flying SAFETY

MARCH 1990

SPECIAL ISSUE
1989 Mishap Review

THE HEAVIES

THERE I WAS

■ While the C-130 crew was flying a local proficiency training sortie at their home station, the GCA controller advised them of civilian VFR traffic at "11 o'clock and 3 miles." Six out of six eyes in the Herk's cockpit began scanning for traffic out the pilot's left window.

Meanwhile, their "traffic," a Cherokee that had just departed a neighboring civilian airport, had been cleared by tower to "overfly the field at 2,500 feet," had been advised of the C-130 in the traffic pattern and, after stating "we have the 130 in sight," was directed to "maintain visual separation."

Back on the 130, the crew heard GCA call the traffic at "1 mile, readout indicates he's at 2,200 feet." The C-130 pilot, tired of staring at the 11 o'clock quadrant, moved his scan across the windscreen to the 2 o'clock position where he spotted the Cherokee and noticed it was rapidly growing larger. He gently pushed the nose over and gradually descended to 1,800 feet, both events taking somewhat less than a microsecond. The Cherokee passed overhead at 2,200 feet with no apparent deviation in heading or change in altitude.

GCA had made the common "your other left" error calling traffic at 11 o'clock when it was actually 2 o'clock. Tower had cleared VFR traffic through their airspace and, anticipating no further dialogue, had deleted the Cherokee from their crosscheck. The Cherokee pilot was 300 feet off assigned altitude and maintaining very little "visual separation" from the C-130.

No harm, no foul? Big Sky Theory proved right once again? It's all part of the job? In this scenario, the only casualty was the pilot's new gray hair. Although the deck was stacked against them, the C-130 crew finished the mission "uneventfully." The lesson learned is possibly the oldest one in the books. *No matter how much high-tech service is being provided, it is the pilot who must first acquire and then maintain separation from other aircraft.* ■

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CONTRIBUTIONS

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SPECIAL ISSUE

We experienced another great year in 1989! We had 55 Class A mishaps in FY89 and for the sixth fiscal year in a row, our Class A mishap rate remained below 1.8. Our heavy aircraft helped keep the rate down.

In this issue, we take a look at how we did in FY89 in our heavy aircraft and helicopters. Next month, we will look at the trainers.

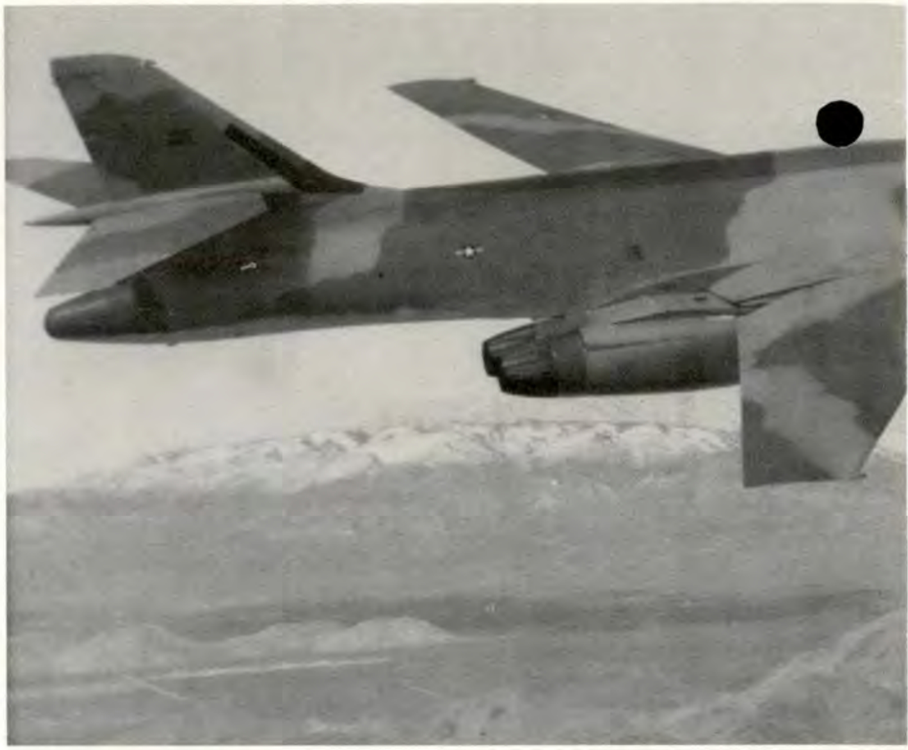
SPECIAL FEATURES

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.

B-1

MAJOR KELLY M. HAGGAR
Directorate of Aerospace Safety



Background

■ As with all aircraft, the B-1B has its friends and its foes. Given the "new guy" status of the B-1B, it also has its share of teething troubles. This is not unique to the B-1B. Almost 50 years ago, a general was asked why the Army was buying trouble-prone P-38s when the more solid and proven P-36 and P-40 were available. His pithy reply? "I'd rather have an airplane that goes like hell and has a few things wrong with it than one that won't go like hell and has a few things wrong with it."

However, the introduction of a large, fast, sophisticated aircraft is an enterprise not without risk. Figures 1 and 2 compare the B-1B's first years of service with other recent bomber aircraft. Additionally, the limited pool of B-1B mishaps (only three Class A's) is rather small for trend analysis.

Mishap Review

The first B-1 was lost after colliding with a bird. Given the mass/speed law of kinetic energy (KE = $1/2\ MV^2$), this is not a surprising result. Hitting anything at over 500 KIAS can ruin your whole day. In the year a B-1B was lost from the bird strikes, several fighter aircraft were also lost from high speed collisions with birds. In one of those fighter mishaps, the pilot suffered fatal injuries from the bird itself. Other large aircraft have received significant damage from bird strikes, even at traffic pattern airspeeds. Both the C-5 and E-4 (747) have had close calls from birds, and a DC-10 was destroyed following a takeoff roll bird strike.

In the second B-1B loss, a fuel leak, which developed into a fire during a touch-and-go landing, eventually forced the crew to eject. All four crewmembers' attempts were successful, raising the B-1B's ejection success rate to 91.7 percent (11 of 12), well above the 82 percent USAF average.

In the third mishap, the aircraft descended into the ground short of the runway during a night weather approach. All materiel teardown reports indicated the aircraft and its systems were functioning normally

Figure 1
Class A Mishaps in First 6 Years of Service

Aircraft	Years	Number Lost	Cumulative Mishap Rate
B-47	1953-58	176	6.79
B-52	1955-60	27	3.87
B-58	1960-65	10	8.50
B-1B	1984-89	3	5.00

NOTE: A Class A is a mishap in which there is a fatality, the aircraft is destroyed, or it is basically too damaged to economically repair. (Specific dollar thresholds have changed greatly over the years.)

Figure 2
Mishap Rates for First 6 Years of Service

Year	1	2	3	4	5	6
B-52B/F						
Rate	0	26.9	10.2	5.7	2.2	1.5
Number Lost	0	4	6	8	5	4
B-58A						
Rate	840.3	132.3	0	22.8	24.9	3.5
Number Lost	1	1	0	2	4	1
B-1B						
Rate	0	0	0	12.0	0	7.0
Number Lost	0	0	0	1	0	2

NOTES: The B-58A flew 119 hours its first year; the B-1B, 195. Even a single mishap will yield high rates given low hours.

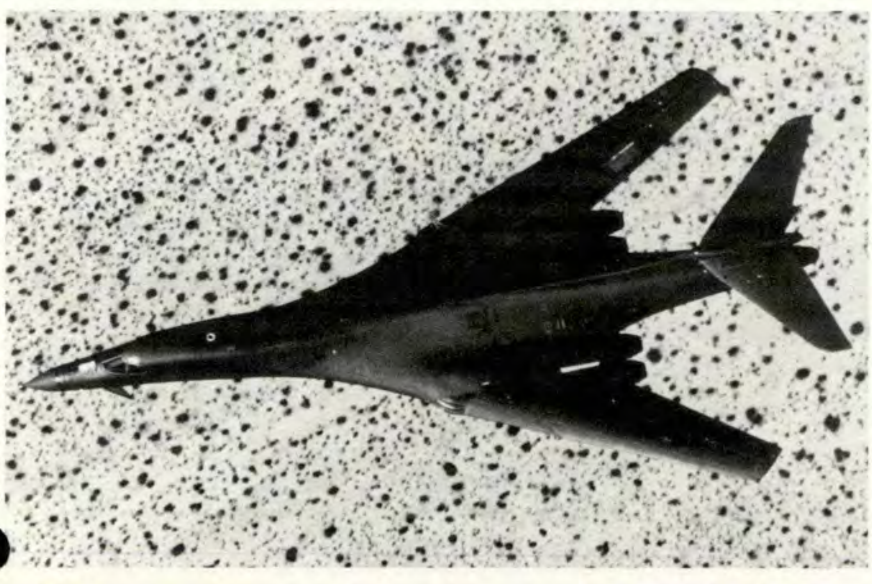
The B-1A loss in August 1984 was not rate-producing, since research and development aircraft mishaps were not counted (and had not been for years) in the USAF mishap rate. Similarly, the B-58 losses only include USAF mishaps. Counting the four B-58s lost in contractor flights would tilt the comparison even further in the B-1's favor.

prior to striking some obstacles short of the runway. While unfortunate, this type of mishap is not limited to the B-1B and has happened before in other aircraft and for similar reasons.

Other Issues

Several logistics actions noted in last year's article are well underway. For example, the Stall Inhibitor System 2/Stability Enhancement Function (SIS2/SEF) modification has been released to AFLC. B-1B aircraft going through periodic depot maintenance (PDM) at the Oklahoma City Air Logistics Center, Tinker AFB, Oklahoma, are routinely receiving SIS2/SEF as part of their PDM work. This has been underway since the summer of 1989 and is proceeding without incident, although financial problems are delaying the program.

Strong SAC/ASD/AFLC efforts led to early resolution of the inflight escape hatch loss and wing sweep problems. Wind tunnel testing of the revised engine inlet duct anti-ice system has been completed, with flight testing to follow. The new ILS symbology is working well. There are no insurmountable problems with the B-1B. As it matures, its capabilities are becoming readily more formidable.



The Challenge

The days of bomber aircraft being retired after just 7 or 8 years of regular squadron service with only 2,500 airframe hours are long gone. The B-1B has barely begun what will certainly be a long career with the USAF.

As big airplanes go, the B-1B has had a very smooth debut. If the past is any guide, the aircraft will be continually modified to carry additional types of weapons and will certainly receive several near complete changeouts of its avionics before the last aircraft retires well into the next century. It also seems likely a younger, smaller, less experienced USAF—both fliers and maintainers—will be fielding the aircraft for some time to come.

This means everyone in the B-1B community now has the rare opportunity of being both a "plank owner" and an "old head." Most of the mishaps, incidents, and close calls in B-1Bs have resulted from things that are common to all aircraft and were not driven by something peculiar to the B-1B. Aircraft have been landing with a nose gear up since retractables began. Landing with the wings nearly full aft turned out to be no big deal, at least on the lakebed.

Thus, everyone in the program in these early days has a chance to become the institutional memory, set the standard, and lead the way for those to come. The experience and the data base being built now—good, bad, or indifferent—will have an impact for many years to come. Each of you has a chance to influence the future of one of the premier weapon systems in the USAF. Step up to the challenge. Fixed right, flown right, the B-1B will be in capable, safe service for a long time. ■

B-52

MAJOR KELLY M. HAGGAR
Directorate of Aerospace Safety

■ The B-52 has been around SAC for more than 30 years and could be soldiering on well past the change of century 10 years hence, since its economic structural life limit is close to 2030. Despite its age, the Buff has a lot going for it, although its days as the Nation's primary bomber are long past. The B-52 still has a tremendous range and payload capability.

All right, so a B-52 can cover a lot of ground. What can it do when it gets there? Granted, there are two things it isn't very good at: Running and hiding. With its slow speed and large radar cross section, the B-52 isn't likely to get there undetected. On the other hand, it doesn't need to. Given its large weapons bay and its external racks, the B-52 is an excellent candidate for a standoff weapons platform.

The B-52 still has a lot to offer as a weapon system, but, as with all other aircraft, it has to be around when the balloon goes up to be of any use. Every B-52 that comes to grief at the LaJunta bomb plot is a crew and aircraft that won't be available in combat.

After all, safety is more than just finding out why the last bird went down. Safety also adds to and changes the aircraft, to both increase its chance of getting home and help the crew accomplish its mission. There is no point in having the "Klingon cloaking device" in your ECM suite if turning it on first causes an electrical fire and then starts the left aft truck cycling up and down. We want the B-52 to continue to remain as it has been for many years: More of a threat to the opposition than to its crews.

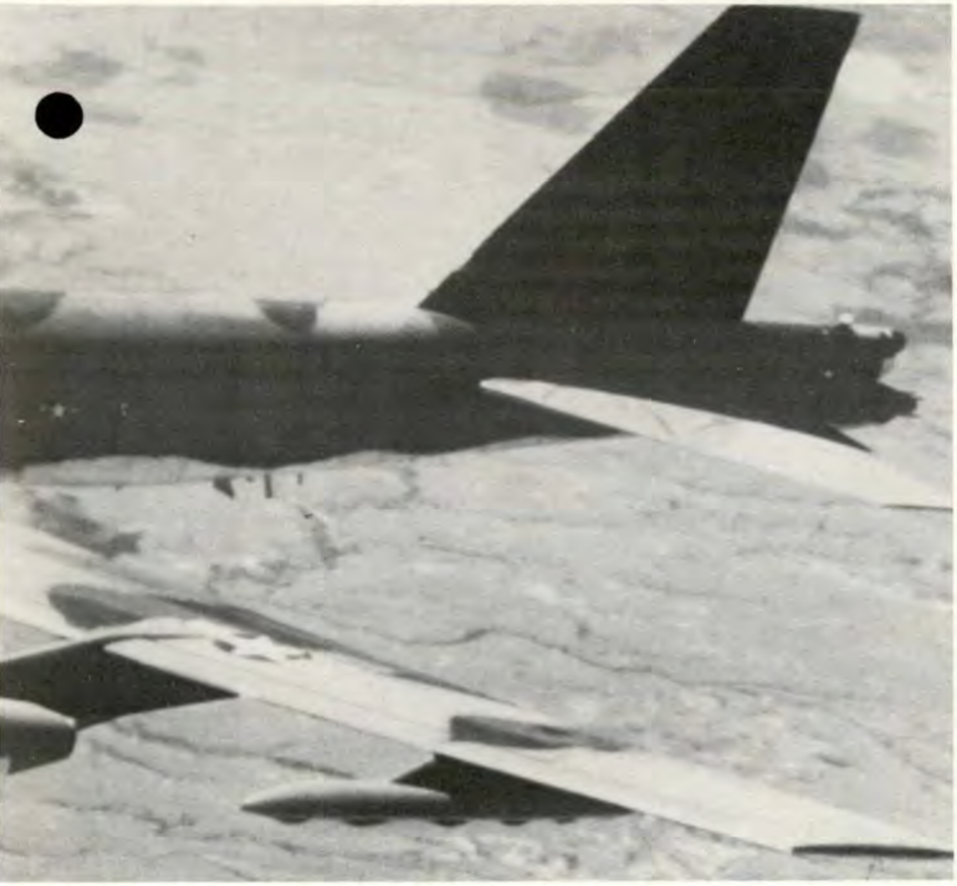
So, how did we do in FY89, and what will FY90 look like? The B-52 had one Class A mishap in FY89. The aircraft was destroyed for a 1.0 mishap rate. While there were major injuries in this sole mishap, no one was killed when an explosion in a fuel tank occurred shortly after liftoff during a touch and go.

What will the FY90 mishap rate be for the B-52? Examine figure 1 and come to your own conclusions.

Figure 1
B-52 Class A Flight Mishap Rates

Year	80	81	82	83	84	85	86	87*	88	89
Number	1	1	2	1	2	0	0	0	2	1
Rate	.77	.75	1.64	.95	1.92	0	0	0	2.04	1

NOTE: The B-52's lifetime rate, 1955-1989, is 1.32 overall.
* 1 Jan 87 to 30 Sep 87



We at the Air Force Inspection and Safety Center don't have the "school solution." But we do have challenges for you, the B-52 fliers and fixers.

- There are more planned and proposed modifications for the B-52 now than at any other time in its history.
- Anyone who even glances occasionally at the headlines can see world changes between East and West will have a profound impact on the missions B-52 crews could be asked—or not asked—to perform.
- All of these changes will have to be faced by an increasingly less experienced crew force.

B-52 10-Year Mishap Summary

Of the 10 mishaps, 4 were operations-related.

- Three of these four were controlled flight into terrain, or collision with the ground by flyable aircraft.
- Poor mission planning and deficiencies in supervisory review were common in all four.

The six remaining mishaps were logistics-related.

- Three of these six involved antiskid/brake problems.
- The other three involved significant maintenance malpractices.
- Two of these six mishaps began as parts failures but became Class A mishaps through significant operator mishandling of the resulting emergency situation.

"Ships are safe in the harbor, but that's not what ships are for." There's a lot of truth in that old naval saying. The *mission* comes first, and there's no such thing as zero risk, even in peacetime. Our joint challenge, yours and mine, is to find ways to accomplish the mission at an *acceptable* level of risk. It may be as simple as installing tiedowns for chocks in the 47 section or as complex as re-engining the aircraft. A strong AFLC and SAC team is working hard to maintain the B-52 as an effective weapons system. Its days of useful service to the Nation are far from over. ■

THE B-52'S FUTURE?

■ The B-52 is far from retirement, and planners are considering a variety of missions for the future. While some of these ideas will never leave the discussion phase, they serve to illustrate the tremendous confidence held for the B-52 weapon system.

Counter-air? How about 12 advanced medium range air-to-air missiles (AMRAAM), 6 under each wing, carried between the engine pods where the old forward-firing ALE-25 chaff rockets used to go?

Interdiction missions with a B-52? With the right missile–definitely. Something like the former Modular Standoff Weapon (MSOW) Program could deliver payloads ranging from CBUs to runway busters. HAVE NAP/AGM-130 and TACIT RAINBOW missiles could complement the weapons mix, permitting self-contained defense suppression and hard target kills as well.

Farfetched? Imagine the reactions one would have gotten in 1955 describing the SRAM missile or the Harpoon. However, both have been fielded on the B-52 quite successfully.

Those who want a good example of a serious study of these issues should contact the Superintendent of Documents, US GPO, Washington DC 20402, and ask for *Technologies for NATO's Follow-on Forces Attack Concept,* Report OTA-ISC-312.5. ■

C-5/C-141

MAJOR ROBERT D. VANDERHOEVEN
Directorate of Aerospace Safety

■ The men and women of the Military Airlift Command, the Air National Guard, and Air Force Reserve continued to diligently reduce the number of reportable flight mishaps experienced during FY89. While the C-5 fleet nearly equaled their record low of the previous year, the C-141 weapon systems recorded their best year ever (see figures). Regrettably, however, both weapon systems' impressive rates were marred by new Class A mishaps.

A review of the four categories for mishaps (i.e., operations, logistics, miscellaneous, and undetermined) reveals no alarming upward trends. Interestingly, there was a substantial reduction in C-141 physiological mishaps while C-5 physiological incidents appear to be on the increase.

Additionally, C-141 operations-

Figure 1
C-5 Mishaps (1980-1989)

Class	80	81	82	83	84	85	86	87*	88	89
A	1	0	1	2	0	0	1	0	0	1
B	3	1	2	2	2	1	0	1	0	0
C	26	20	31	28	24	25	18	16	15	17
HAP	23	15	14	18	16	19	8	18	10	8
Total	53	36	48	50	42	45	27	35	25	26

* 1 Jan 87 to 30 Sep 87

Class C-141 Mishaps (1980-89)

Class	80	81	82	83	84	85	86	87*	88	89
A	1	1	1	0	1	0	1	1	0	1
B	0	1	0	2	0	0	0	0	0	0
C	109	73	66	77	73	84	42	20	31	31
HAP	123	66	74	73	49	55	39	53	44	24
Total	233	141	141	152	123	139	82	74	75	56

*1 Jan 87 to 30 Sep 87

Figure 2
C-5 Mishaps by Category (1985-1989)

	CY85	CY86	FY87*	FY88	FY89
Operations					
Physiological	0	0	2	1	4
Jet Blast	0	1	1	1	0
Other	0	4	6	3	4
Total	0	5	9	5	8
Logistics					
Cargo Spills/Shift	4	3	4	3	1
Landing Gear	14	6	2	3	5
Engines	5	2	2	3	1
Flight Controls	3	3	4	3	1
Other	15	5	7	1	7
Total	41	19	19	13	15
Miscellaneous					
Bird Strikes	1	2	5	4	2
Weather	2	1	1	1	1
Other	1	0	1	2	0
Total	4	3	7	7	3

* 1 Jan 87 to 30 Sep 87

related mishaps reflect a drastic reduction for the 5-year period (1985-1989) as opposed to the relatively constant numbers experienced by the C-5 fleet during this same period of time.

While FY89 was characterized by a reduction in reportable flight mishaps, the period was not exempt from several serious safety concerns. Among these issues were C-5 A/B VHF command radio reception difficulties, C-5A low altitude radar altimeter and associated critical spares shortages, and C-141B wing cracks.


The C-141B Starlifter transport provides rapid long-range airlift. The Starlifter was the first jet aircraft designed to meet military needs for a troop and cargo carrier.

AN/ARC-186(V) Command Radio Reception

Frequent complaints from C-5 aircrew members regarding poor ground-to-air reception of the AN/ARC-186(V) VHF command radio prompted HQ MAC/IGFF to investigate the alleged discrepancies. The results of the study indicated there was a power loss occurring between the ARC 186 receiver-transmitter and the antenna. While those aircraft radios tested at Altus AFB, Oklahoma, showed a slight power loss, the Dover AFB, Delaware, C-5 fleet sustained a 50-percent output loss. Unfortunately, there is no empirical method to determine the amount of corresponding system reception degradation. However, the outcome of the survey from Altus AFB, Travis AFB, California, and Dover AFB C-5 aircraft radios corroborates aircrew allegations concerning the inadequacy of the AN/ARC-186(V) command radios within the European Theater. Consequently, there is concern the radio may not be capable of even attaining the 150-mile range as required by the design specifications and, thus, poses a definite operational hazard.

Even more baffling is the fact the previous VHF command radio (Wilcox 807A) did not experience reception problems and was only replaced due to its limited frequency capability (i.e., the radio was only capable of 50 KHZ spacing and not 25 KHZ).

Consequently, San Antonio-Air Logistics Center (SA-ALC) has begun an engineering study to compare the sensitivity of the Wilcox 807A VHF radio with that of the AN/ARC-186(V) radio, determine the limiting factors of the AN/ARC-186(V) radio when installed in the C-5, and establish corrective action(s) for any such discrepancies.

Additionally, HQ MAC/LGM is striving to ensure all continuity checks of the equipment are valid and reasonable, as well as ensuring avionics units in the field are maintaining the radios in accordance with manufacturers' specifications.

Figure 3
C-141 Mishaps by Category (1985-1989)

	CY85	CY86	FY87*	FY88	FY89
Operations					
Physiological	15	17	9	8	6
Jet Blast	0	0	0	1	0
Other	23	11	17	7	5
Total	38	28	26	16	11
Logistics					
Cargo Spills/Shift	12	11	9	10	7
Landing Gear	3	1	5	7	5
Engines	26	6	4	4	9
Flight Controls	12	8	18	22	8
Other	25	21	8	8	8
Total	78	47	44	51	37
Miscellaneous					
Bird Strikes	19	5	3	4	6
Weather	0	0	0	1	1
Other	4	2	1	3	2
Total	23	7	4	8	9

* 1 Jan 87 to 30 Sep 87

C-5A Low Altitude Radar Altimeter (LARA)/Critical Spares Shortage

There currently exists a shortage of C-5A LARAs, as well as critical spares for the equipment. The shortage is of such severity that on the average, there is only one functional radar altimeter installed

continued

in A-model aircraft. When operational necessity dictates, maintenance will attempt to provide the requisite systems. However, the shortage is further exacerbated by the fact the pilot position radar altimeter receiver-transmitter unit is not interchangeable with the copilot's.

The current shortage of the LARA system resulted from the planned procurement and retrofit of the C-5B combined altitude radar altimeter (CARA) in the C-5A aircraft. As a result, the LARA system support was terminated. This action was predicated on an expected quick retrofit schedule for the A-model aircraft. However, the burn-in procedure used to calibrate the CARA system prior to installation appears to be the bottleneck. When the procurement problem with the CARA system arose, the LARA system spares support had been dormant 1 year, and it would have taken approximately 1 year to regenerate the spares pipeline. Current plans call for the diversion of CARA systems from the C-130 and C-141 fleet so the C-5As can be retrofitted as soon as possible.

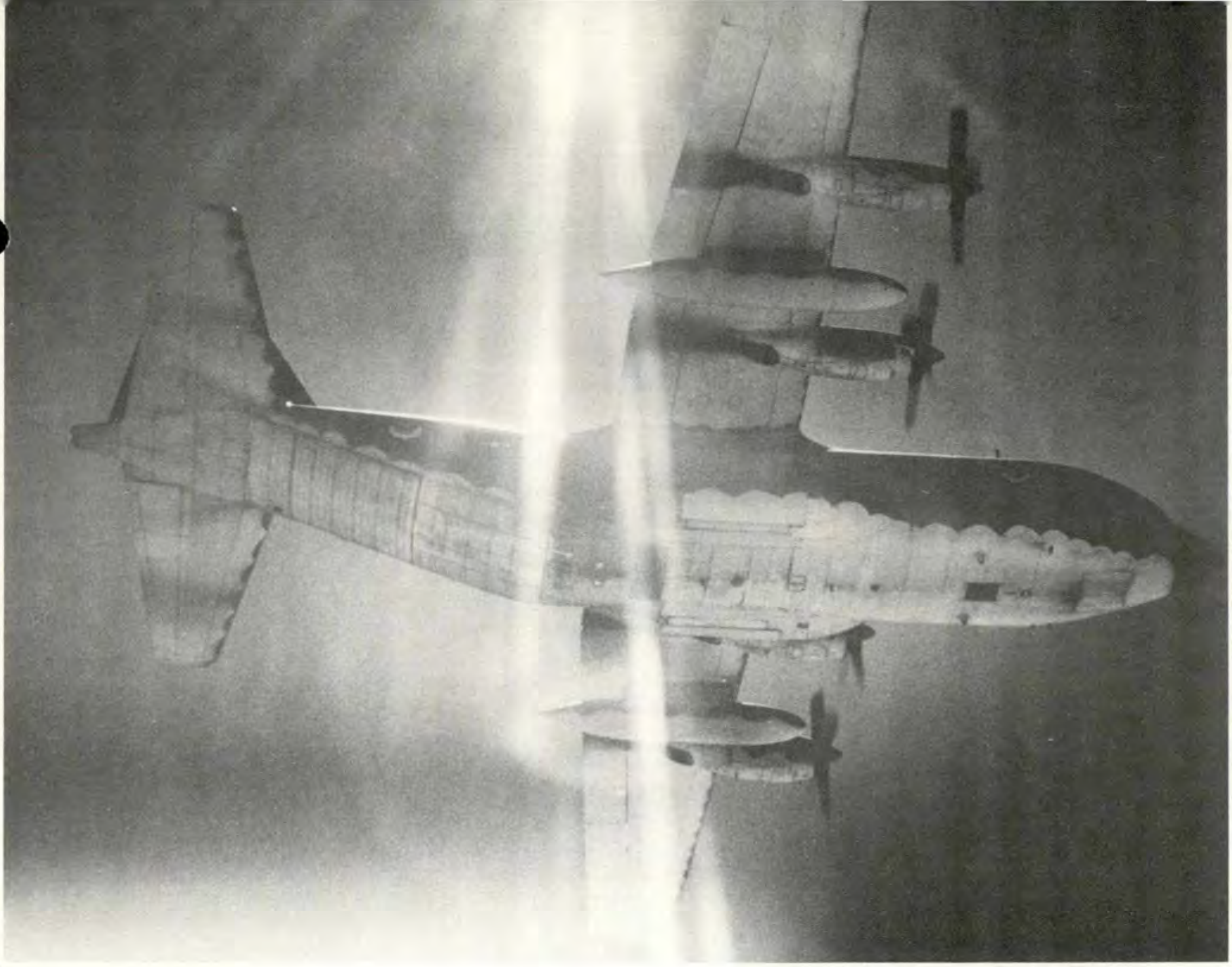
C-141 Wing Rear Spar Lower Beam Cap Cracks/Integral Riser Cracks

While performing routine depot maintenance on C-141 aircraft at Warner Robins Air Logistics Center, Georgia, cracks were found in several aircraft's wing trailing edge. The cracks, located at a beam joint between two wing sections, resulted from "classic stress fatigue" and were predictable in a fleet with an average age of 20 to 25 years. Of 270 aircraft, 18 were identified for immediate replacement of beam cap segments. To date, all 18 aircraft have either had the requisite work performed or are currently undergoing repair by Lockheed-Georgia Company or Warner Robins Air Logistics Center. Forty-one other aircraft will have a locally manufactured, field installed, underwing doubler strap attached until the permanent fix is installed during regular depot maintenance. Permanent repair speed lines are currently being negotiated with a modification completion date of December 1993.

The C-5 Galaxy's cargo compartment approximates the size of an eight-lane bowling alley.

The criticality of the C-141 wing structure problem was further exacerbated by the discovery that integral risers in C-141 inspar wing skins were cracking at weep holes, some through the skin thickness. These recently discovered cracks resulted from fatigue as was the case with the cracks found in the rear spar lower beam caps. To further compound the problem, these cracks are randomly distributed and, thus, are not predictable through any current fatigue analysis computer modeling. As a consequence, restrictions have been imposed on the entire C-141 fleet until each aircraft can be inspected and repaired as necessary. Proper corrective action for the riser cracks will include reaming, followed by "cold working" of the holes and subsequent sleeving of the newly enlarged holes with sealant to prevent corrosion. Such action should prevent any new cracks at the weep holes.

As a consequence of the combined efforts of aircraft and systems engineers, maintenance personnel and, of course, the aircraft operators, strategic airlift aircraft continue to enjoy unprecedented levels of flight safety. Only through the continued selfless efforts of all concerned can the current levels of unparalleled safety be sustained and ultimately improved. We, at AFISC, salute all those dedicated individuals who strive to protect our valuable national resources. ■



C-130

LT COLONEL MARK E. S. MAYHEW
Directorate of Aerospace Safety

■ It's hard to believe that another year has slipped into the record books, but as it has, it's time to review what happened in the C-130 fleet during its 35th year of service to the Air Force. In the next few pages, I'll cover the Herk's mishap statistics and some of the lessons available from those mishaps. Then we'll look at some of the programs to enhance the aircraft's performance and survivability well into the 21st century.

Class A Mishaps

The Free World's transport, the C-130, logged over 330,000 Air Force flying hours this year to raise its total to 12,000,000. That translates to a Class A rate of 0.30, the lowest since 1983, when we also lost one aircraft. Since the first loss back in 1955, we've had 134 Class A flight mishaps, bringing the lifetime Class A rate to 1.12. Figure 1 shows a 10-year history.

While not shown on the 10-year history, it's interesting to note things have been considerably worse for the C-130. In 1967, '68, and '69, there were 16, 13, and 11 Class A's. Remember, we don't count combat losses in those numbers. This year, the one Class A happened on a heavy equipment delivery where the load failed to extract and the aircraft forced landed, fatally injuring one crewmember, severely injuring another, and destroying the airplane.

When we look at the sequence of events and their consequences, a number of factors stand out. The crew had not been able to drop on their first pass over the drop zone. They completed the drop checklist and started a short racetrack pattern for a second attempt. All crew actions were on a very compressed basis.

Once the two, 28-foot extraction parachutes inflated and the load failed to extract, a second series of events brought to light critical facts. Although operations manuals said the aircraft should have been able to fly to a landing field, it appears that was not the case. With the

continued

Figure 1
C-130 Class A 10-Year Summary

	80	81	82	83	84	85	86	87	88	89
Number	2	4	2	1	3	3	2	1	2	1
Rate	.56	1.09	.53	.27	.80	.79	.54	.36	.59	.30

The versatile C-130 can carry a complete range of cargo types. Due to the many configurations, tanks, troops, patients, supplies, and materiel are routine.

chutes deployed, the thrust required increases significantly as airspeed increases to the point where drag exceeds the thrust available.

Load planning documents also lead folks to believe two chutes are necessary to assure a successful extraction. This calculation process will be looked into further. Since the need to do these types of deliveries with the C-130 still exists, the possibility of a parachute jettison system will be explored. Finally, operations manuals will be reviewed to ensure they adequately address proper crew actions and flight characteristics with extraction chutes deployed.

Class C and HAP Mishaps

You know how you feel when you say something and fear, having said it, the situation will change? So it is with reluctance I once again say in FY89, there were no Class B flight mishaps. Keep it up. The most notable Class C and HAP mishaps were in 3/4 engine power loss, liferaft deployments, bird strikes, and physiological incidents.

Four-Engine Power Loss After 2 years of increases, four-engine power loss mishaps are on the decline. This, in large part, is due to the efforts of the system program manager and staff at WR-ALC. Their program will eventually see the installation of the solid-state synchrophaser to replace the older tube type, as well as developing better maintenance for the aircraft generators. Their interim fix to install constant voltage regulators has been a great help to reduce the number and severity of this type of mishap.

Inadvertent Liferaft Deployments Hopefully, we reached a peak in FY89 as the new filler valve, developed through the direction of San Antonio ALC, is able to be installed. The installation was delayed due to procurement problems. With the final installation of these assemblies, a significant potential hazard to the aircraft and crew, as well as to those on the ground, will be alleviated.

Bird Strikes It was a bad year for birds. The good news is base BASH programs are doing a great job to lower the threat of bird strikes in the traffic pattern. The bad news is with more low-level and night flying, we heavies are finding what the fighters have known for years—the area close to the ground is also a working area for a great many birds. The BASH team's bird avoidance models are made to help planners determine the risk of a bird encounter at a given time and altitude. Don't forget about them when you're planning local or deployed exercises.

The reliable C-130 can carry more than 42,000 pounds of cargo. It has proven to be the most adaptable aircraft design since the classic C-47. Probably no other US Air Force aircraft has been used in more different ways, over such distances, and in every climatic extreme.

Physiological and In-Flight Injury The numbers listed in figure 2 are the number of events, not the number of people involved. A quantity were due to decompression. There are the same disturbing reports of aircrew members flying with a known problem only to have it translate into an incident on down the road. Of greatest concern is the number of crewmembers being injured during normal mission profiles. At least in the last few years, where part of the crew survives or if there are only minor injuries, the folks in the back of the aircraft are most likely to receive those injuries. Sometimes it's due to unexpected turbulence. But there have been too many cases where the front end didn't give the back end warning of a maneuver and caused something or someone to fall, causing injuries ranging up to fatal. Loadmasters and flight deck crews must maintain intercom communications to reduce this number.

Figure 2

C-130 Flight Mishap Summary

Category	1986	1987	1988	1989
Class A	2	1	2	1
Rate/100,000 hours	.54	.36	.59	.30
Destroyed	2	1	1	1
Fatalities	14	5	6	1
Class B	0	3	0	0
Rate/100,000 hours	0	1.1	0	0
Class C and HAP	134	127	148	152
Significant areas				
Bird Strikes	9	1	3	10
FOD	5	2	4	4
Physiological/Injury	21	19	18	37
Lightning Strikes	13	1	10	7
Foam Fire	4	7	1	6
2 Engine Shutdown	5	2	2	2
Flight Control Malfunction	4	5	3	2
3 or 4 Engine Power Loss	3	13	18	13
Inadvertent Liferaft Dep	0	4	5	19

System Improvements

Over the next many years, the old Hercules will see a number of exciting improvements. Some of these include electrical system upgrade, autopilot/ground collision avoidance system (GCAS), and the self-contained navigation system. As we have proceeded with modifications which introduced or modified the C-130 with more computer components, it became increasingly clear the existing electrical supply and switching system was inadequate. The four-engine power loss malfunctions further highlighted the need to look at what direction would need to be taken to keep the electrical system capable of responding to the additional and more technologically advanced subsystems. Currently, WR-ALC is developing different possible approaches to increase the load capacity of the electrical system, redundancies, switching speed, and reliability.

Another valuable modification will be the replacement of the existing autopilot with a version of the digital autopilot used on the B-52 and KC-135s. The package will include a GCAS that should help reduce controlled-flight-into-terrain mishaps. With a number of the initial bugs worked out of the systems, it appears they are ready to go to production installation. Fortunately, the approach on all of these issues has been one of careful ex- amination of the possible risks and of ensuring those risks are minimized before proceeding.

The Future

The future of the C-130 will be affected by the same forces that, in this era, affect the entire gamut of

continued

In the history of flight, the C-130's safety record has always been remarkable, especially when you consider the tasks demanded of this workhorse—from gunship to fire retardant drops, to low level pallet extraction, paratroop deployment, search and rescue, and much more.

military issues. The economic pressures may impact both the loss of experienced personnel and the availability of dollars for training and equipment. For us, this means we will have to get the most from the experienced people who remain and to do our best to prevent losing any of the precious nonreplaceable resources.

One idea—remember when we were first getting checked out and those captains and master sergeants who had been in the war taught us how to keep from busting our butts? Well, that teaching has to occur on every mission regardless if we are a brandnew aircraft commander, a high-time flight engineer, or an old-head navigator. Every crewmember is an instructor. That doesn't mean to let someone go too far or perform maneuvers which aren't authorized. No, what it means is to challenge new folks' knowledge. Try to show them how you make decisions. In short, try to share experiences, not just war stories, on how to deal with a crew; how to decipher the maintenance explanation about why the airplane's okay to fly; how to understand why the Ops officer is breathing down your neck to get off on time; or how to divert when the weather is closing in on your destination.

If there is the opportunity to just shoot the breeze, how about sharing the limits you've set for yourself for decision making? For example, let's say you've been trying to get a training mission off for 4 or 5 hours, and the airplane is still broken. So, you change birds and you need to preflight this one. You find a problem, and the weather is starting to get worse. There's still a few hours on your crew duty day window, but on your way to base ops to file, you take a wrong turn in your car because you were daydreaming. Is that a danger sign you're slipping? How do you know when to call it quits? What are your *personal* limits?

How about if a crewmember arrives late to the briefing and reduces your chances for an on-time takeoff. There you are, ready to start engines. You'll brief the crew and check the forms again when airborne. After all, you have to get in the air on time. During the checklist, you realize an item was missed. Is this a danger sign?

Or, what if you have to divert into a base with marginal weather. Are there parts of your approach briefing you do differently? Do you ask the crew to give any additional inputs to the briefing or during the approach? Are you really prepared to do a missed approach at decision height? Are there any visual illusions which may be present on final? In addition to altitude calls, have you established maximum airspeed, rate of descent, and course deviation calls for other crewmembers to watch and help you out? Just as important, have you established an atmosphere where inputs to action are expected and accepted professionally?

What does all this have to do with the future of the C-130? The mishaps we classify as logistics are way down, while those involving human factors are not decreasing. For us to say human factors cause a lot of mishaps isn't a news flash. What we all have to do is to be sensitive to potential hazards, maybe even in ourselves, and know how to use that information to avoid a mishap. To tell someone not to be complacent or not to fly if they're not really up to it doesn't help them recognize complacency or the little clues that all may not be well within.

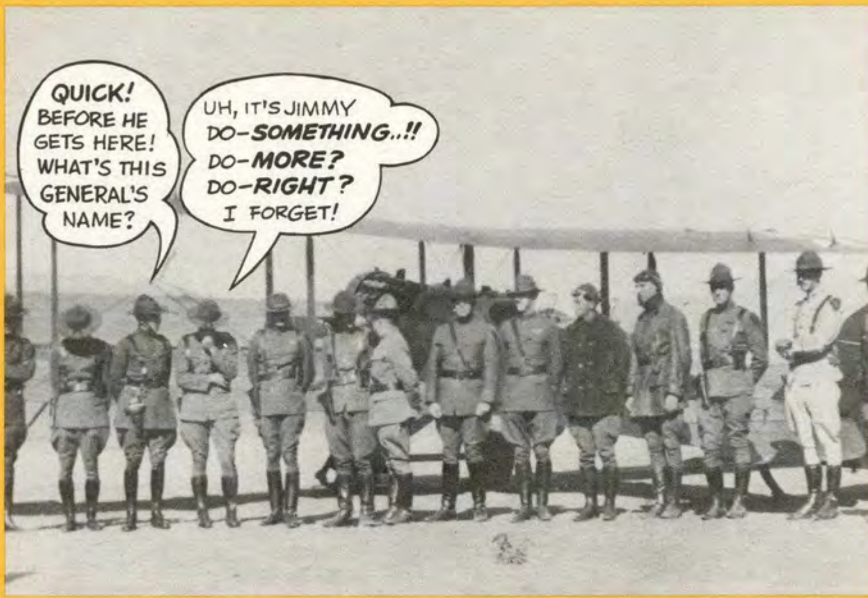
Good luck in 1990. Let us know how you recognized the threat or hazard, analyzed the risk, and made sure you got the job done in the safest practical way. We'll pass on your good words. ■

C-130s have flown to crisis areas around the world to deliver food, clothing, shelter, and medical personnel and supplies; and to fly victims out of disaster areas. Some Air National Guard and Air Force Reserve C-130s are equipped to combat forest fires.

Once Again, Thanks for Your Support!

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

Chuck Woodside
SA-ALC/LGMW
Kelly AFB, Texas



We once again learned many of you are "dumb humor" experts. Our panel had fun selecting the top captions. After much deliberation, they chose the winner — our congratulations to Chuck Woodside. (You're our first two-time winner, Chuck.) We tried to come up with a cheaper and smaller prize in your honor but couldn't, so, your prize is in the mail! If you win a third time, it would mean we would retire the trophy.

Fortunately, we don't have a trophy, only a cheap little prize. So have at it, Chuck, and start a cheap little collection.

And if any of you other readers want to try to start your own collection, check out our back cover to see how you can enter our latest contest and beat our dumb caption experts.

Honorable Mentions

1. And whoever pulls the short straw gets to fly it!
Sgt Christine Tomczak, 83 FWS, Tyndall AFB, Florida

2."What do you mean, 'The rubberband broke'?"
Maj Art Box, HQ AFISC/SEPX, Norton AFB, California

Even though the following was sent to us after the cutoff date, we appreciate the interest, enthusiasm, and support shown by Kevin Hart. He is a true dumb caption genius. (Just don't tell our professional dumb caption writers we said so. Their feelings are very delicately balanced.)

Dear Editor

I am in the U.S. Navy stationed with VQ-3 (Tacamopac) in Barbers Point, Hawaii, as a flight engineer on the E6-A aircraft. Being that I'm USN and your magazine is primarily USAF, copies of the *Flying Safety* magazine are hard to come by in my command. (We have *Approach*, the naval aviation safety review magazine.) I just recently found a copy of your November 1989 issue and thought it would be fun to submit an entry.

Kevin S. Hart
VQ-3 Flight Engineer
NAS Barbers Point, Hawaii 96862

Kevin's entry is printed at the right, Thanks, Navy, Ed.

C/KC-135

MAJOR JAMES L. WALL
Directorate of Aerospace Safety

■ The first C-135s are now 33 years old, and the total fleet as of 1 October 1989 has flown 9.4 million hours. During these 33 years, the C-135 has been involved in 72 flight Class A mishaps which have claimed the lives of many individuals. Unfortunately, three of these mishaps occurred during FY89.

Of the 808 C-135 aircraft produced for the USAF, 734 are still available and are currently being used by 9 major commands, NASA, and the Navy. Figure 1 shows an analysis of the mishap rates for the last 10 years. Comparing these numbers with figure 2 will give you an idea of how the C-135 compares with other current aircraft and their mishap rates.

It should not surprise anyone that most of the C-135 Class A mishaps have occurred during critical phases of flight. Specifically, 27 during takeoff, 13 during air refueling, and 20 during landing. Since we know where most of the mishaps occur (looking at cause factors gives us an idea of why they occur), we now possess some knowledge of how to prevent some of the mishaps. Here are a couple of suggestions that might keep you and your crew from being one of my statistics.

First, be prepared! If you lose an engine on takeoff and you're committed to continue, your first actions can't be to brief the crew on their duties. They and you, the aircraft commander, must know what to do ahead of time. This means you must brief the crew and they must understand what is expected of them. The best time to do this is during mission planning. But when was the last time you had a crew simulator? That's right—all four of you in the same box at the same time. This way, the nav and boom get to see what your actions are,

Figure 1
KC-135 Mishap Rate Analysis

	80	81	82	83	84	85	86	87*	88	89
Mishaps	1	3	2	0	0	2	1	2	0	3
Rate	.39	1.16	.77	0	0	.77	.39	.79	0	1.14

* 1 Jan 87 to 30 Sep 87

Figure 2
Other Current Aircraft Mishap Rates

Aircraft	80	81	82	83	84	85	86	87*	88	89
C-141	.36	.34	.35	0	.35	0	.35	.45	0	.36
C-130	.56	1.09	.53	.27	.80	.79	.54	.36	.59	.30
B-52	.77	.75	1.64	.95	1.92	0	0	0	2.04	.93

* 1 Jan 87 to 30 Sep 87

and they get to visually see what the engine indications will look like for loss of water or loss of an engine.

Second, follow what the FD-109 is telling you. (In other words, don't overrotate the aircraft.) That's why it was put into the aircraft—because of all the overrotations and mishaps which occurred when the C-135 was new.

Third, develop and use a crew concept. AFISC has been advocating this approach which is called Cockpit Resource Management (CRM). The airlines have been using this concept for several years, and it's a proven way to help prevent mishaps. Crewmembers should be getting information on this concept in the near future.

For CRM to work, two very important principles must come together. First, the crew must be willing to talk to the pilot when they feel something is going wrong. Second, and most important, the pilot must be responsive to the crew's input. When you see the pilot has gone below an assigned altitude or the VVI is pegged on final approach, don't be afraid to say something. Other crewmembers in the past didn't, and they're not around anymore to speak up. This is especially true with a young AC or with a highly experienced AC and an inexperienced crew. Historically, C-135 mishaps have occurred when a young pilot continues an approach that should have been taken around or when an experienced pilot knowingly violates some directive or flight rule.

Finally, watch out for changes — that is, changes within the crew, aircraft, or mission. Recently, several of the safety officers at AFISC had their own hangar flying session. One of the most striking realizations was many mishaps occur after something in the above three categories was changed.

Commanders need to ask themselves these questions after a change:

- Did the substitute crewmember get thoroughly briefed on the mission?
- How far behind will it put the crew if they change aircraft now, and is the new aircraft ready for this mission?
- Did all the mission changes get briefed and approved by the proper authority?
- Is the spare crew really ready to fly?

If the answer to any of these is "No," the potential of your crew having a mishap just increased.

Figure 3
A Comparison of Four Mishap Catagories

Category	CY86	FY87*	FY88	FY89
Air Refueling	18	16	13	12
Bird Strikes	14	11	10	13
Engines	17	7	23	19
Physiological	23	26	16	18

* 1 Jan 87 to 30 Sep 87

Class C Mishaps

FY89 seemed to be a typical year for Class C mishaps. Again, mishaps involving engines, including engine FOD, had the highest number. Figure 3 shows a comparison of four major categories of mishaps during the past 4 years.

Modification and Modernization

The C-135 fleet continues to modernize—but slowly. The most significant mod, considering dollar costs ($12.5 billion), is the re-engining of the J-57 with the CFM-56 engines. Already, 168 aircraft have been completed. Estimated total completion date is FY99 - FY02 time frame, with three to four aircraft being modernized monthly.

The new digital autopilot has been installed on 59 aircraft. Unfortunately, it doesn't work quite right. The fix will be an internal design change which should be taking place at this time.

Two upcoming proposed mods are the rewiring and the avionics modernization program (AMP). Phase one of rewiring will consist of replacing wiring to 26 mission essential/flight safety systems. The ultimate goal will be the complete replacement of all C-135 wiring. Estimated start date will be FY91. The SAC proposed AMP would replace 10 major aircraft systems which, in turn, would not only increase aircraft reliability but decrease maintenance man-hour-per-flying-hour cost by 50 percent.

One modification AFISC and several mishap boards have advocated is the installation of a ground collision avoidance system (GCAS) in the C-135. Initial flight testing has just been completed, and installation is expected to begin in FY91. At this time, there is no stall warning incorporated into this GCAS modification.

Although there has already been one flight mishap and one ground mishap in FY90, the challenge is to make the rest of the year a mishap-free year. As the C-135 gets older, and the crews younger, there will be the continued pressure to prevent operations-caused mishaps. Only through hard work and keeping a professional attitude can we expect to reduce last year's high mishap rate. ■

KC-10

MAJOR JAMES L. WALL
Directorate of Aerospace Safety

■ During FY89, the KC-10 fleet added another 47,350 hours, giving this aircraft almost 220,000 Class A mishap-free hours. No Class B mishaps were reported during the previous year, and Class C/HAP mishaps were only a little higher than previous years. The figure gives an exact comparison of FY89 mishaps in four common categories with the previous 3 years.

As an invited observer to the Sioux City, Iowa, DC-10 mishap, I was able to observe, firsthand, what all of us in the Air Force hope never happens to a KC-10. This mishap was apparently caused by the failure of the no. 2 engine disk. This failure occurred due to a metallurgic flaw which occurred during the manufacturing process.

Unlike the double-melt CFM6-6, DC-10 engine, the KC-10 engines have triple-melt disks. In normal English, this means the material goes through an additional melting process to cleanse impurities. There has not been a single known problem with the current KC-10 engine disks. McDonnell Douglas is in the process of initiating steps to ensure the total aircraft hydraulic quantities can't be depleted from a similar-type mishap. The proposed modifications will entail placing a shutoff valve within the no. 3 hydraulic system. If the level of fluid drops, that valve will close to prevent the loss of the entire system.

Recently, one of our KC-10s had a close encounter of the worst kind. This one occurred with another aircraft at FL350. Although there was no damage to the KC-10, a few of the other aircraft's passengers and stewardess received minor injuries. The incident is still being investigated by the NTSB. An important point to emphasize is this is at least the twelfth near miss between a military aircraft and a civilian air carrier that occurred above FL240 within the last 5 years. If you believe ATC will always take care of you and warn you about other traffic in the positive control airspace (PCA), you may someday be as surprised as the pilots of this KC-10. Malfunctions within the system and air traffic control errors are still possible. Don't be lulled into a false sense of security once you get into the PCA.

During the most recent KC-10 system safety group meeting, there was a discussion of the exact definition of an engine cycle. Many in attendance were unaware of the numerous throttle movements which occur on a typical flight and are never tracked or recorded. One KC-10 base may soon be required to keep track of large throttle movements, such as those occurring on a low approach—which, incidentally, is not currently considered an engine cycle. Maintenance is discovering certain engine parts are wearing out before their normal, civilian cycle times.

Specifically, the KC-10's engine-driven fuel pumps were wearing out at one-third the time of their counterpart in the DC-10. The problem was tracked to the internal use of JP-7 fuel. The current proposal will be to limit the use of this fuel and to change out the existing pumps.

The KC-10 crews are required to operate from locations that not only stretch the reins of command but also require the crew to carefully assess their present situation to ensure the safest possible completed mission. Obviously, you have been successful! The KC-10 community has produced another excellent safety record while operating under some austere conditions. The challenge of keeping the KC-10's mishap-free record intact is up to each and every one of you. Make 1990 another mishap-free year. ■

A Comparison of KC-10 Mishaps

Category	CY86	FY87*	FY88	FY89
Air Refueling	7	2	4	6
Bird Strikes	1	1	1	2
Cargo	0	2	2	1
Engine	0	1	3	5

* 1 Jan 87 to 30 Sep 87

MAJOR JOSEPH J. POUNDER III
Directorate of Aerospace Safety

HELICOPTERS

■ FY89 was a good news and bad news year. The good news was the Class C and high accident potential (HAP) mishaps were down by 52 percent. The bad news was we saw Class A mishaps increase by 200 percent. The FY89 mishap experience by aircraft and category is shown in figure 1.

Class A Mishaps

Two of the mishaps were operations related, while the other was logistics related. One of the ops-related mishaps involved a formation of MH-53Js. The mishap formation departed on a routine night two-ship training extraction mission. On formation approach to an unsurveyed LZ, both aircraft encountered brownout conditions due to blowing dust from rotor downwash. No. 2 executed a go-around. On his second approach, no. 2 inadvertently contacted a wooden electric pole, resulting in loss of control and subsequent ground contact. Three crewmembers were injured.

The logistics mishap involved a CH-3E. The mishap aircraft was no. 2 in a two-ship formation, night vision goggle training sortie. Approximately 15 minutes after takeoff, the black main rotor blade tip assembly separated and struck the tail rotor system. The crew completed the critical action procedures for tail rotor drive failure. During autorotation, the white main rotor blade sleeve retention nut failed, and the blade separated. The tail pylon separated, and the aircraft uncontrollably pitched forward. The aircraft impacted the ground fatally injuring all 15 people.

The other ops-related mishap occurred while an HH-3E was practicing night water hoist approaches. This was an initial instructor pilot evaluation without the pilot or copilot being qualified in the maneuver. The crew was performing their third approach when, at 100 feet AWL, neither the pilot nor copilot detected an increasing rate of descent and rear-

continued

Figure 1
Class of Mishap by Helicopter Type

	A	B	C	HAP
H-1	0	0	7	5
H-3	2	0	5	2
H-53	1	0	10	6
H-60	0	0	2	0
Total	3	0	24	13

Helicopters

continued

ward drift. When the evaluator pilot called for a go-around, it was too late to prevent water impact. Three crewmembers drowned. Helicopter emergency egress devices (HEED) were not available.

Class C and HAP Mishaps

Now, back to the good news. There was a dramatic decrease in Class C and HAP mishaps reported in FY89. There are some who will say this was due to a decrease in flying hours. Not true! We dropped only 6,000 hours, from 67,974 in FY88 to 62,081 for FY89. That's less than 9 percent. Judging by the number of MDRs received, the logistics folks are giving us a better product, and our maintenance folks are finding and fixing problems before we ever get airborne. They get a pat on the back. Figure 2 offers a breakdown of the FY89 mishaps.

Since 1977, we have lost the equivalent of over two wings of aircraft just due to collision with the ground. Our commands simply cannot afford to accept these numbers of preventable losses. ■

Figure 2
Helicopter Mishaps by Category

	H-1	H-3	H-53	H-60
Engines	3	5	3	0
Fuel	0	0	2	0
Rotor	1	1	3	0
Drive	3	0	0	0
Flt Control	1	0	0	0
FOD	0	0	1	0
Aircrew	3	1	5	2
Misc	1	0	2	0
Total	12	7	16	2

FSO's CORNER

The Real There-I-Was Story

CAPTAIN DALE T. PIERCE
919th Special Operations Group
Duke Field, Florida

■ **Yesterday, I received a very professional telephone call from Navy Lt Ward Carroll. He's the editor of the Navy's *Approach* magazine. He read the September FSO's Corner article and called to express concern it contained some information that was not exactly in sync with reality.**

Since it is my intent to convey accurately portrayed flight safety program ideas, I, too, was concerned and welcomed his information. In this article, I want to accurately describe the Navy's "There I Was" program (which is even better than the version described in the September FSO's Corner).

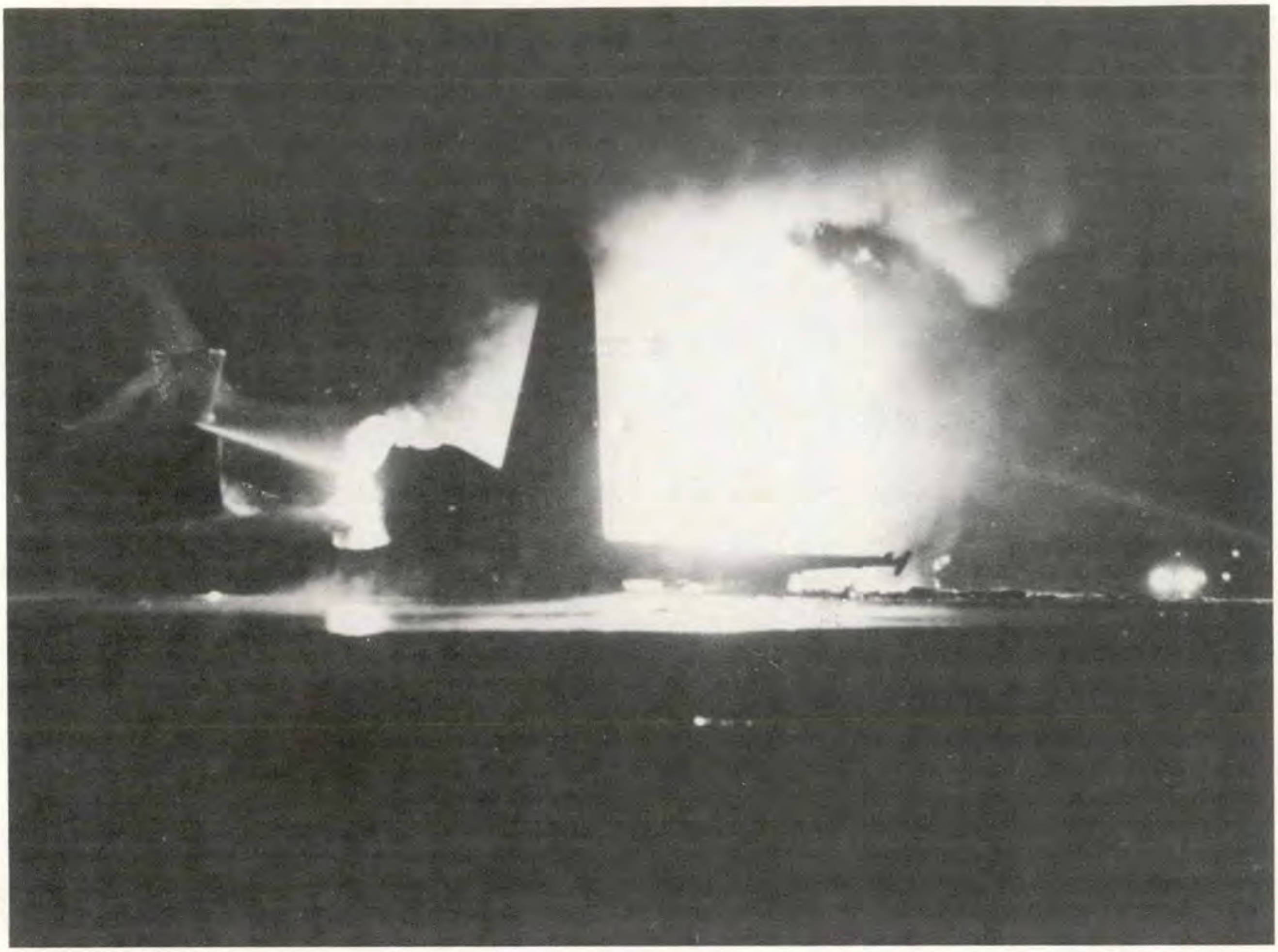
Unlike the good luck experienced by the commander in the September issue, Lt Carroll has received few usable articles from organizations holding command-sponsored, forced writing sessions. While such sessions have occurred in the Navy, Lt Carroll tries to discourage their use.

What does work well in the Navy is a different type of command-sponsored writing. Some organizations, such as VA-95 and VA-27 (A-6s and A-7s, respectively), encourage writing There-I-Was stories whenever something goes wrong in the cockpit. It's a semiformal part of their flight safety programs. It helps the flier think through the experience and develop ways to avoid reliving it. It also works a little like writing to the Aviation Safety Reporting System (ASRS) as a civil pilot. The writers are seldom penalized by commanders for their errors when they write to *Approach* magazine, and the individuals are recognized for their efforts to help others to avoid the same trap.

Some Navy organizations are very proud of their writing programs, and Lt Carroll receives an average of 15 unsolicited articles each week, 80 percent of which are in the There-I-Was style.

The Air Force flight safety programs could take a giant step forward if each FSO would establish a similar program for each wing and squadron.

What are you doing in your program which could help other FSOs if they knew about it? If you know of something worthwhile, call me (Dale Pierce) at AUTOVON 872-2235 (USAFTAWC), or send a short note to 919 SOG/SEF, Duke Field, Florida 32542-6005. ■



IN THE STILL OF THE NIGHT

LT COLONEL MARK E. S. MAYHEW
Directorate of Aerospace Safety

■ Recently, there's been a flood of information about human factors and how they affect mishaps. While it's awfully hard to change people, we can train both the operators and maintainers of our weapons systems, as well as their supervisors, to recognize a hazardous situation, evaluate the risk and the payoff, and make the right decision.

The Threat

In the following article, I'm going to look at three transport mishaps that took place in one of the most challenging flight environments—night. Add marginal weather conditions, and the mishap potential is high. In fact, over the last 10 years, the USAF has experienced 106 night mishaps.

Although there are probably a lot of reasons why flying at night increases the risk, we can't escape at least two human limitations. One, our eyes don't function as well at night or in the weather. Second, since we normally sleep at night, night flying can throw our body's rhythms off. With these two limitations in mind, we have to overcome some classic night flying challenges: Visual illusions, fatigue, and visual deprivation (black hole and loss of depth perception) to name a few. Thorough planning and mission briefing; developing crew coordination to maximize situational awareness and crew involvement; educating crewmembers about the possible hazards and how to recognize their presence; and, finally, establishing personal criteria may help us to question if all is well.

Approach Lights in Sight . . .

We pick up our first example more than 4 hours into the mission with the crew starting a night PAR into a base whose runway environment was partially obscured by fog. Complicating the situation, the approach lighting on short final was irregular due to the existence of a river running 90 degrees to the approach path. The runway approach lights and runway edge lights were visible to the crew from at least 12 miles out until well into the approach. On short final, the visual picture changed dramatically as the aircraft flew into the fog. Suddenly, out of the murk, what appeared to be a wall materialized in front of them. Seconds later, they

continued

In the still of the night

continued

felt the impact. This visual illusion has been documented. Unfortunately, the results of not recognizing the hazard are also a matter of statistics.

AFM 51-37, Instrument Flying, states: "When a pilot enters a fog bank from above, if he has initially been able to see the approach lights, his visual cues will disappear as he enters the fog. The loss of these cues will often induce the illusion or sensation of climbing. These situations of erroneous cues, convincing the pilot the aircraft is above normal glidepath, generally result in a pushover reaction, an increased rate of descent, and a short or hard landing."

The other visual illusion affecting this crew occurs if pilots lose their aimpoint due to poor visibility. They tend to put the available visual horizon in the "aimpoint" position on the windscreen. The result is a lowering of the glidepath and a landing short of the runway. In this case, the crew did lose visual cues on short final. There was no overrun, and the aircraft impacted 350 feet short, breaking off the tail section and fatally injuring nine of the people on board. The rest of the aircraft slid 500 feet down the runway and turned 180 degrees before coming to a stop.

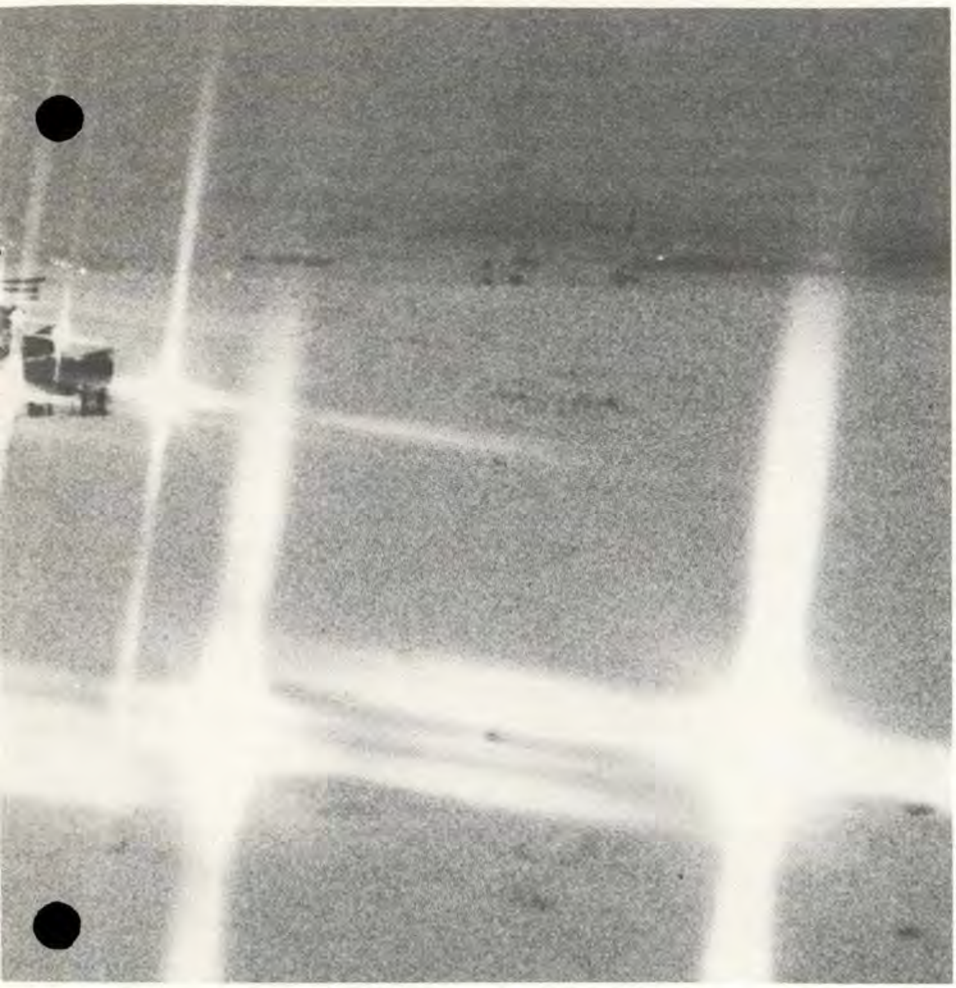
Why didn't the crew know about the lighting configuration? Was the crew aware of all the problems associated with low visibility landings? Why wasn't altitude being monitored to avoid an unrecoverable situation? And finally, why, when the visual cues started to break down, didn't someone on the crew call or initiate a go-around?

One can perhaps cite aircrew proficiency in night instrument approaches, training deficiencies, or visual illusions. Likewise, adequate preplanning to include a complete study (as though your life depended on it) of the runway environment, lighting, and terrain comes into play. Additionally, aircrew coordination (an active leadership function of the aircraft commander to use every crewmember as a resource to ensure mission accomplishment) is essential.

"Say Current Altimeter, Please"

Our next example involves an airlift crew making an airborne radar approach (ARA) to a remote landing zone—at night. While the crew had briefed the approach, some crewmembers weren't sure of their duties or responsibilities. The maps used for the ARA did not provide adequate information. Prior to starting their descent into a "black hole," where the absence of outside references does not provide sufficient peripheral visual cues to make an accurate glide slope or slant range estimation, the crew did not update the current altimeter setting. This caused them to be 120 to 190 feet lower than they thought.

Even though a crewmember made a 200-AGL call at about the 2-mile point, no one on the crew realized maybe they were too low, too soon, and probably ought to go around. After the 200-AGL call, no further distance-to-go calls were made. The pilot had to rely on extremely confusing visual cues to perform a maneuver he had not done for almost 4 months. During all of this, there was constant radio chatter, causing confusion whether the runway was clear and whether the mishap crew had received landing clearance. When a 100-AGL call was made, a crewmember looked out the window, saw the ground, and alerted the crew shortly before ground impact, well short of the intended landing zone. Once again, the aircraft was destroyed causing seven fatalities.



patchy fog. What do you do? How do you change the way you use the crew or fly the approach? If you're not the aircraft commander and you hear a radio call the fog is too bad for landing, what goes through your mind? Do you say to yourself, "I sure hope the AC makes the right decision," or do you try to figure out how you can best help if he or she decides to continue?

Well, the crew did continue. By the time they arrived, the remote location of the airport and the fog set up a "black hole" situation. As they started their descent, the increasing fog caused the approach lights to appear dim. Along with the narrow runway, the dimming approach lights caused the crew to feel they were high and climbing away from the runway. The natural reaction to this perception would be to lower the nose to get the right "picture." What about a go-around because you realize you're too low or the descent rate you've set up exceeds some personal standard you've predetermined? Unfortunately, this crew went with the illusion and landed 1,300 feet short of the runway doing Class A damage to the aircraft.

In this instance, there were a number of warnings which went unnoticed until one reviews the sequence of events. First, nothing, absolutely nothing, can replace proficiency in a mission or maneuver when we are trying to prevent mishaps. A number of errors can be directly attributable to a lack of event, or overall, proficiency.

Task saturation, pressing, mission stress, overcommitment, distraction, channelized attention, and even apparent complacency may be present in a crew of limited proficiency. Ill-defined crew tasks, either by crew commander or higher-level supervision, can set the stage for crewmember inaction which has been a common factor in a number of mishaps. Assuming the crew lives, statements like, "I didn't know I was supposed to do that," "I don't have time to do everything," or "He never asked me to monitor that" are often reported. Planning without the appropriate charts available, for whatever reason, deprives the crew of critical tools to make time-critical decisions.

You Have the Aircraft

Finally, let's imagine it's the middle of the night, you're the crew on the third aircraft inbound into an airfield with strange approach lighting, a runway half as wide as the one you last landed at, no precision approach available, and the VOR NOTAMed out. No problem—the weather's supposed to be good except for some patchy fog. So, you complete the normal approach briefing and prepare for landing.

Did you mention the part about the width of the runway being half as wide and the visual illusion that might cause? Before you start the approach, the crew from the preceding aircraft calls you and recommends you not land because of the

Our Mission and Yours

Safety investigations are not just to determine what happened but also to try to identify the basic reason "why" it happened. Having determined the "why's" and then spread the word, we hope that you, recognizing a similar situation in yourself, your mission, or your people, will be able to make a decision which may avoid a repeat mishap.

During almost every safety briefing, we've heard safety officers brief lessons learned. Because it seems they are not being "learned," but simply heard, maybe we should call them "lessons available." That doesn't mean learning the lessons is optional. On the contrary, all of us must learn the lessons available from the investigated errors of others. Those lessons must be part of the way we do business every day, every mission. If not, one of us may provide material for reiterating lessons learned. ■

IFC APPROACH

By the USAF Instrument Flight Center, Randolph AFB, TX 78150-5001

MY INSTRUMENT QUESTION IS:

CAPTAIN BRIAN BAIKIE
USAF Instrument Flight Center
Randolph AFB, Texas

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

QUESTION: *Why are circling approaches not compatible with precision approach criteria and under normal circumstances, should not be attempted?*

ANSWER: The reason we don't recommend circling from an ILS is because the missed approach point (MAP) is defined by an altitude decision height (DH) and not by a published fix (or by timing) which are associated with nonprecision approaches. Consequently, when flying the ILS to circling minimums, you would have to execute the missed approach upon reaching DH if the airport environment is not in sight. On the other hand, when flying the localizer approach, you have a published fix or time at which you must begin your missed approach procedure.

Likewise, it isn't advisable to circle from a PAR approach because there is no fix to define when to commence your missed approach. You will have to go missed approach when you reach your circling altitude (this becomes your DH) if the airport environment isn't in sight, which could be more than 2 miles from the field. There also is a good possibility the controller will lose radar contact with an aircraft after level off at MDA as it proceeds towards the runway threshold because of the limitations of the precision radarscope. Leveling at an MDA on a PAR is not an approved procedure. The radar controller has only one clearly defined fix on his radarscope which is the DH defined by an altitude for a precision approach.

There are a few IAPs which use ILS glide slope to descend to circling minimums, but they always provide a fix for the MAP and are, therefore, really nonprecision procedures. These IAPs are "nonstandard" rather than "normal" procedures. Pilots are not prohibited from circling from precision approaches that have circling minimums published, but we don't recommend their use if there is a nonprecision circling procedure published. Remember, circling minimums published on an IAP do not apply to radar approaches.

QUESTION: *Why don't the NOAA High Altitude charts show MOAs which extend into the high altitude structure?*

ANSWER: Special Use Airspace (SUA) is not charted above 18,000 feet because it is "real time" airspace—termed Air Traffic Control Assigned Airspace (ATCAA). If able, ATC will clear nonparticipating aircraft through the SUA. In most cases, the pilot doesn't need to know about it. The intent is to have the controller provide vectors to ensure nonparticipating aircraft remain clear of an active SUA—not have nonparticipating aircraft file

Special use airspace (SUA) is not charted above 18,000 feet! This is because this area is considered "real time" airspace—termed Air Traffic Control Assigned Airspace (ATCAA). If able, ATC will clear nonparticipating aircraft through the SUA.

around SUAs simply because they are depicted on a chart. If all SUAs were charted, the US and offshore charts would be unnecessarily cluttered. The present system provides the greatest amount of flexibility for both ATC and DOD.

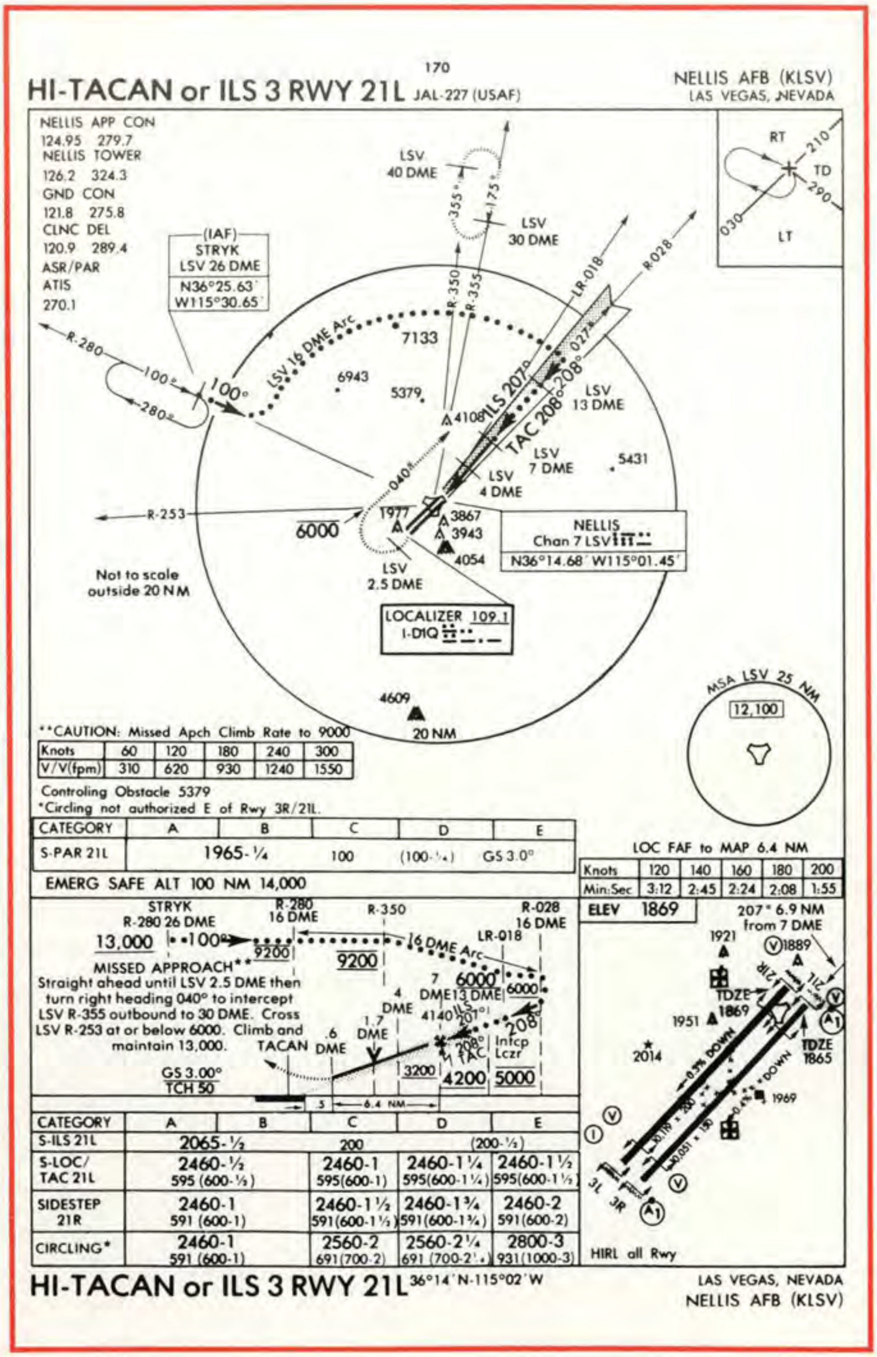
QUESTION: *The Airman's Information Manual (AIM), para 370b, stipulates after an approach clearance is issued, aircraft may descend to the minimum altitude associated with the "segment of the published route or IAP" that is being flown. AFM 51-37,* Instrument Flying, *para 10-4c (covering en route descents), stipulates "once cleared for the approach, maintain last assigned altitude and heading until established on a segment of the published terminal routing or IAP." This appears to mean civilian pilots can descend to the MEA or MOCA associated with the airway, and the descent clearance is a part of the approach clearance. On the other hand, Air Force pilots cannot descend unless specifically cleared to a lower altitude which means additional radio calls for a specific altitude clearance are frequently required. Can you clarify this for me?*

ANSWER: Contrary to what was stated in the question, the pilot shall *first* maintain his last assigned altitude unless a different altitude is assigned by ATC *or* until the aircraft is established on a segment of the published route or IAP. AFM 51-37, para 10-4c, although worded somewhat differently, should be interpreted to correspond with the wording in AIM. AFM 51-37, para 10-6e (low altitude approach), says Air Force pilots *can* descend to a lower altitude *without* a specific altitude clearance provided they have been cleared for the approach *and* are established on a segment of the published routing or IAP. There should be no request for lower altitudes by pilots established on published routing once they are cleared for an approach, unless the pilots need clarification.

QUESTION: *Looking at the HI-TACAN 3 RWY 21L/R NELLIS AFB (see figure), the way I understand this approach, you cannot descend out of 6,000 feet MSL until you've intercepted the 028 degree radial and are within 16 DME. This gives you 3 miles to lose 1,000 feet because you have to be at 5,000 feet at 13 DME. I don't think you have enough miles to descend all the way to 5,000 feet by the crossing restriction.*

ANSWER: AFM 51-37, Chapter 11, para 11-4, states "an altitude or radial altitude restriction only applies while established on that segment of the approach to which the altitude restriction applies. Once a lead point is reached *and* a turn to the next segment is initiated, the pilot may descend to the next applicable altitude restriction." In this approach, once you have reached the 020 degree lead radial, a descent to 5,000 feet is then permissible.

continued



QUESTION: *AFM 51-37 strongly recommends aircrews use a visual descent point (VDP) when accomplishing a nonprecision approach. Why are we reluctant to use a VDP on all nonprecision approaches? Even on approaches that do not publish a VDP, it isn't difficult to calculate one.*

ANSWER: VDPs are not a mandatory part of a nonprecision approach procedure because VDPs cannot be published on all approaches due to depiction and obstacle clearance requirements. Without DME, a crossing radial, or a marker, it is impossible to establish a VDP. In addition, VDP criteria require obstacle clearance similar to precision approaches which sometimes precludes establishment of a VDP. Many approach plates have more than one nonprecision approach minima depicted on the same page. This requires the VDP shown on the IAP to be for the nonprecision approach with the lowest landing minima (HAT). If every approach minimum published had a VDP depicted, the profile view would become cluttered and confusing to the user. If a procedure requiring a pilot to be at a VDP prior to descending out of the MDA was instituted and VDPs weren't always published, we would invoke more confusion to the pilot. Pilots desiring to maintain a normal glidepath to landing and proper obstacle clearance should not descend below MDA before reaching the VDP and acquiring the necessary visual reference with the runway environment. Whether the VDP is published or self-computed, we recommend the use of it on all nonprecision approaches. More restrictions will *never* be a good substitute for sound pilot judgment and technique. ■

Visual descent points (VDP) are *not* a mandatory part of a nonprecision approach procedure. They cannot be published on all approaches due to depiction and obstacle clearance requirements. However, IFC *recommends* the use of a VDP on all nonprecision approaches.

OPS TOPICS

Bends

■ A 2-week vacation isn't always the best thing for you. A student was returning to flying following the holiday break when he discovered his body wasn't up to speed. There's a good chance his activities during the break set him up for this uncomfortable ride.

After 20 minutes of flight in the Tweet, the student and IP were at 19,000 feet in preparation for a planned spin entry. The student felt tingling in his elbows and knees and informed the pilot he wasn't feeling very well. The IP took control of the aircraft and noted the student was breathing rapidly. The IP directed the student to follow the appropriate emergency procedures, including 100 percent oxygen, and began a recovery to the nearby home base.

The flight surgeon examined the student after landing and determined he had encountered the "bends" during the flight at 19,000 feet for an unknown reason. The problem was made worse when the student hyperventilated due to anxiety over the pending spin, a warm cockpit, and the response to his tingling sensations.

We frequently think of the "rusty hands" side of long layoffs from flying, but the body also needs to recover from certain physical activities, get back into the groove of pulling Gs, and prepare to react to a changing environment. Take it easy and gradually work back into the business of flying.

Hurried

The fighter pilot's day started like all the rest, a 2-ship formation out to the MOA with the wingman behaving himself. About an hour into the routine, a "fuel low" caution light illuminated to break the monotony.

Suddenly, things needed to be handled quickly. The pilot confirmed a trapped fuel problem with the centerline tank while simultaneously requesting radar vectors to the nearest airfield from GCI. Upon reaching his max range altitude, a quick glance at the charts convinced him he couldn't reach the field.

Now, he decided the only option was to go down low and warm the "frozen" fuel in the centerline tank. Despite running through the emergency checklist (a number of times in quick succession), his problem did not correct itself. With flameout imminent, he started a climb back to altitude while cranking up the EPU. Passing 17,000 feet, he became a glider pilot. He dropped the centerline tank, and not until he was 5 miles from the field was he convinced he would make it.

Well, almost make it. He landed short of the overrun and slid up onto the runway with the landing gear still retracted. The ground egress, like the last few minutes of the flight, took place very quickly.

Time was on his side, and he failed to take advantage of it. The quick assessment of the diversion range was inaccurate. The descent to low altitude to thaw fuel which has rarely, if ever, frozen, wasted precious fuel. The multiple attempts, in quick succession, to run the emergency checklist prevented the system from repressurizing. A timely response to emergencies is always appropriate, but "timely" is not the same as "immediately."

Loadmaster

The Starlifter was receiving its usual assortment of vehicles, troops, and pallets for transport to points east. The combination kept the loadmaster busy arranging the seating, checking on the pallets, and a lot more.

When the Marines offered to help push the three vehicles into position and tie them down, he quickly put them to work. He closely supervised the tiedown of the first vehicle but had to solve another problem before he got to the second and third vehicles. When he returned, they were already tied down by the Marines and a quick visual check showed they had done a good job.

But not a great job. As the pilot raised the Starlifter's nose for takeoff, one of the vehicles rolled downhill and parked itself on top of a shiny, Marine boot. The pilot was told of the problem and soon leveled off to enable the vehicle to be rolled back into position.

The loadmaster checked the last two vehicles during the turn back to home field, and he now saw that while all the chains were in the correct locations, none of them were tightened. He was caught in the same "interruption trap" which has caught so many pilots and crew chiefs before. The only way out of the trap is to start the checklist over again. ■

MAINTENANCE MATTERS

Micro FOD

■ When we think of FOD, we generally think of a 10/32 screw or some kind of hardware going down the intake of a jet engine or jamming the flight controls of an aircraft. But foreign objects (FO) often come in another form that we, as maintainers, tend to overlook. It often comes in the form of dust-sized particles which are seemingly harmless and often difficult to detect. Although small, this kind of FO can cause big problems.

For example, while the crew of a C-141 was preflighting the aircraft, the engineer noticed the autopilot would not disengage by the use of either the pilot's or copilot's autopilot release switch. The mission was scrubbed, and the problem turned over to the instrument/autopilot shop. The technicians found the autopilot solenoid was hanging up, preventing the disengage mode to be complete. It appeared dust had accumulated inside the flight controller, causing it to hang up.

In another incident, a flight surgeon was flying in the back seat of an F-4 when he felt particles of some kind enter both of his eyes. Upon landing, the flight surgeon casually mentioned the incident to the pilot, but since he was experiencing only minor discomfort, no entries were made in the aircraft forms. However, the next day, the doctor experienced severe pain in both eyes. During an examination, an ophthalmologist was required to remove particles of fiberglass from the cornea of the flight surgeon's right eye. As a result of the incident, the doctor temporarily lost 20 percent of the vision to the right eye.

The aircraft was impounded, and investigators traced the source of the fiberglass to a badly deteriorated torn kick panel in the front cockpit.

These incidents are examples of how small particles of FO can cause serious problems. While they had only minor consequences, had the C-141 been airborne or had the fiberglass blinded the pilot of the F-4, the results could have been disastrous.

The solution to these types of problems is awareness by both maintenance and aircrews of the hazards of even the smallest FO particles. Prompt reporting of FO by flight crews and FO-conscious maintenance practices may have prevented these incidents. The bottom line is the hazard of foreign objects cannot be judged by its size only.

Underground Bench Stock

How many times have you made a trip to the bench stock for a piece of hardware only to find the cupboard bare? There is nothing more frustrating for a technician than to go on work stoppage for want of a common piece of hardware. But what can you do? The right answer, of course, is to order the part on the proper priority. However, you know that ordering the part takes some paperwork and a little time.

Besides, MSgt McScrounge, the bench stock monitor, maintains a clandestine supply box that contains all kinds of bits and pieces and suitable instruments of repair he has acquired over the years. So, when no one is looking, the crusty Master Sergeant leads you to a dark, hidden corner of his office and allows you a 10-minute shopping spree in his 1-cubic-foot, 200-pound scrounge box. Luck is with you, and, within minutes, the much needed replacement part is in your hands and on the way to the flight line.

Problem solved? Let's take a look at some of the reasons Master Sergeant McScrounge's box is unauthorized.

To begin with, every time a piece of hardware is obtained out of the proper supply channels, it does not create a demand. The reason the part was not available in the bench stock in the first place was probably because it was traditionally foraged in McScrounge's box, and, therefore, no demand was put on the supply system.

Furthermore, looks can be deceiving. While bootleg replacement parts may appear to be suitable, in many cases, they are not. Consider the selection of a simple bolt. A quick look at TO 1-1A-8, *Aircraft Structural Hardware,* will enlighten you on the complicated process engineers use when choosing a bolt for a particular use. While it doesn't take an engineer to find a bolt of the proper length and thread size, it is not always possible to ensure it is the proper hardness or made of the

MAINTENANCE MATTERS

right material. And there is no way of knowing how many times the bolt has been used or if it has been overtorqued or abused in some other manner.

Shelf life is another consideration. It is highly unlikely that McScrounge monitors the shelf life status of items he keeps in his little box. Think about the disappointment when, after 3 days, the epoxy you used to fix a widget has still not cured.

Perhaps the most serious problem with McScrounge's illicit chest of maintenance treasures is its propensity to generate FO. An effective FOD prevention program (and AFR 66-31) demands strict control of hardware. Most bench stock managers require expendable items be replaced on a one-for-one basis. This is clearly not the case when spare parts are allowed to accumulate in an uncontrolled box.

The next time you visit the local bench stock, remember supply procedures are written to help technicians get the proper part in a timely manner. In the long run, circumventing proper supply procedures usually has a detrimental effect on the quality and timeliness of maintenance. So, whenever Master Sergeant McScrounge tempts you with a visit to his illegal box, JUST SAY NO.

A Mind of Its Own

After an uneventful training mission, the F-16 taxied to its hardened shelter (HAS). The crew chief marshaled the jet into position in front of the HAS and performed a tire inspection. With the aircraft chocked, the crew chief moved to a position in front of the right wheel to plug in his headset. Before he could plug in the headset, the aircraft engine auto accelerated, and without warning, the jet leaped forward, jumping over the wheel

chocks and narrowly missing the crew chief.

In spite of the fact the pilot was holding the brakes, the aircraft skidded both main tires for a distance of about 5 feet. After a few seconds, the engine returned to idle. The pilot and the crew chief described uncommanded spool-up as more of a thump than an ordinary acceleration. Had the pilot not been holding on the brakes when the engine auto accelerated, the aircraft would have jumped the chocks and seriously injured the crew chief.

This auto acceleration problem is a phenomena associated with the F110-GE-100 engine. It can happen extremely quickly and without any warning. Going to Secondary Engine Control (SEC) can correct the problem after it happens.

This is not an isolated incident. A similar incident occurred to another F-16 only a few days prior. Maintenance people traced the cause of both these mishaps to a faulty signal data converter (SDC). An MDR has been submitted on the SDC, but in the meantime—pilots, stay on the brakes and maintainers, avoid standing in the possible path of a fickle Falcon!

Rags to Wreckage

Shortly after wheels up, the pilot felt a thump and experienced a loss of thrust from the Falcon's engine. A video camera on the ground showed a flash of fire, and then several panels fell from the rear of the aircraft to the runway below. Reacting to the emergency, the pilot turned out over the water and jettisoned the aircraft's external tanks. When all attempts to regain thrust failed, he successfully ejected. Seconds later, the Falcon hit the water and was destroyed.

What caused the F-16's afterburner to come apart like a $2 watch? The investigation centered around the segment 3 spray ring, because the aircraft records showed it had been replaced just prior to the aircraft's final flight. Investigators found a piece of corduroy cloth tied to the spray ring. They concluded the corduroy rag changed the fuel and flame pattern of the afterburner enough to cause a severe explosion and fire.

Interviews of maintenance people indicated it was accepted practice to use cloth rags when installing spray rings to prevent FO from being dropped into the engine. In an effort to prevent FOD, the maintainers actually created a FOD hazard that caused the loss of a jet!

Although there were no requirements to inventory the rags used during engine maintenance—a practice easier said than done—this mishap could probably have been prevented had someone ensured all the rags that went into the engine also came out, and the supervisor conducted a thorough inspection prior to signing off the red X in the jet's forms. ■

MAJOR
Thomas J. King

CAPTAIN
Evan J. Smith

1ST LIEUTENANT
Thomas M. Cole

STAFF SERGEANT
David J. Phillips

SERGEANT
Richard C. Ellison

28th Air Division
Davis Monthan AFB, Arizona

■ Major King and his crew were flying their EC-130H Compass Call at flight level 270 from Davis Monthan AFB to Loring AFB, Maine, when the aircraft suddenly shuddered and yawed severely to the right. The pilots, Major King and Captain Smith, and flight engineer, Sergeant Ellison, verified the no. 3 engine was inoperative, and no. 4 was operating erratically with a turbine overheat.

The no. 3 engine was shut down, and the throttle retarded on no. 4, but the overheat persisted. Captain Smith directed its shutdown, but the condition lever (the primary means of engine shutdown) would not move. Major King pulled the fire handle and the engine wound down, but the overheat light remained on. The pilot had to apply full rudder trim to help counteract the adverse yaw. After the engine shutdown checklists were completed, a fire light illuminated in the no. 3 fire handle. The extinguishing agent was discharged, and the bleed air supply to the right wing removed, but the fire light remained on.

The crew visually confirmed the no. 3 propeller assembly, reduction gearbox, and engine cowling forward of the wing were gone, and the no. 4 propeller had shifted 90 degrees to the left from its plane of rotation, causing a 2-foot cut in the wing.

Knowing they could not reach their destination on only two engines, Lieutenant Cole, the navigator, briefed the crew on their emergency airfields. Their EC-130 was in a constant descent, since it could not maintain altitude. Captain Smith performed a no-flap approach and landing which was required due to the unusual antenna configuration on the EC-130. Due to adverse yaw on landing, the pilots applied full right brake to keep the aircraft on the runway. After stopping, everyone quickly egressed because of the potential for fire from engines or overheated brakes.

The superb crew coordination and airmanship by Major King and his crew saved 16 lives and a valuable combat aircraft. WELL DONE! ■

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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

Curtis L. Cook

388th Tactical Fighter Wing, Hill AFB, Utah

■ Captain Cook was leading a two-ship flight of F-16s RTB from a surface attack tactics training mission. During the recovery, both aircraft entered IMC in close formation. Approximately 20 miles from the field, both F-16s were simultaneously struck by lightning bolts. The wingman's aircraft was rendered uncontrollable, and he ejected moments after the lightning strike.

Captain Cook's F-16 was severely damaged. Both external fuel tanks exploded, the left one catastrophically, damaging the left wing, the left side of the fuselage, and the tail section of the aircraft. In addition, all of his primary flight control and navigation instruments failed including his airspeed, attitude, heading indicators, and his head-up display.

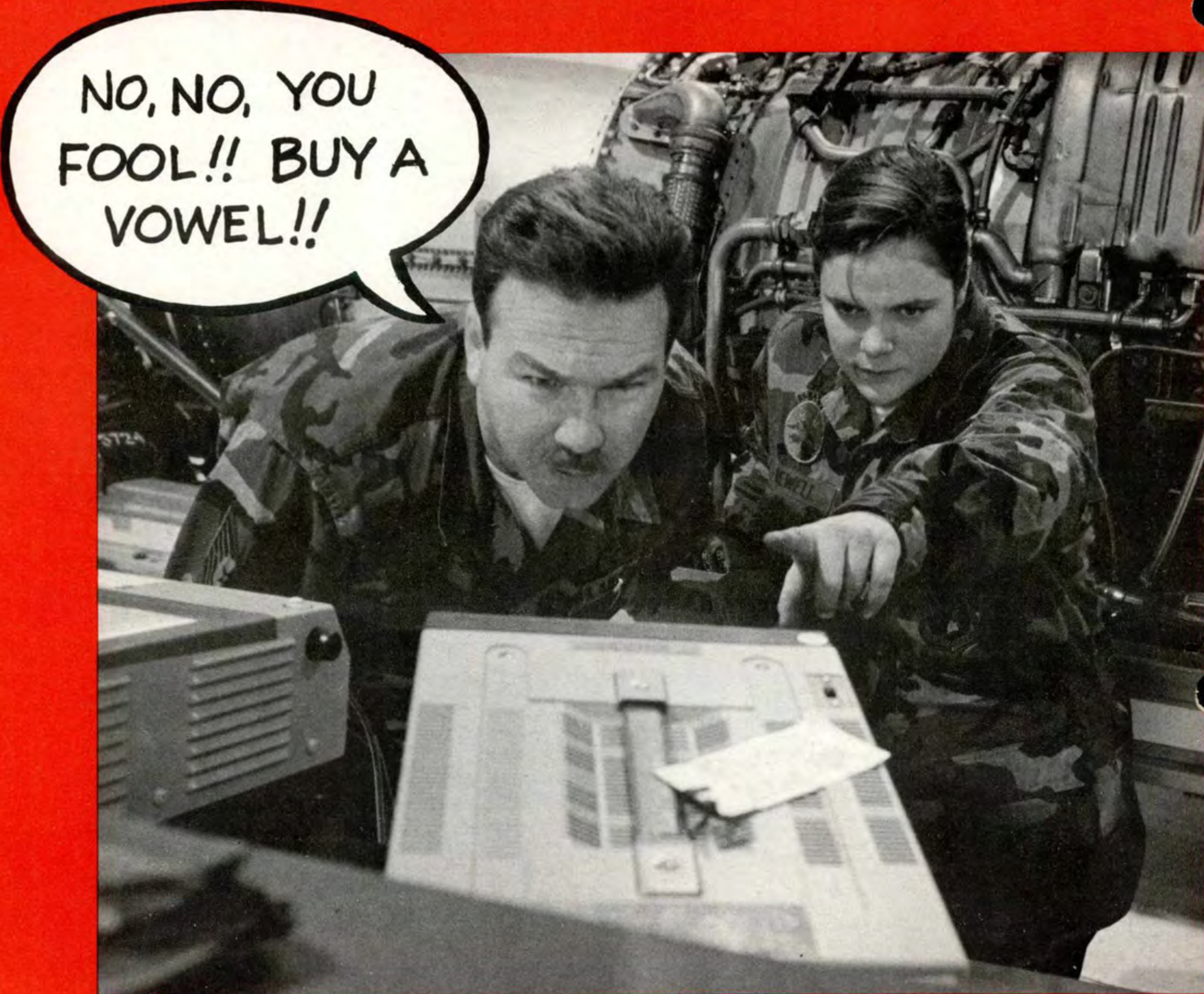
As a result, Captain Cook found himself flying in clouds in an F-16 with significant structural damage and with only a standby attitude indicator and the altimeter to use for instrument references. Despite the dangerous situation in which he found himself, Captain Cook maintained aircraft control and informed the arrival ground controller of the emergency and his downed wingman.

He skillfully descended until he was below the clouds and could use visual references to maintain attitude control. Next, he coordinated for another aircraft to join him, and using airspeed references from the chase aircraft, performed a controllability check to determine if he could safely land his crippled jet.

Flying higher-than-normal airspeeds because of the damaged left wing, Captain Cook maneuvered his aircraft to a safe landing, avoiding further incident. His quick and accurate position call regarding his wingman's bailout also aided in the rapid and successful recovery of the downed airman.

The professional skill and airmanship displayed by Captain Cook saved the loss of a valuable combat aircraft and assisted in the quick recovery of an irreplaceable wingman. WELL DONE! ■

Write A Dumb Caption Contest Thing



Every time we print our dumb caption, we are sure this is the one that will show you people up as the true amateurs you are. After all, we have dumb caption writers who are trained professionals. Then, each month, we hear the sound of raging and vile curses emanating from their cages when your entries top theirs.

This month, they have assured us their caption is one of their dumbest ever and will be the one to finally break down your collective talent pool. So there's probably little point in you even trying to enter the contest. Of course, if you should enter and win, you would drive them into a fit of despondency and win the fabulous and elusive, cheap little prize as well.

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 for each person in the photo or use a caption under the entire page. You may also submit your captions on a plain piece of paper. Entries will be judged by a panel of experts on dumb humor in June 1990. Remember, decisions are open to bribes over $100,000.

Send your entries to: **"Dumb Caption Contest Thing" • *Flying Safety* Magazine • HQ AFISC/SEPP • Norton AFB, CA 92409-700**