slope indications, you could transition to the precision approach. But you cannot use 10 DME from Laredo VORTAC as your FAF. As long as you have a suitable backup plan in case the OM doesn't work or you miss it, it is safe to use the OM as the sole means of identifying the FAF or the initial approach fix (IAF). Remember the old saying, "Don't put all your eggs in one basket." It applies to instrument flying because we always need to ensure we have a way out, especially as we get closer to the ground!

***QUESTION:** The approach into Moron AB, Spain, RWY21 TACAN has a caution stating the TACAN is unmonitored. Is it safe to attempt an approach to this field under IFR conditions?*

ANSWER: Yes, it is safe to fly an approach to a field with an unmonitored NAVAID as long as the pilot tunes, identifies, and monitors the NAVAID during the approach (as required on all instrument approaches). But do not use an airport with an unmonitored NAVAID as an alternate. If you arrive at an alternate with an unmonitored NAVAID, there is no way (NOTAMs, FSS, etc.) to be assured it is operational until you tune and identify the NAVAID. If you were low on fuel and found the NAVAID not operational when you reached the field, your day could be ruined.

***QUESTION:** Can a low NAVAID be used in the high structure?*

ANSWER: Simple answer: Not in most cases. According to FAAH 7110.65, *Air Traffic Control*, para 4-32a(2), Degree Distance Route Definition for Military Operations, the NAVAIDS selected to define the degree-distance fixes shall be those authorized for use at the altitude being flown and at a distance within the published service volume area. Furthermore, the *Airman's Information Manual* (para 10a, NAVAID Service Volumes) states the standard service volume defines the reception limits of unrestricted NAVAIDS which are usable for random or unpublished route navigation.

Bottom line: If a low NAVAID is used to define a jet route, then the NAVAID can be used to navigate on that jet route. However, you cannot jump off the jet route point-to-point from that NAVAID because it hasn't been flight checked for that purpose. Even though you cannot do a point-to-point in the high structure (above 18,000 feet) with low NAVAIDS, this does not preclude you from filing to a low IAF from the high structure. ■

MY INSTRUMENT QUESTION IS:

Fold

USAF IFC/FOT
RANDOLPH AFB, TX 78150-5001

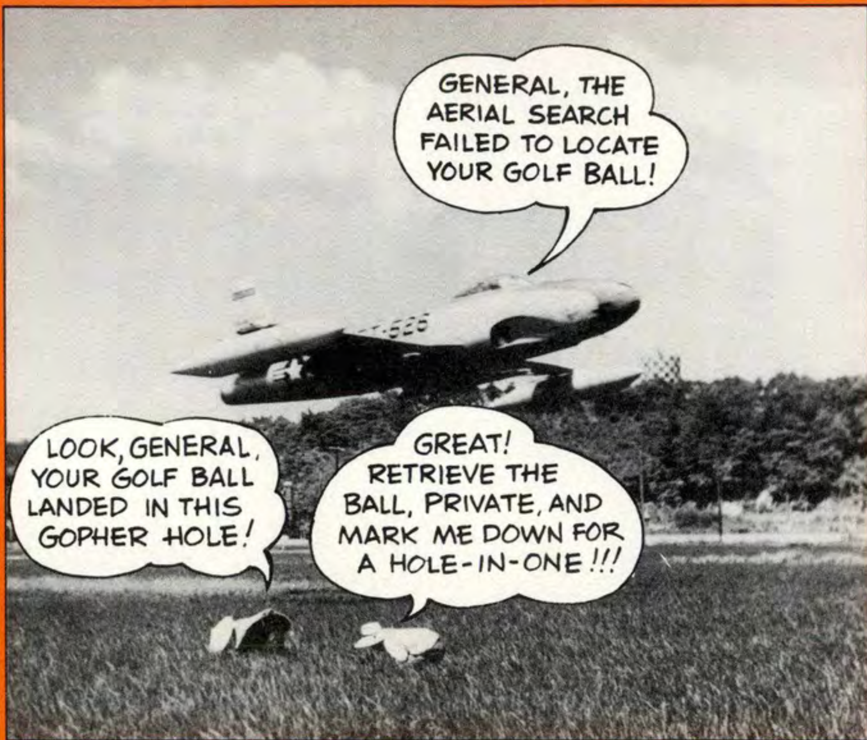
USAF IFC/FOT
RANDOLPH AFB, TX 78150-5001

Fold

Once Again, Thanks For Your Support!

. . . AND THE WINNER
FOR THE
DECEMBER 1989
DUMB CAPTION CONTEST
IS . . .

TSgt Dan Lyon
153 TAG/PAO
Cheyenne MAP, Wyoming



Okay, gang, we admit it! Your talents for dumb humor are approaching the pure genius level. We keep thinking these pictures can only have a few possible approaches, and you keep proving this is just *not* the case. So, congratulations TSgt Lyon—you are our latest winner! Your cheap little prize is in the mail.

Now take a look at the honorable mentions to see how tough the competition is getting. If you really want to be stumped, take a look at our latest contest on the back cover and see if you can beat it.

Honorable Mentions

1. (Cockpit) It's a plane. (L) It's a bird! (R) No, it's a UPT undergrad!
SSgt M.K. Abrams, 524 BMS/OTT, Wurtsmith AFB, Michigan

2. (R) Hurry up and find the remote control before that thing kills someone!!
Sgt J.L. Hughes, 3246 AMS/MAAMCC, Eglin AFB, Florida

3. (Cockpit) Heh, heh . . . Crop dustin' just ain't the same since they surplused these F-80s.
SSgt Clint Lowe, N. Dakota ANG/MAFD, Fargo, North Dakota

4. (L) Where do we get these guys? Whoever heard of losing a centerline tank in 2 feet of grass?
Chuck Woodside, SA-ALC/PMR, Kelly AFB, Texas

5. (Cockpit) Cost-effective . . . yeah right! (L) These new crop dusters are cooking the rice "before" we can pick it! (R) Shut up and keep looking for my contact lens!
SRA Steven W. Mundrane, MAML/22 CAMS SQ, March AFB, California

6. (L) This is a great hiding place! (R) It sure is! They 'll never find us here! (Cockpit) Hey there they are! Now it's our turn to hide and their turn to fly.
Amn Michael Williams, 27 AGS/MAAM, Cannon AFB, New Mexico

7. (L) Look, this sign says, 'Caution, low flying planes.' (R) No kidding! (Cockpit) Can't those people read?
MSgt Alan B. Crank and TSgt David M. Schmidbauer, 33 AGS/WSS, Eglin AFB, Florida

8. (L) Those radio controlled planes keep getting bigger and bigger. (R) And now they come with sound effects.
James C. Pine, HQ ACD/KSE, Scott AFB, Illinois

9. (L) Time out! I can't hear the signals! (R) 44-49-52 Hike! Hike! (Cockpit) Must be the rice bowl.
CMSgt Richard Hert, 433 MAW/MA, Kelly AFB, Texas

10. (Cockpit) Somehow . . . the 'Moon Over Miami' will never be the same!
Sharon Jacobsen, Chief, Programs, 58 TTW/MASC, Luke AFB, Arizona

CMSGT ROBERT T. HOLRITZ
Technical Editor

■ Except for the unusually strong headwinds, it was a beautiful day for flying. The pilot noticed the aircraft was climbing almost effortlessly in the smooth air and would have no problem clearing the upcoming mountain range and the few cumulus-looking clouds along its ridge. The mountain was crowned with a dense cloud that shone like a pearl in the reflection of the sun, and several layers of pancake-shaped clouds hung motionless a few thousand feet above. It was the perfect day for flying the "friendly skies."

If you are an airplane driver and you haven't questioned this pilot's feeling of serenity, you should definitely read the rest of this article.

As our contented pilot continued his flight, he flew over the first clouds and experienced severe turbulence. After a few distressing moments, the turbulence subsided, and he regained control of the aircraft. He then continued toward the moutain range. At his present altitude and rate of climb, the pilot estimated the aircraft would easily clear the 6,000-foot mountain peak by at least 3,000 feet. However, as he came to within 10 miles of the mountain's crest, the aircraft began an uncommanded, 5,000-foot-per-minute descent. In spite of the skill of this experienced aviator, the aircraft crashed in a ravine 400 feet from the peak of the mountain.

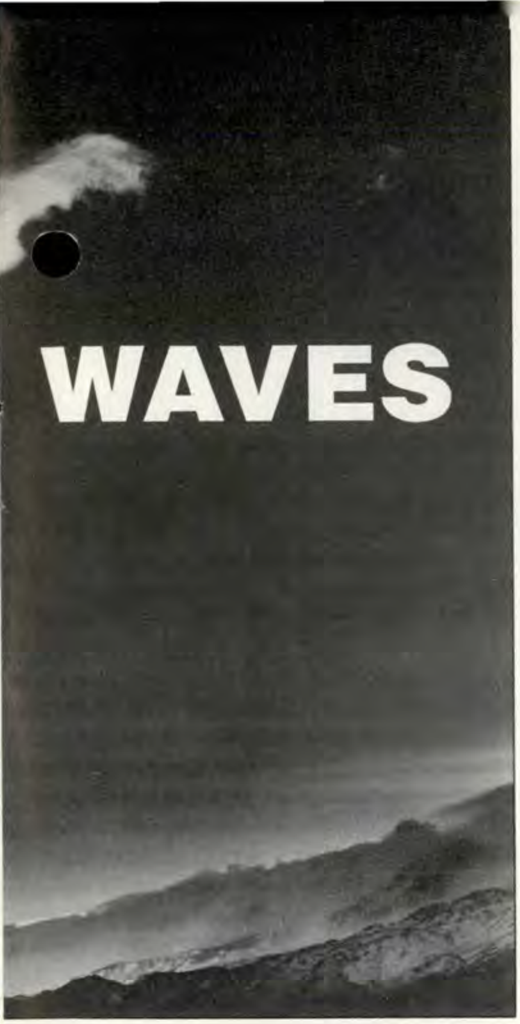
It should be fairly obvious to an experienced pilot the cause of our pilot's unfortunate mishap was a phenomenon called a mountain wave. While the mechanics of a mountain wave are taught to pilots in ground school and continually briefed throughout a pilot's career, many pilots, even those with years of flying experience, still find themselves caught by this potentially deadly phenomenon. Some have been killed!

Mountain Wave Formation

A mountain wave is a weather phenomenon that occurs when stable air crosses a mountain barrier much the same way as water flows over a rock in a shallow stream. On the windward side of the mountain or ridge, the airflow is smooth and laminar. On the leeward side, however, the air spills down the side of the mountain, creating an extremely powerful downdraft.

The wind currents over the peak are often characterized by a cap cloud which flows down the mountain like a waterfall. As the air continues to move along the still air mass behind the mountains, it meets with resistance and forms rolling currents that often form rotor clouds. These rolling currents are particularly hazardous to aircraft because they contain severe up and downdrafts, which are usually relatively close to the ground.

Also on the leeward side, at altitudes a few thousand feet above the mountain peak, lens-shaped altocumulus clouds signify different layers of disturbed air currents. While these "lenticular" clouds appear to



To avoid the effects of a mountain wave, when lenticular clouds are present, begin your climb early and cross the mountain ridge at an altitude at least 50 percent higher than its peak.

be stationary, they are actually continuously forming toward the windward side and dissipating on the leeward side. There may be as many as 10 of these clouds on the downwind side of the mountain, each one marking a wave. Although they may appear stationary and docile, lenticular clouds are usually a sign of extremely strong winds.

It is important to note all mountain waves are not characterized by these types of distinctive clouds. Under certain dry conditions, one or all of these cloud formations may be absent. For this reason, aircrews should be cautious flying over mountains in strong head-or tailwinds.

The Dynamics

In 1951, a joint Navy and Air Force team conducted a project to study the dynamics of the mountain wave. The team used specially instrumented sailplanes to analyze wind currents, temperatures, and pressures that occur during the phenomenon. Gliders were chosen over powered aircraft because of their G capability, low sink rate, and low speed. During one of these tests, a specially instrumented glider was virtually torn apart even though it was designed to withstand 14 Gs. The pilot had the ride of his life when he safely bailed out in the cosmic turbulence. In spite of the loss of an aircraft and some instrumentation problems, the study provided valuable information on the mechanics of mountain waves for both meteorologists and pilots.

Today we understand the severity of a mountain wave is a function of the windspeed, the angle in which it meets the mountain, and the height of the mountain. The minimum windspeed required to create a mountain wave is about 25 mph. At this speed, the angle of incidence to the mountain must be almost exactly perpendicular. However, at increased windspeeds, the wave effect can occur at varied angles of wind direction, up to 50 degrees. Generally, any mountain range with crests of 300 feet or higher can produce a wave and, as a rule, the higher the mountain, the more violent the wave. In 1964, a B-52 lost most of its rudder and vertical stabilizer in a severe downdraft caused by a mountain wave on the leeward side of a high mountain peak in the Colorado Rockies. Miraculously, the skillful crew managed to bring the big bomber home.

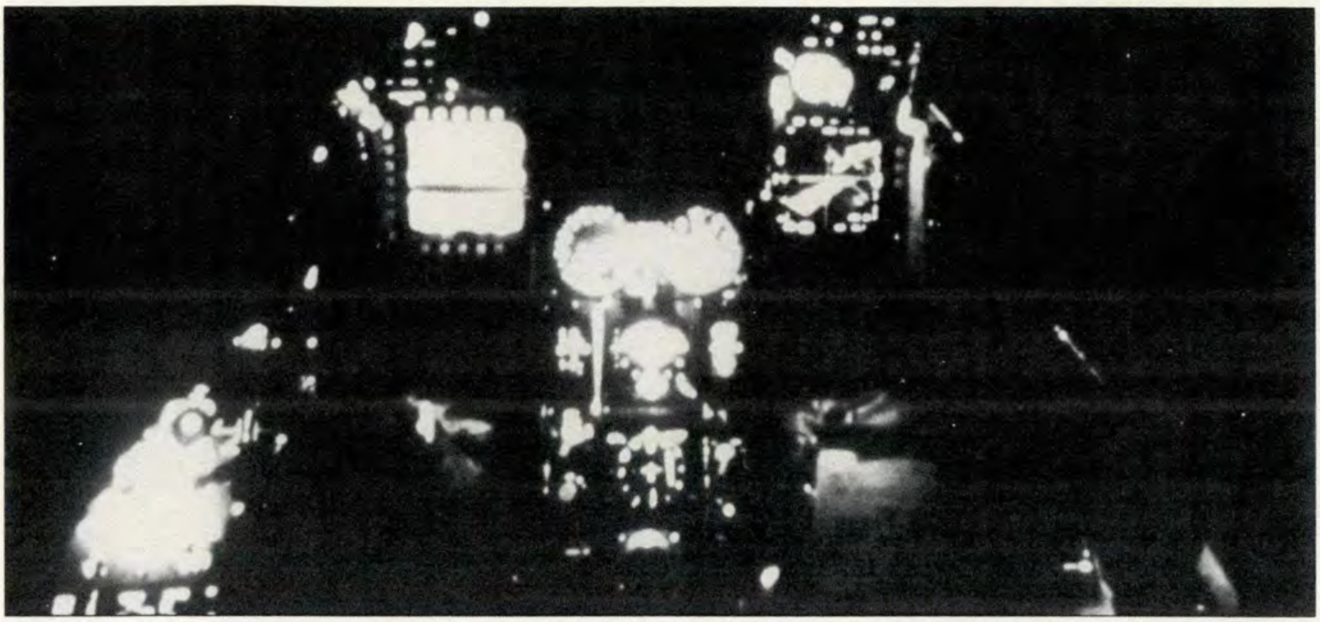
Rules of Engagement

As with thunderstorms, it is best to avoid mountain waves entirely, even if it means rescheduling a flight. However, if this is not possible, the following guide can help lessen the hazard.

- As a rule of thumb, fly at a level at least 50 percent higher than the height of the mountain peak. However, it is important to understand the effects of a mountain wave can extend to altitudes exceeding 70,000 feet.
- Avoid rotor, cap, and lenticular clouds.
- Do not place too much confidence in pressure instruments. This is because barometric pressure is erratic in a mountain wave.
- Pay close attention to the speed and direction of winds aloft when planning a flight in mountainous areas. Winds perpendicular, or nearly so, indicate a possible mountain wave.
- When approaching a mountain in high winds, begin your climb early—at least 100 miles, if you suspect a mountain wave. If possible, approach the mountain or ridge at a 45-degree angle to allow yourself a hasty retreat.

Your Best Prevention

Mountain flying can be treacherous, but a thorough study of the winds aloft and an understanding of the dynamics of the mountain wave is your best prevention and can help you avoid a dangerous situation. ■



NIGHT SIGHT

LT COL SAMUEL STRAUSS, MC, FS
Resident, Aerospace Medicine
USAF School of Aerospace Medicine
Brooks AFB, Texas

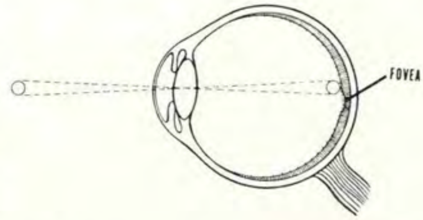
■ "Cobra 13, Denver Center. Traffic at 11 o'clock, 5 miles." It's 2100 local, and you're flying the last hop of a long cross-country. How long would it take you to "tally ho" that contact? A sharp eye and a smart night vision technique can reduce that time and increase your margin of safety.

Understanding Night Vision

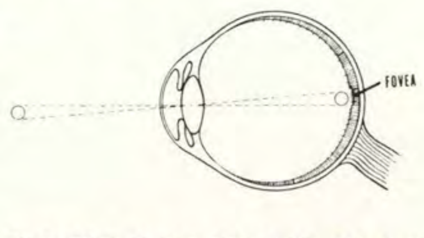
Vision is critical to every aspect of flying. Good vision is necessary for the recognition and identification of distant objects including aircraft, birds, and other things with which we share airspace. Good vision is also necessary to perceive the details of shape and color, to judge distances and object movement, and to read cockpit displays, charts, and flight plans. Night vision is particularly important because it functions differently than our day vision. Effective night vision requires special skills and knowledge.

The retina is the light-sensing part of the eye. It contains a very small central area called the fovea. The fovea senses maximal visual clarity and color discrimination. It works well under moderate to high levels of illumination, such as when reading and with direct focusing on well-lighted objects. Unfortunately, it fails under the low intensity light encountered at night.

On the other hand, the peripheral (non fovea) area of the retina functions under conditions of low levels of illumination. Actually, this area only requires one-thousandth the intensity of light as the fovea requires for daylight vision. Sometimes pilots complain they are able to spot an aircraft at night only to have it disappear when they look directly at it. They have, unfortun-



When looking directly at an object at night, the cones are used, which are less adaptable to night vision.



By looking to one side of the object at night, the rods are used which are 1,000 times more sensitive to dim light than are the cone cells.

NIGHT VISION PRINCIPLES AND TECHNIQUES

ately, shifted from dark adapted peripheral vision to dark insensitive central vision and thereby lost sight of the contact. To keep an object in sight at night, learn to look off to the side at about a 15-degree angle, thereby using the dark adapted peripheral vision. More about technique later.

One drawback of peripheral night vision is the perceived image is less clear than the day vision image. Visual clarity at night is 5 to 10 percent of daytime visual clarity. Another drawback is that color perception is considerably reduced or may be limited to shades of gray. This change occurs because the light-sensing cells of the peripheral retina are farther apart and much less sensitive to color than those used in central vision. Therefore, shapes and colors we use in daylight flying to help us with visual orientation may be lost at night. There are several ways we can reduce the loss of our visual function at night. One of these is "dark adaptation."

Dark adaptation is the process by which the eye adjusts to seeing in low levels of light. It involves physiologic changes in the structures of the eye, as well as photochemical processes in the retina. We are most aware of this mechanism when driving into a tunnel from daylight or walking into a dark movie theater. The eye takes about 30 minutes to fully dark adapt. This process is independent in each eye and can be quickly lost with exposure to moderate or bright light. Fortunately, the eye does not lose dark adaptation when exposed to dark red light. Therefore, it is possible to wear light-tight red goggles in well-lit areas and become dark adapted prior to flight.

Helpful Hints to Improve Night Sight

To preserve dark adaptation while flying at night, aircrews should avoid using supplemental white light sources. When necessary, a low intensity light source should be used. Aircrews should avoid gazing at bright light sources outside of the cockpit. If a bright light cannot be avoided, and one eye can be closed, this will protect the light adaptation in that eye.

The eye's ability to dark adapt properly depends on a photochemical process. This process requires an adequate intake of vitamin A. A healthy diet which includes vitamin A is, therefore, essential. Good sources of vitamin A include green vegetables, carrots, peaches, tomatoes, and bananas.

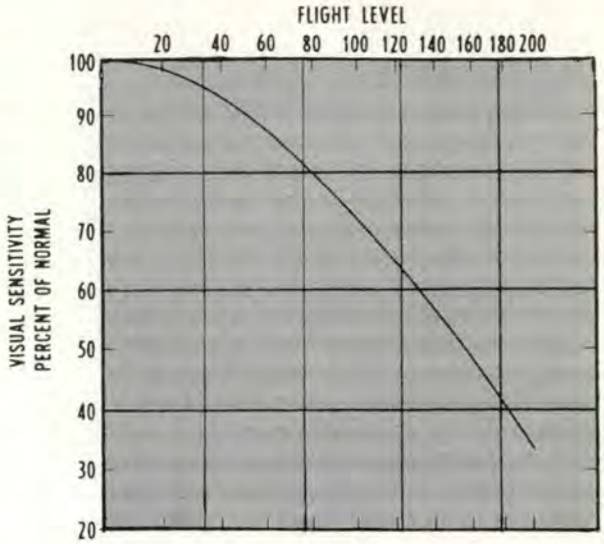
Another factor which reduces night vision is "hypoxia"—low oxygen in the blood. Without supplemental oxygen at a cabin altitude of 13,000 feet, the average percent decrease in night vision is 35 percent. At 16,000 feet, night vision is reduced by 50 percent. Proper flight checks and use of your oxygen system are essential to safe night vision.

Other factors which reduce night vision are cigarette smoking and fatigue. Cigarette smoking produces carbon monoxide that is inhaled and binds strongly to hemoglobin in the blood. This reduces the oxygen-carrying capacity of the blood. The decreased oxygenation of the retina reduces night vision. Fatigue reduces alertness and optimal functioning of your visual system.

You can also improve your night vision by techniques that increase the effectiveness of your eyes. Because of the central blind spot under low illumination, remember to look about 15 degrees to the side of the area to be viewed. Another method used to improve night vision performance is the sky-scanning technique. Scan the sky in an organized pattern with intermittent stops at points of fixation. This may seem unnatural at first, but it can be easily perfected with practice.

Get Help and Plan

Now you have the knowledge you need to improve your night sight. Ask your flight surgeon to help you develop your night vision skills and answer questions you may have about night vision. Then, before you fly, think about your night mission requirements and review the "Night Vision Checklist" to see better and to fly safe. ■

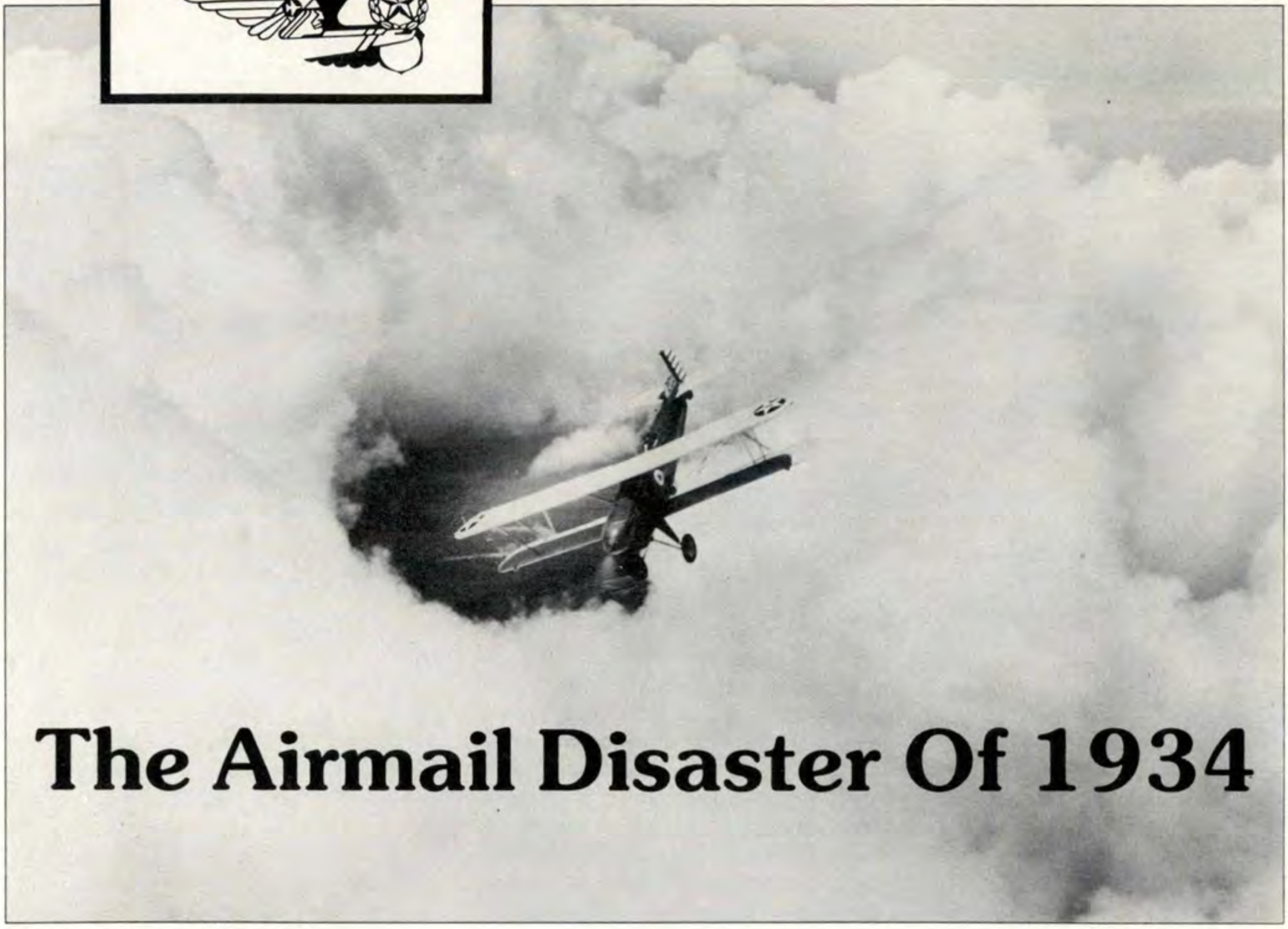


Effect of Altitude on Night Vision

THE TEN COMMANDMENTS OF NIGHT VISION

1. Take 30 minutes before takeoff to become fully dark adapted.
2. Keep glasses, visor, and canopy clean.
3. Learn to look 15 degrees off to the side of objects to be viewed at night.
4. Use your scanning technique to search the sky.
5. Minimize unnecessary cockpit light, and use a low-intensity light source for supplementary lighting.
6. Close one eye if you anticipate exposure to a bright light.
7. Properly use supplemental oxygen to prevent hypoxic loss of night vision.
8. If you smoke, get help to quit. (See your flight surgeon.)
9. Be well rested for your night mission.
10. Maintain adequate vitamin A in your diet.

Safety Warrior



The Airmail Disaster Of 1934

Photos courtesy of Office of Air Force History

Convinced by a Senate investigation they were awarded through collusion and fraud, President Franklin Roosevelt ordered the airmail contracts with the civilian airlines canceled and tasked the Air Corps to carry the mail. This decision proved to be costly in more ways than one!

CMSGT ROBERT T. HOLRITZ
Technical Editor

The Tasking

■ On 9 February 1934, at about 9 a.m., the Chief of the Air Corps, Major General Benjamin Foulois, received a call from Mr Harllee Branch, the Second Assistant Postmaster General. He asked if the general could attend an immediate meeting in his office regarding postal air service. Foulois arrived at the Post Office building shortly before noon.

After a brief greeting, Branch came straight to the point. "The President may cancel the airmail contracts with the civilian airlines. He wants to know if the Air Corps can carry the mail." Foulois was taken aback by the President's question. He had read in the newspapers the President was considering canceling the airmail contracts, but the thought of the Air Corps delivering mail had never crossed his mind.

The urgency in Branch's voice told Foulois President Roosevelt wanted an immediate answer. He called several members of his staff to come to the Post Office building to discuss the matter. After the conference, which lasted about 3 hours, Foulois gave his answer —"Yes." He could see no reason why the Air Corps could not handle the tasking.

Branch had one more question for the general—how long would it take the Air Corps to be ready to begin takeover of the airmail routes? The general replied, without hesitation, "About a week or 10 days."

This snap decision was going to cause Foulois problems, but it was not made without good reasons. For one thing, Foulois was a strong promoter of a separate Air Force,

Confident of the Air Corps' ability to safely carry the mail, Maj Gen Benjamin Foulois stands in front of a map of the routes to be flown by the Air Corps airmail operation.

Lt Col Henry H. (Hap) Arnold, Commander of the Army Air Corps airmail in the Western Zone. He later commanded the Air Corps during WW II.

and carrying the mail would put the Air Corps in the public eye. For another, the Air Arm had been neglected by the General Staff, and he was sure he could use the airmail to gain much-needed congressional support.

Another reason for his "yes" was it was well known in Washington that when FDR asked such a question, it was to be considered an order. In fact, although Foulois did not know it, even before he made his decision, the President had already planned to announce the airmail contracts would be canceled and the Air Corps would assume responsibility for delivering the mail on 19 February! The general's decision to lead the charge was the correct one.

Organizing

There was little time to spare, but General Foulois performed best under pressure. When he arrived at his office the next morning, he already had a plan.

The project was to be commanded by Brigadier General Oscar Westover. Westover, himself an outspoken officer, did not always see eye to eye with Foulois, especially in his views on a separate Air Force. But Foulois knew he was an excellent leader and was the best man for the job.

The airmail service would be divided into three zones across the continental US. He selected Major Byron Jones to command the Eastern Zone, Lt Colonel Horace Hickam, the Central Zone, and Colonel Henry H. (Hap) Arnold, the Western Zone. The project would require over 200 pilots, almost 400 enlisted men, and 122 aircraft to maintain nearly 40,000 miles of daily routes.

Public Reaction

The move to cancel the civilian contracts was basically a political one, and the President fully expected the civilian carriers to find fault with his decision. After 2 days, the airlines made their move. On 11 February, aviation pioneer, Charles Lindbergh, fired off a telegram to President Roosevelt. He also released the text of the message to the press. In the message, he cautioned the President that while Air Corps pilots were experts in combat flying, they lacked the experience to fly in poor weather and were not proficient in night navigation or in the use of federal airways.

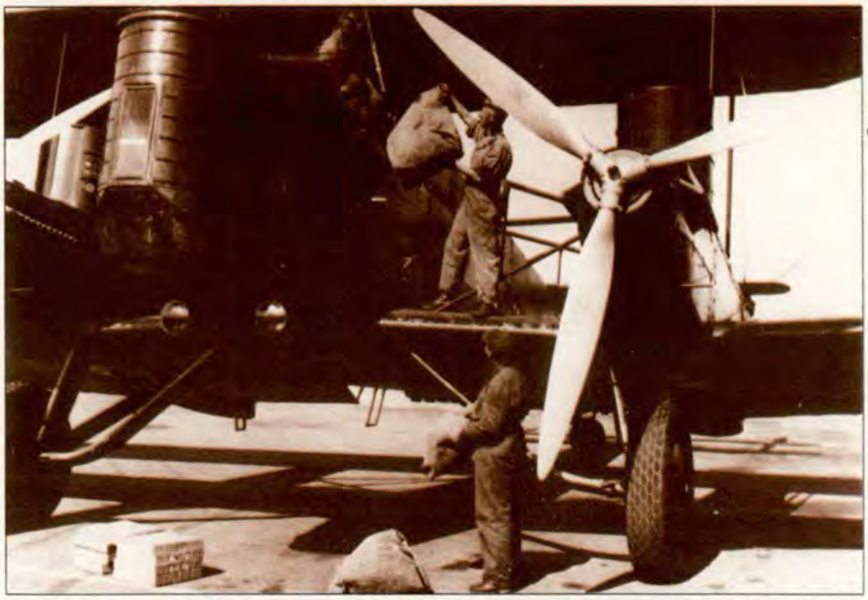
Another aviation pioneer and

continued

Lt Col Horace Hickam commanded the Central Zone.

Major Byron Q. Jones was chosen by Foulois to lead the Eastern Zone.

SAFETY WARRIOR:
The Airmail Disaster of 1934 continued



A mechanic helps the crew of the Curtiss (B-2) load the mail. Working with limited parts and tools and in poor facilities, the Air Corps mechanics managed to keep the airmail birds flying.

"Lucky Lindy," the world's most renowned aviator, spoke against President Franklin D. Roosevelt's plan to use the Army Air Corps to carry the mail, planting the seed for public and political criticism.

WWI Ace, Eddie Rickenbacker, a strong proponent of commercial aviation, made dire predictions for the Air Corps' airmail involvement. But Roosevelt didn't listen.

WWI Ace, Eddie Rickenbacker, also publicly warned the President of the hazards of using Air Corps pilots to deliver the mail. Since these celebrated aviators were affiliated with airlines, the President considered these protests to be little more than cries of "sour grapes" from the airlines. But when Will Rogers, the grassroots humorist, spoke out against the Army carrying the mail, the public listened.

Undoubtedly, Rogers' remarks echoed the sentiments of his close friend Wiley Post, the famous barnstorming aviation pioneer. Ironically, both Rogers and Post would be killed in an air crash in Alaska 18 months later.

The Air Corps reacted to the criticism with reassuring comments. Maj Jones told reporters the Air Corps would carry the mail..."unless an elephant drops on us. If it does, we'll cut it up and ship it airmail." Col Arnold reminded the public "90 percent of the airline pilots were trained in the Army."

Foulois did not take the critics lightly. He knew, for the most part, they were correct. Most of the pilots chosen to fly the mail were from tactical squadrons. A fighter pilot was trained in aerial combat techniques. He had little need to fly at night, and a dogfight in instrument weather was ludicrous. Further, there were no airways needed to guide a pilot to a combat zone.

The aircraft were also a problem. Almost none of them had the instruments needed for navigation or blind flying, and almost all of the aircraft designated to fly the mail were open cockpit, ill suited for flying in bad weather.

Still, Foulois believed these problems could be overcome. Pilots could be trained, and the aircraft could be equipped. The Air Corps had the instruments needed for "blind" flying, but they were in storage, waiting to be used in the newer, long-range transports and bombers that were being built.

What bothered Foulois more than the training and equipment was the bad press the Air Corps was receiving would make the pilots take unnecessary chances just to prove Lindy wrong. To ensure this did not happen, Foulois sent a letter to the field, warning pilots from taking a cavalier attitude in order to meet a schedule. He ordered Westover and the zone commanders to fly only in accordance with peacetime regulations. This meant they were prohibited from flying at night if the ceiling was less than 1,000 feet and during the day with a ceiling of less than 500 feet. Unfortunately, his orders would not always be obeyed.

The Curtiss (B-2) Condor, one of the several bombers that were used in the Air Corps to carry mail and supplies over long distance mail routes. Its open cockpit and lack of instruments made it ill suited to deliver the mail in poor weather.

Logistics

Essentially, flying the mail would be a nighttime job and, as it turned out, in poor weather conditions. Therefore, it would require the aircraft to be configured with instruments. At the very minimum, each aircraft would need a gyro and an artificial horizon. As mentioned before, the Air Corps had sufficient instruments, but they were sitting in a warehouse earmarked for installation in the newer bombers and transports.

Foulois wanted every aircraft that flew at night or in poor weather to be equipped with these instruments. He, therefore, ordered his maintenance people and engineers to work around the clock to have the aircraft ready for the 19 February deadline. But in spite of their efforts, they did not make this goal. Not only were some of the aircraft put into service without instruments, but the instruments that were installed were mounted on makeshift wooden panels in a position difficult—even impossible—for the pilot to read. At least one pilot died when he flew his aircraft into the ground during a snowstorm because he misread an artificial horizon which was installed between his legs near the cockpit floor.

Radios were another problem. Unlike the instruments, the Army didn't have enough radios to go around. Those it did have had a short range compared to those used by the airlines, and they required modification to operate on the Department of Commerce's airway system's frequencies and to receive vital weather advisories. As a result, many Air Corps pilots would have to fly without the benefit of radio navigation or in-flight weather advisories.

Safety First

Foulois' prime concern was still for the safety of the pilots. On 16 February, he sent another message to his subordinate commanders reemphasizing his priority of safeguarding the lives of the airmen over that of delivering the mail on schedule. Less than an hour after the radiogram was transmitted, Foulois received a message from Hap Arnold that three Western Zone pilots were killed in two separate training flights. Two died when their A-12 crashed in a snowstorm and a third when his aircraft crashed in heavy fog. Pilot instrument proficiency was the primary cause of both of these mishaps. This factor would continue to plague the airmail effort.

If Foulois had overestimated his pilots' instrument proficiency, Eddie Rickenbacker did not. He lashed out at the Army, calling the fatalities "legalized murder." The strong words came as Rickenbacker was preparing to set a cross-country record for the delivery of mail. The flight was an attempt to further vilify the President's decision to cancel the airline contracts. He set out in a DC-2 on 18 February, the last day of the civilian contract, to fly the mail from California to New Jersey. When he arrived at Newark, Rickenbacker not only set a new cross-country record of 13 hours, 2 minutes, but he did it in weather that caused the first of the Air Corps mail flights to be canceled.

Weather

Foulois knew weather might be a problem for his pilots. But no one, not Will Rogers or even Rickenbacker, could have predicted the US would experience the most severe winter weather in more than 100 years. The storm that took the lives of the three aviators on 16 February continued to intensify. By 19 February, it covered most of the Northwest. Severe storms also covered most of the Eastern Zone.

The task of flying the mail in this weather was difficult, at best. Most of the flying was done at night. The majority of the aircraft were open cockpit-type, requiring pilots to wear bulky clothing and cumbersome gloves to protect them from the subzero, 100-mph wind. Icing conditions compounded the problem.

In spite of these adversities, the flying went well for the first 2 days. Then, once again, disaster struck. On 22 February, Lt Durward Lowry lost his life when his aircraft became lost in heavy fog and crashed. That same night, another pilot was killed while on a training flight. Before the night was over, two more Air Corps aircraft crashed, injuring one of the pilots. The next day, an Air Corps pilot was drowned when the commercial airliner he was a passenger on ditched in the Atlantic in severe weather. By 23 February, the Air Corps fatalities numbered six—all as a result of weather.

Foulois was frustrated. He knew most of the fatalities could have been prevented had his instructions been followed. In each of the fatal mishaps, and the dozen or so nonfatal crashes, the ground control officers used poor judgment and authorized overzealous pilots to fly in conditions beyond their skill.

The events of 22 and 23 February caused the words of Eddie Rickenbacker, "legalized murder," to echo through Congress. Roosevelt was now beginning to feel the heat, and he quietly began to make arrangements to negotiate new contracts with the civilian carriers.

Another Message

The rash of accidents made the Air Corps front-page news. In less than 8 days, six pilots were killed, more than a dozen airplanes destroyed, and the delivery of mail was not even close to meeting the schedule. Still, Foulois was convinced his aviators would eventually come up to speed and deliver the mail safely and on time. On 24 February, he sent another message ordering his commanders to tighten up on safety. This message was more specific, requiring sufficient crew rest and only the most experienced pilots to fly at night or in bad weather.

It finally looked like the curse had been lifted. In spite of the continued bad weather, the crashes and fatalities had stopped, and the Air Corps was no longer a prime target for the press. The schedule was still not being met, but neither FDR nor MacArthur were pressing the issue.

But on 9 March, the luck ran out. The Air Corps again made the front page when one of Foulois' more experienced pilots flew into a moun-

One of Hap Arnold's airmail pilots takes the time to pose for a photographer prior to takeoff from March Field, California. Daring pilots won the admiration of young aviation enthusiasts of the thirties.

A postal truck transferring mail to the Thomas Morse 0-19 at Denver for a flight to Kansas City (above). The Boeing B-9 and P-12 (below) were typical of the open cockpit aircraft that subjected the aircrews to frigid temperatures while nightly flying the dangerous mail routes.

tain in a snowstorm and was killed. A few hours later, a B-6 bomber crashed on takeoff after a double-engine failure, killing one of its crew. That night, a mail plane crashed near Cheyenne, Wyoming. In a 2-day period, the Air Corps lost four aircrew and six airplanes.

The latest series of mishaps earned Foulois and MacArthur an invitation to the White House the afternoon of 10 March. FDR was angry, and although MacArthur was the commander of the Army, the President directed his anger directly at Foulois. He held the Air Corps Chief solely responsible for the embarrassment he was suffering over the Air Corps' inability to carry the mail.

"When is this killing going to stop?" he asked Foulois. The feisty general answered, without hesitation, "Only when airplanes stop flying." At least for a moment, the room was quiet. There was no comment from either FDR or the normally outspoken MacArthur.

The silence was broken by the President as he handed Foulois a letter he had just sent to Secretary of War Dern. The text, which was immediately released to the news media, set the President's personal policy for flying the mail. The letter stated since the overall cause of the high fatality rate was weather, the Air Corps would stop carrying the mail except during the safest conditions. But the letter ended with a caveat allowing the Air Corps "full authority" to modify schedules. Unknown to the two generals, FDR was stalling for time. He was already in the process of returning the airmail service to the civilian carriers.

The Final Days

The next day, FDR formally announced the postal service would accept contract bids from airlines to deliver the mail beginning 1 June. Foulois took advantage of the President's letter to Mr Dern and immediately ordered all flying stopped. His plan was to take the time to provide additional training for pilots and to have the instruments properly installed. During this time, he toured the airmail units and reiterated his policy on safe flying. On 19 March, the Air Corps resumed airmail service. The weather had improved, and until the civilian contract began, the Air Corps had a much-improved record suffering only one additional fatality.

Epilogue

The final toll of what has been called the "Airmail Fiasco" was 12 fatalities and 66 aircraft lost at a cost of $4,000,000. Before the contracts were canceled, it cost the postal service about 50 cents per mile to fly the mail. The cost for the Army to do the job was nearly $2.25 per mile. In spite of the high mishap rate, it is to the credit of the Air Corps that not a single letter was lost.

While the loss of lives and aircraft was tragic, it was not entirely for nothing. The difficulties the Air Corps had delivering the mail prompted Secretary of War Dern to appoint a board to analyze the Air Corps' ability to fulfill its wartime mission. As a result of the board's findings, Air Corps pilots would receive extensive navigation training, and all aircraft purchased in the future would be equipped with the necessary instruments and radios. In a few years, American pilots would be flying combat missions in the skies over Europe and the Pacific. The lessons learned during the airmail fiasco saved thousands of lives and helped airpower bring the allies to victory in WWII. ■

MAINTENANCE MATTERS

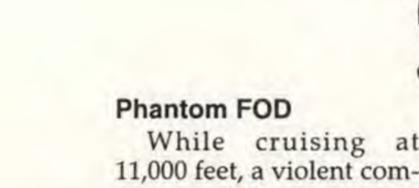
Hydraulic Fluid Caution

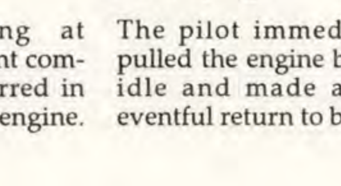
■ In recent years, the Air Force switched to a new "fire resistant" hydraulic fluid. The new fluid (MIL-H-83282) is now the standard for most of our aircraft. However, a recent aircraft mishap indicates there is a misconception in the field that this new fire-resistant hydraulic fluid won't burn. Not true.

Here are some words of caution from the engineers at the Air Force Inspection and Safety Center.

The key advantage of the new fluid is that it has a higher flashpoint and auto-ignition temperature than its predecessor. In most fire scenarios, these characteristics represent a significant safety margin over other hydraulic fluids. However, when a fine spray or mist is present, as would result from a small crack or a pinhole leak in a pressurized line, all hydraulic fluids are equally combustible. All it takes to ignite this (aerosol) mixture is an ignition source such as a small spark or an electrical arc.

Think about a home heating oil system or a diesel engine. In each, the fuel is atomized through a nozzle. A single spark ignites the heater fuel, and the diesel mist is ignited by the heat from the compression of the mixture. This same principle applies to aircraft hydraulic fluid. Therefore, any leak from a pressurized hydraulic system must be treated as a highly flammable mixture. **FIRE RESISTANT DOES NOT MEAN FIREPROOF.**





Phantom FOD

While cruising at 11,000 feet, a violent compressor stall occurred in the Phantom's left engine. The pilot immediately pulled the engine back to idle and made an uneventful return to base.

During a postflight inspection, maintenance people found severe FOD damage to the aircraft's no. 1 engine. The engine was removed, and during teardown inspection, impact marks from a threaded object were found on the compressor blades. While no screws or hardware were missing, investigation revealed that on the night prior to the mishap, maintenance was performed on the left vari-ramp. During the maintenance, one of the ramp's louver panels was removed and reinstalled, and several screws were replaced with new ones. Comparison of the replacement-type screw indicated it was a good match with the marks on the compressor blades.

Further investigation indicated this incident may not have occurred had maintainers followed established procedures. An examination of the aircraft forms revealed the installation of the louver panel was not properly documented in that only the "inspected by" block was signed off, indicating the required in-process inspection may not have been performed. In addition, in spite of the documentation discrepancy, a supervisor signed off the exceptional release, clearing the aircraft for flight.

The cost of not following procedures and technical directives can be high. In this case, the cost of repairing the J-79 was nearly $30,000. It could have caused the loss of an aircraft or, even worse, an aircrew.

Aircraft vs Manhole Cover

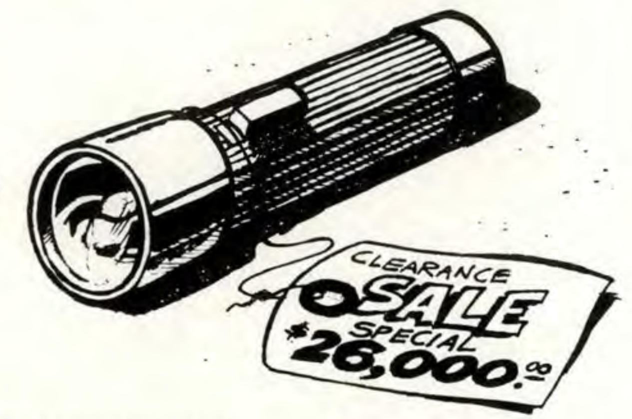
The tow team was briefed, tech data in use, and the wing walkers properly placed. It was a routine aircraft towing operation until the team began to swing the jet in front of the hangar to position it for backing. As the right main tire passed over it, a manhole cover failed under the aircraft's weight, leaving the aircraft resting on the centerline tank and right wing fold. Fortunately, damage was limited to the centerline tank and the right main gear door. Had the aircraft been fully fueled, or moving faster, damage could have been more ex-

MAINTENANCE MATTERS

tensive. Further examination of the manhole cover showed it was not stressed to bear the weight of the aircraft.

Manhole covers are designed to withstand the weight of heavy commercial vehicles. But unlike commercial vehicles whose weight is distributed over a number of wheels, the weight of an aircraft rests mostly on the main tires and is concentrated on a very small area. This can easily exceed the weight capacity of some manhole covers.

If there are manhole covers in aircraft taxi or tow areas of your maintenance ramp, it is a good idea to contact the folks at CE to ensure the covers will bear the weight of an aircraft. Better still, avoid towing aircraft over manholes or any area not specifically designed to bear the weight of an aircraft. It may be worthwhile to paint those manhole covers to make sure all are aware they are "No Crossing" zones.



Batteries Included

The Phantom was towed to the hush house for a double-engine run to troubleshoot for the source of oil leaks in both tailpipes. In preparation for the engine runs, the engine specialist performed an inventory of his tool kit. After accounting for all of his tools, he removed two flashlights from the tool box. He kept one and gave the other to the dedicated crew chief. Then he went to the rear of the jet to look for the source of the oil leaks while the crew chief inspected the intakes prior to the run.

Preparations completed, the crew chief started the no. 2 engine. After all instruments were stabilized, he literally fired up no. 1. Shortly after no. 1 was started, the specialist on the ground saw a huge fireball coming from the tailpipe. The crew chief immediately shut down both engines, and the fire went out. It was at this time the crew chief noticed he was missing his flashlight. As was expected, when the engine was removed and top-halved by the engine shop, pieces of the flashlight, batteries and all, were found deep inside the compressor section. Yes, the crew chief had set the flashlight on the lip of the intake and forgotten it. Had a tool kit inventory been completed just prior to engine start, more than $26,000 in damage would have been avoided.

Water Intrusion

Returning from a bombing mission, the F-16 pilot was alerted by the voice caution and a BATTERY FAIL light. In accordance with procedures, he immediately turned on the emergency power unit (EPU). Within a few minutes, the pilot heard the EPU oscillating and watched the EPU RUN and HYDRAZINE light briefly flash. A few seconds later, the EPU completely shut down, leaving only the EPU GENERATOR and EPU PMG lights illuminated. The pilot then shut off the EPU switch, and all lights went out. After declaring an emergency, the pilot made a straight-in approach and brought the Falcon to an uneventful landing.

The aircraft was impounded, and after only a few minutes, maintenance folks found water in the EPU controller. The water probably entered the unit when the EPU was sprayed by high-pressure hoses when the aircraft was being washed.

Unfortunately, this is not an isolated incident. Every month, aircrews experience in-flight problems as a result of moisture finding a way into electrical and avionics equipment. While engineers design aircraft and components with rain and moisture in mind, they do not design them to be waterproof. For this reason, it is never wise to use high-pressure water, or chemical, sprays on electrical connectors or avionics equipment. ■

MAJOR

Donald H. Perry

479th Tactical Training Wing
Holloman AFB, New Mexico

■ Major Donald H. Perry was no. 2 in a flight of three T-38s returning from an air combat maneuvering mission. He had just completed the battle damage check when, suddenly, both throttles were blocked and could not be reduced below 95 percent. He immediately told lead of the problem and simultaneously extended his speed brakes.

With no fuel to spare and facing a problem not addressed in the flight manual, Major Perry declared an emergency and proceeded directly to runway 34 for a straight-in approach. He requested the departure-end barrier be raised, and elected to continue with both engines running while using positive G-loading along with speed brakes to reduce speed for landing configuration.

Knowing the potentially disastrous consequences of landing too fast, Major Perry was determined to land as close to on-speed as possible. With gear, full flaps and speed brakes extended, a 360-degree descending spiral was flown approaching the field to lose excess altitude and speed prior to line up on final approach.

Established on final at 7 nm with airspeed control still a problem, Major Perry elected to shut down the right engine using the fuel shutoff switch, retracted the flaps to 60 percent, and continued with a single-engine approach.

The plan was working perfectly when tower announced, on 4 nm final, the barrier had failed to come up on runway 34; however, runway 25 was available with a raised barrier. Major Perry flew a critical, single engine go-around with 800 pounds of fuel remaining. By climbing first to the right, then reversing back to the left, he was able to quickly align himself on runway 25.

His landing was perfect, on-speed, and 500 feet past the threshold; however, the aircraft began to accelerate after touchdown. He immediately shut down the left engine using the fuel shutoff switch. Unable to aerobrake due to total loss of hydraulics, Major Perry used optimum braking and stopped the aircraft short of the barrier.

Major Perry's timely decisions and actions, coupled with his flawless single engine go-around, prevented the loss of a vital fighter training aircraft.

WELL DONE! ■

☆ US GOVERNMENT PRINTING OFFICE: 1990-779-017/20009

UNITED STATES AIR FORCE

Well Done Award

Presented for outstanding airmanship and professional performance during a hazardous situation and for a significant contribution to the United States Air Force Mishap Prevention Program.

CAPTAIN

James O. Witten

401st Tactical Fighter Wing
Torrejon Air Base, Spain

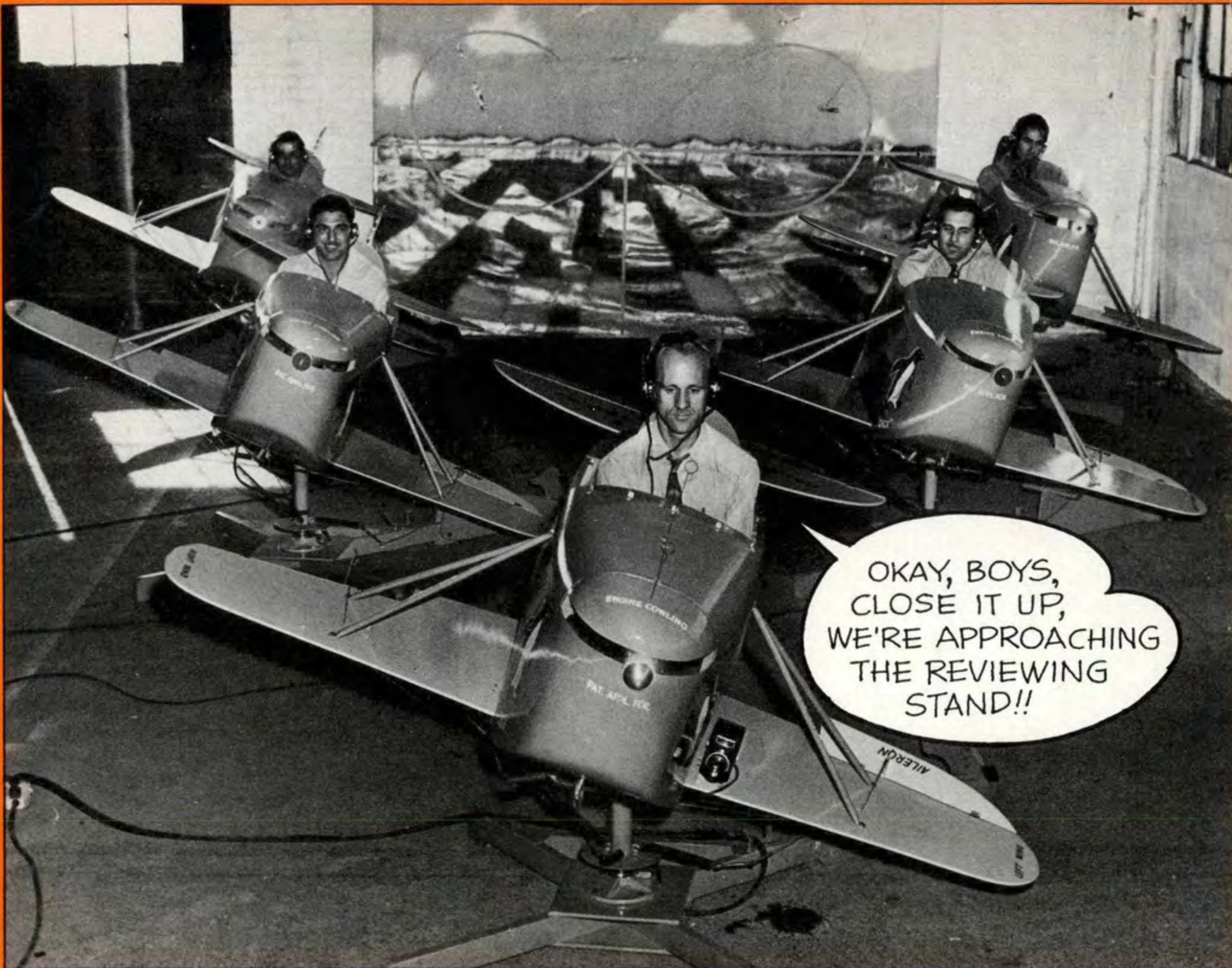
■ Captain James O. Witten successfully recovered his distressed F-16 after a throttle malfunction caused his engine to flame out. He had just departed Bandirma Air Base, Turkey, as part of an eight-ship package in a NATO exercise. Five minutes after takeoff, he was rejoining on his flight leader at 500 feet AGL and 350 knots when his aircraft engine auto accelerated into afterburner. Captain Witten retarded the throttle to idle. The engine was slow to respond but it stabilized at 80 percent RPM. After readvancing the throttle to military power, the engine would not accelerate past 80 percent. Captain Witten informed his leader of the engine problem and started an immediate 30-degree nose high climbing turn back to Bandirma. While in the turn, engine RPM rapidly rolled back to subidle RPM.

Captain Witten instinctively responded by initiating airstart procedures. He cycled the throttle to off and back to midrange and because of his low altitude, he immediately selected secondary engine control (SEC) for the best possible chance of an airstart. With SEC selected, the engine rapidly responded to 95 percent RPM. Usable thrust was regained at 3,000 feet AGL, 1,000 feet above minimum ejection altitude. Captain Witten climbed to high key back at Bandirma, an airfield he had only seen once before. He executed a flawless simulated flameout approach and landed his aircraft safely.

Captain Witten's excellent judgment and split-second decision prevented the loss of a valuable combat aircraft.

WELL DONE! ■

Write A Dumb Caption Contest Thing



Once again, our team of professional dumb caption writers are giggling with glee at the prospect of beating your dumb caption efforts. They tell us this caption is undoubtedly the world's all-time dumbest caption, and your pitiful attempts at humor will never top it. They say to mention they are the trained professionals.

We're not so sure. You people have consistently bettered their dumbest material with some really off-the-wall captions. And if you could beat them again, you would win the world renowned, legendary cheap little prize and be forever recognized as a true dumb caption genius. Wow, it boggles the mind!

Write your captions on a slip of paper and tape it on a photocopy of this page. DO NOT SEND US THE MAGAZINE PAGE. Use "balloon" captions pointing to each person talking in the photo or a caption under the entire page. You may also submit your caption on a plain piece of paper. Entries will be judged by a panel of dumb humor experts in July 1990. Remember, all decisions are relatively final and only open to bribes over $100,000.00 (we're still waiting).

Send your entries to: **"Dumb Caption Contest Thing"** • *Flying Safety* Magazine • HQ AFISC/SEPP • Norton AFB, CA 92409-7001.