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SAFETY

FEBRUARY 1988

SPECIAL ISSUE

Mishap Review and 1988 Forecast — Ejection Summary

B-1B

MAJOR MILTON H. WADDELL
Directorate of Aerospace Safety

■ The B-1B is here to stay. The first delivery of the B-1B to the Strategic Air Command was at Dyess AFB, Texas, in June 1985. Dyess has received all of its aircraft. The base put its first aircraft on alert and achieved initial operational capability on 1 October 1986. Ellsworth AFB, South Dakota, has also received all of its aircraft, and next in line is Grand Forks AFB, North Dakota. Finally, McConnell AFB, Kansas, received its first aircraft in January 1988. Rockwell International at Palmdale, California, produces four aircraft per month, and the 100th and final B-1B should enter the inventory in May 1988.

Accomplishments

Since entering the inventory, the "Jet" has had some extraordinary accomplishments and highlights that have made all of us in blue uniforms proud. The B-1B presently holds 36 world records. Some of the most recent were nine world speed, distance, and payload milestones.

Powered by four F101-GE-102 engines producing 30,000 pounds of thrust, a B-1B traveled 2,700 nautical miles, carrying a payload of 67,300 pounds at an average speed of 655 miles per hour (approximately .9 Mach). Four of the speed records were held by the Soviet's IL-76, a reconnaissance aircraft. The KC-135 and the B-1's predecessor, the B-52, held the other five.

The B-1 flew to Antarctica and successfully completed long endurance test flights. It completed one operational readiness inspection at Dyess AFB with flying colors and participated in major exercises such as Global Shield and Red Flag. Finally, the B-1B made a command performance at the Paris Airshow in June at LeBourget Airport.

Testing Continues

Testing and evaluating continue. The Air Force Operational Test and Evaluation Center, Kirtland AFB, New Mexico, conducts ongoing operational testing. They are concentrating on system capability and interface and cold weather procedures. The Central Flight Test Facility at Edwards AFB, California, works hard to further develop technical systems such as the stability enhancement function, stall inhibiting systems, and the terrain following function. Finally, ice testing continues at Edwards AFB and the Arnold Air Test Facility, Tennessee.

Mishap Record

With all of the B-1B's accomplishments, it is sad to report we did experience one Class A mishap in 1987. We lost three crewmembers, and the aircraft was destroyed. The B-1B fleet compiled 8,097 flying hours (as of 30 September 1987). The B-1 also experienced 2 Class Bs, 18 Class Cs, and 3 HAPs. As you can probably guess, the majority of the mishaps were FOD (including ice).

Crew Production

Finally, crew training and production continue at Dyess AFB. Dyess and Ellsworth AFBs have their full complement of crews. Grand Forks crews are presently being trained, and congratulations to the aircrew members recently selected for assignment to McConnell AFB. The "Jet" is an excellent opportunity to serve and get some great flying experience. I look forward to writing many more articles about the B-1B and its accomplishments. Again, congratulations to those who fly, and many thanks to those who maintain. Say, does anybody know where I can get a flight? ■

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CONTRIBUTIONS

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SPECIAL ISSUE

1987 was a great year for USAF safety. Our Class A mishap rate of 1.51 was the *second lowest* in USAF history. Our combined Class A and B rate of 2.08 and our Class A operations factor mishap rate of 0.87 were the *lowest* in our history. Many of our heavy aircraft experienced a zero Class A mishap rate.

We converted from calendar year to fiscal year reporting in 1987. The statistics cover 1 January through 30 September. To avoid confusion, our safety action officers have used the term transition year, or TY 87, in their articles.

In this issue, we take a close look at how we did in 1987 in our heavy aircraft. This issue also contains the 1987 USAF Ejection Summary.

SPECIAL FEATURES

REGULAR FEATURES

DEPARTMENT OF THE AIR FORCE • THE INSPECTOR GENERAL, OSAF

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B-52

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Directorate of Aerospace Safety

■ The B-52 has completed 3 consecutive years without a Class A mishap. The first B-52 became operational in 1955, and the last H model aircraft was delivered in 1962. A total of 742 aircraft were built.

Today, Strategic Air Command owns 263 (167 G and 96 H model aircraft). Five are in the test inventory, and the remaining 474 have either been scrapped, destroyed, or placed in extended storage. The active B-52s are stationed at 11 bases across the CONUS and at 1 overseas base.

The "Buff" has amassed approximately 6,637,642 flying hours; 79,415 of those hours being flown last year. Figure 1 shows which years the 90 Class A mishaps occurred. These mishaps resulted in the loss of 307 lives and 71 destroyed aircraft. The B-52's mishap rate for 1987 was a big zero as compared to the Air Force's 1987 rate of 1.51. This article will address the B-52's recent mishap experience, trends, current actions, and modifications.

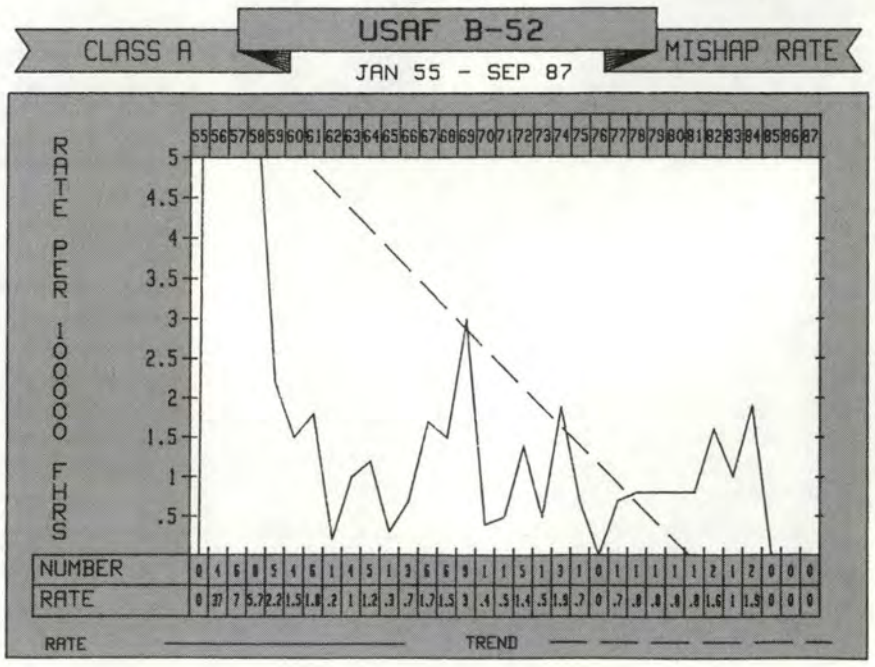
Mishap Experience

I am happy to report that last year the B-52 did not meet AFISC's prediction of one Class A. The AFISC Class A prediction was a collision with the ground. However, the B-52 force did experience one Class B; an H model mishap that involved cowling loss and damage.

For 1987 (1 January through 30 September), the B-52 fleet experienced 44 Class Cs and 21 HAPs; 11 fewer than the 1986 total. The Class Cs and HAPs for 1985, 1986, and 1987 are compared in Figure 2.

AFISC's three major concerns are physiological/pressurization, broken outboard tripod link lugs, and ruptured starter chambers. Physiological/pressurization mishaps continue to rise. SAC experienced 10 in 1986 and 19 in 1987's 9-month reporting period.

Figure 1



Six of the mishaps involved pressurization problems due to equipment failure. Smoke and fumes were the villains in 2, and 11 centered around airsickness, sinus blocks, and ear blocks. Several of these mishaps were preventable if the crewmembers had only visited their friendly flight surgeon.

The B-52 has suffered three mishaps which involved broken outboard tripod link lugs on the right forward gear. The lugs failed in tension due to excessive drag loads which caused the gear to fold. In addition, three parts of the brake system have been identified as problem areas.

They are hydraulic surges, wornout brakes, and brake chatter. The B-52 manual hydraulic system pressure is 3,000 psi, but the maximum brake pressure is only 700 psi. Tests show that brake pressures, in the form of surges, were much higher than the target 700 psi.

Figure 2

B-52 Most Common Class Cs and HAPs

	1985	1986	1987
Bird Strikes	42	11	9
Pressurization/ Physiological	12	11	19
Engine Failures/ Fires	7	9	12
Weather	6	5	3
Landing	5	3	6
Water	20	15	3

These surges were caused by obstructions and contaminants in the feedback orifice constricting the flow of hydraulic fluid. Currently, the obstructions and contaminants cannot be removed without destroying the brake valves, and the particles are difficult to detect unless the valve is operated while installed in the B-52 system.

A second factor is wornout or missing brake lining. If these linings are not intact, there is added torque. This added torque is most pronounced at 10 knots or less. This condition essentially negates the torque-limiting safety feature of the brake system.

Finally, brake chatter contributes to the excessive drag loads. The faster the steel rotors and cerametallic stator plates slide against each other, the lower the friction and vice versa. This is called negative damping.

This couples with the natural springiness of the landing gear, and oscillations will occur. As the gear approaches the maximum forward position, it slows, waits for the aircraft to catch up, and friction rises, causing the whole process to repeat itself and increase in amplitude.

At the point of maximum rearward deflection in this cycle, brief but very high tension loads are imparted to the strut lugs on the right-hand gear. These high peak loads, in concert with a coincident peak load from higher brake torque (caused by hydraulic surges and/or excessively worn brakes), create sufficient force to fail the lugs. New brake lining materials are being considered to correct these problems.

Also, crewmembers are now required to report any cases of brake chatter. Maintenance personnel are giving special attention to proper brake control rigging, including setting the meter control valve pressures. In addition, a recent TCTO was accomplished to reduce the actuation point of the relief valve. Brake taxi tests were conducted between 11 May and 9 June 1987. Contact OC-ALC/MMHRHB, Tinker AFB, Oklahoma, for test results.

Next, there has been an increase in ruptured starter chambers due to defective cartridges and starters. While no catastrophic mishaps have occurred, the potential does exist, due to rupturing of the starter breech which could propel pieces through the engine cowlings. This problem could also degrade the ability of alert aircraft to complete their missions. The program manager has taken the following corrective actions:

- Conduct hydrostatic and magnetic field profile testing on all breech chambers during overhaul at the OC-ALC.
- Continue breech chamber stress levels and failure mode research projects.
- Replace the less reliable B-52 starters with surplus KC-135 starters (from the re-engine program).
- Evaluate the removal of speed limiters on H-model starters.
- Rewrite cartridge specifications to improve reliability on cartridges subjected to significant temperature cycles. The current supply of cartridges is to be x-rayed to verify there are no cracks in the propellant. If x-rayed cartridges experience seven significant temperature cycles, they will be x-rayed again.

continued

The propellant will crack if stored in areas that experience high temperatures. The cracks cause a faster burn when activated and result in overpressure.

Modifications

This intercontinental heavy bombardment aircraft is capable of many diverse missions to include tactical environment area denial, penetration for hard target attack, standoff launch of ALCMs, anti-ship sealane control, reconnaissance, and combat crew trainer. For you to effectively accomplish these missions, the aircraft is continuously updated and improved. Major modifications now in progress are:

- The digital autopilot system which will replace our present old vacuum tube autopilot. This will eliminate those untimely pitchups and pitchdowns during air refueling and low level. The scheduled completion date is FY 89.
- The offensive avionics system (OAS)/cruise missile integration modification is to modernize the bombing and navigation system on all G and H models and incorporate the cruise missile. The OAS portion of the modification is complete. The cruise missile integration provides external ALCM carriage on 99 G models and 96 H models. The Gs are complete, and the Hs will be finished in FY 90.
- The new fuel quantity indicating system is replacing the existing system with solid-state analog, pointer-type indicators, new all-metal probes, new wiring harness and connectors, and associated hardware. Completion date is FY 88.
- PAVE MINT (ALQ-172 (V)1) is affecting 129 G models. It includes an update of the ALQ-117 electronic countermeasure system and provides improved threat warning and jamming capability — FY 91 for this one.
- ALQ-172(V)2 affects 96 H models. It is an updated ALQ-117 system using a new phased array antenna system; it also provides an improved threat warning and jamming capability. Completion date is same as above.
- The strategic radar is a reliability, maintainability, and supportability improvement to the present radar system — FY 91 again.
- The environmental control system replaces the existing air-conditioning system pack with a more efficient unit that will provide better pressurization and cooling for new electronics. Completion date is FY 89.

The Future

SAC plans to implement many new tactics and methods to increase mission effectiveness. Crewmembers will be tasked to perfect combat capability. Good judgment is the key to safety and mission results. Know your limits, then go accomplish the mission and enjoy. Do I hear 4 consecutive Class A mishap-free years? ■

C-5

CAPTAIN BEN RICH
Directorate of Aerospace Safety

■ The first 9 months of 1987 were exciting for all involved in the C-5 program, and 1988 has the potential to be even better. We saw the completion of the first operational year for the C-5B while the entire fleet reached the 850,000-flying hour plateau.

Although we had a few close calls, we ended 1987 without a Class A mishap, lowering our lifetime Class A rate to 1.53 mishaps per 100,000 flying hours (Figure 1).

We experienced one Class B mishap when a C-5B departed the runway at Dover AFB, Delaware, during marginal weather conditions. Our Class C and HAP totals increased by one in 1987. This is interesting because the minimum cost criterion for a Class C mishap was elevated from $1,000 to $10,000 in 1986 and should have resulted in a decrease in the numbers. (Remember, our 1987 reporting period was 25 percent shorter than previous years.)

It will take several years to see the final effects of the 1986 change, but this action, in conjunction with the efforts of the maintainers and operators, should result in a decrease in the numbers.

Figure 1
C-5 Mishaps (1979-1987)

CY	A	B	C	HAPs	Total
1979	0	2	26	21	49
1980	1	3	26	23	53
1981	0	1	20	15	36
1982	1	2	31	14	48
1983	2	2	28	18	50
1984	0	2	24	14	40
1985	0	1	27	19	47
1986	1	0	18	7	26
1987	0	1	12	14	27

Some of our most exciting news came as the 439th Military Airlift Wing (AFRES) at Westover AFB, Massachusetts, initiated its conversion to the C-5A. The 439th is the sixth organization to operate the C-5, and joins the 433d Military Airlift Wing, Kelly AFB, Texas, and 105th Military Airlift Group, Stewart IAP, Newburgh, New York, as an augmenting component to the Military Airlift Command's (MAC) active duty C-5 forces.

From the modifications standpoint, the wing mod for the A-models is now complete, and the fleet is operating unrestricted. Although we have experienced some minor teething pains, new carbon brakes are being introduced, while the modification to equip the fleet with high visibility strobe lights is also underway.

AFLC and MAC have agreed to reactivate the A-model's cargo compartment fire suppression system, which will be modified to eliminate the activation problems encountered during the system's first operational life.

All in all, we have made some great strides in improving the C-5's safety record, but a few experiences still offer lessons from which we can learn.

Logistics

Our major logistics achievements came in reducing the number of landing gear mishaps (Figure 2). The engineers and maintainers seem to have a handle on the gearbox problems with no gearbox mishaps reported in 1987. We sustained another nose-gear-up landing when the crew experienced a malfunction

continued

in the NLG door system.

They elected to accept minimum damage by landing with the nose gear retracted, rather than possibly forcing the nose gear down through a partially opened door. (They were unable to determine the position of the nose gear doors.)

The crew's expert handling of the situation resulted in a near flawless landing and absolutely minimum damage to the aircraft. The nose gear door indicating problem is being worked by San Antonio ALC, and hopefully, a fix will be available.

The second landing gear problem involved overheated brakes and blown tires after a crew tried to dissipate fog by taxiing up and down the runway. This will be discussed under operations.

The miscellaneous category increased dramatically, but there was no trend in any of the reports. The mishap areas included an exterior lighting failure during a night landing, a cargo tie-down device failure, two flight control malfunctions (one rudder and one aileron), and a pitot static system loss.

A review of the last 3 years shows a dramatic reduction in the number of logistics-related mishaps, and the credit must go to the maintainers for an outstanding job. While some of the reduction results from the 1986 reporting criteria change, we must also recognize the important contributions by the maintenance troops.

Figure 2
C-5 Mishaps by Category (1983-1987)

	1983	1984	1985	1986	1987*
Logistics	29	27.5	35	15	10.5
Engines	2	4	2	3	2
Landing Gear	13	9	15	7	1.5
Slats	4	0	3	2	0
Flaps	3	0	3	3	2
Misc (No Trend)	7	14.5	12	0	5
Operations	5	0.5	2	5	6.5
Taxi Mishaps	2	0	0	2	4
Misc (No Trend)	3	0.5	2	3	2.5
Other	16	12	11	7	10
Bird Strikes	5	5	1	2	4
Cargo Spills	6	2	4	3	2
Physiological	2	2	1	2	3
FOD	0	3	2	0	1
Misc (No Trend)	3	0	3	0	0

* (January - September 1987)

Operations

The high numbers of operations-related mishaps have produced questions for which we don't seem to be able to find answers (Figure 2). The 100-percent increase in reported taxi mishaps is unexplainable, and this problem is not limited to the C-5 community. The C-141 and C-130 operators also saw dramatic increases in the number of taxi mishaps as indicated in their annual reviews, and the targets of

opportunity vary.

C-5 drivers managed to claim a fire bottle and a tree, while jet blast caused damage in one case, and one crew experienced landing gear damage when they taxied off a runway during a 180-degree turn. This is the third consecutive year C-5 operators have caused airfield damage with jet blast.

The landing gear damage referred to in the logistics section occurred when a crew decided to taxi up and down the runway to dissipate the fog which prevented their departure. When the engines were started, the visibility was 1/4-mile in fog, and dropped to 1/8-mile by taxi time.

After waiting approximately 20 minutes, the crew decided to taxi up and down the runway to improve visibility. After two lengths of the runway and three 180-degree turns, transient alert stopped the aircraft, and the scanner discovered three blown tires and several smoking brakes. Damaged areas included 10 tires and brake systems.

The other operations-related mishaps included one lightning strike and the runway departure previously discussed. The latter incident was an excellent example of complacency, that dreaded disease that sneaks up on us when we are least aware. In this case, a very experienced crew all thought the "other guy" was making all of the checks, and the result was a landing in out-of-limit crosswinds on a low RCR.

The aircraft departed the runway and experienced major damage to the landing gear and all four engines. The timely check of one chart could have prevented this mishap, and the all-important lesson to learn is an old one — don't ASSUME the other person is going to accomplish an action that you should be doing.

Other

In our other than logistics and operations areas, we saw a rise in bird strikes after 2 years of minimum activity (Figure 2). Birds have been responsible for several recent mishaps and deaths, and the potential from a collision with our feathered friends can't be overstated.

As in other weapon systems, we continue to see physiological incidents for familiar reasons including food poisoning, dehydration (a passenger), and fume inhalation. The food poisoning was possibly caused by consumption of food in a foreign commercial establishment. Strategic airlift offers a great opportunity to experience foreign cultures, but a little precaution can prevent a lot of pain.

Our last miscellaneous area involves cargo leaks. This problem borders on uncontrolled, and again, its seriousness can't be overstated. Although the slight numerical decrease doesn't seem disastrous, when we consider the sources of the spills — JP-4 from a helicopter and a fuel truck — the potential exists for a catastrophe. This problem is rampant throughout the transport community, and sooner or later, we will experience the consequences if we don't solve the problem.

Future Outlook

The outlook for the C-5 community remains bright and exciting. We are expecting 21 additional C-5Bs to be delivered in FY 88, and as the new aircraft come on line, additional A-models will be delivered to the guard and reserves. The taxi mishaps and cargo leaks must be halted before we experience catastrophic results while common sense and prevention will help control our physiological mishaps. For this to happen, we all must continue to work hard by accurately reporting discrepancies and striving to ensure hazards are abated. ■

C-9/T-43/C-22

CAPTAIN BEN RICH
Directorate of Aerospace Safety

■ Our fleet of large, off-the-shelf aircraft completed another successful year in terms of safety, and extended their respective records one more year without a Class A or Class B mishap. Minor support problems identified by the C-9 and T-43 communities are being worked hard before they develop into serious problems, while the C-22 fleet doubled its flying time and continued to accomplish its mission in a positive, but low profile manner.

C-9

The C-9 fleet completed its seventh consecutive year without a Class A or B mishap, and raised its total flying time over the 500,000 hour plateau. Since their introduction in 1968, C-9s have experienced two Class A mishaps with one aircraft destroyed, and one Class B mishap — an impressive record considering the challenging mission profiles flown by C-9 crews. This equates to a Class A mishap rate of 0.39 mishaps per 100,000 flying hours (or one major mishap every 250,000 flight hours), and ranks the C-9 with the C-141 as one of our safest aircraft in history (Figure 1).

1987 Mishaps

Our only reported mishaps in 1987 involved two engine related problems, and the maintainers seem to be gaining the upper edge in this area. A shift from calendar year (CY) reporting to fiscal year (FY) reporting resulted in an abbreviated 1987 reporting period of 9 months. In spite of the reduced reporting period, the accomplishments of the operators and maintainers in reducing reportable mishaps must be given proper credit (Figure 2).

Our only recent engine problems included the shutdown of the No. 2 engine due to water freezing on the throttle cable and a No. 2 engine power loss due to fuel system problems. The water leak problem is be-

Figure 1

Lifetime Class A Mishap Comparison
As of 1 October 1987

C-141	C-9	C-135	C-130	C-5	C-124
.39	.39	.81	1.16	1.53	1.99

Figure 2

	T-43A Mishap Class				C-9A/C Mishap Class				C-22A/B Mishap Class			
YR	A	B	C	HAPs	A	B	C	HAPs	A	B	C	HAPs
81	0	0	7	0	0	0	6	0				
82	0	0	8	2	0	0	5	2				
83	0	0	8	1	0	0	6	0				
84	0	0	2	0	0	0	8	0	0	0	0	0
85	0	0	3	0	0	0	5	2	0	0	0	0
86	0	0	3	0	0	0	9	2	0	0	1	0
87*	0	0	4	3	0	0	2	0	0	0	0	0

*Indicates reporting period of Jan-Sep 1987.

ing worked by the San Antonio ALC, and procedural and equipment changes should eliminate this problem.

The turbine problems encountered during the 1985 to 1986 timeframe seem to be abated by the introduction of new maintenance procedures and increased monitoring. This combination resulted in the identification of several engines prior to failure — a desirable situation. The next year will determine how successful our efforts have been, but all evidence indicates 1988 should be as good, if not better than 1987 (Figure 3).

The real good news is that C-9 crews avoided the operational traps that are plaguing other aircraft (Figure 3). As indicated by Figure 3, C-9 crews completed the year with no operations-related mishaps and, specifically, the dreaded taxi mishap was avoided. This is indicative of the professionalism and the increased awareness displayed by the crews, but this is not a signal for crews to relax. Complacency can quickly erase this achievement.

Air Traffic Hazards

C-9 crews were involved in three reported near midair collisions, highlighting the constant need for a "see and avoid" attitude. This is a decrease from four reported near misses in 1986 and eight reported near misses in 1985. The mission profiles for the "nine" take crews into some of the busiest airports in the world, and constant vigilance is a necessity.

Modifications

The C-9 fleet has been equipped with strobe lights offering a high visibility profile for high density areas. Plans are underway to procure a new digital flight data recorder to replace the antiquated analog system currently installed, and a new and improved emergency escape slide is being distributed which eliminates deficiencies identified with the current escape systems. AFLC initiated action to install an altitude alert system for the cockpit which will aid aircrews in adhering to clearances and allow improved clearing techniques. Unfortunately, completion dates for ongoing programs are in question due to the scarcity of modification funds.

The Future

The future of our aeromedical airlift and special air mission C-9s is bright and long. Commercial versions of our aircraft are approaching the 60,000-hour mark, while our high time aircraft has less than 31,000 hours and most of the fleet has less than 25,000 hours. Based on current average use rates, our C-9s have not reached half of their expected life and should be with us for at least another 20 years.

T-43

The T-43 fleet logged its 14th consecutive operational year without a Class A mishap, making it one of our most successful aircraft in the current inventory. The fleet of 19 aircraft has amassed over 213,000 hours without a Class A mishap, and completed its seventh consecutive year without a Class B mishap. Unfortunately, Class Cs and HAPs increased 133 percent in 1987, mostly due to engine malfunctions, an APU malfunction, and attitude heading reference system (AHRS) failures (Figure 2).

1987 Mishaps

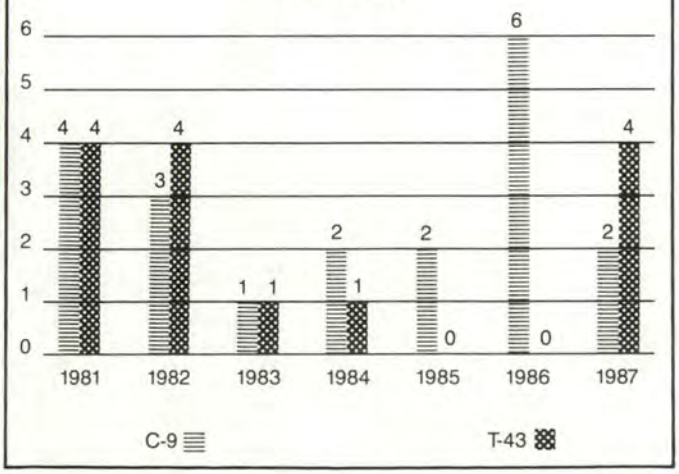
While the C-9 fleet has consistently experienced more engine-related problems with their Pratt & Whitney JT-8D engines, the T-43 fleet dominated this area in the first 9 months of 1987 (Figure 4). As shown in Figure 4, the T-43 fleet experienced four engine failures and

continued

Figure 3
C-9 Class C Problem Areas

Fiscal Year	81	82	83	84	85	86	87
Engine Loss/Shutdown	4	3	1	2	2	6	2
Bird Strikes	0	1	2	1	0	0	0
Tire Failures	1	1	0	2	0	0	0
Physiological	0	0	1	1	2	1	0
Taxi Mishaps	0	0	0	0	0	1	0
ADI Failures	0	0	0	0	1	2	0
FOD	0	1	1	1	0	0	0
Landing Mishaps	0	0	1	0	0	0	0
Misc (No Trend)	1	1	0	1	2	1	0
Totals	6	7	6	8	7	11	2

Figure 4
Engine Failure Comparison
(T-43 vs C-9)



C-9/T-43/C-22

continued

shutdowns compared to the C-9's two engine losses for the same period.

Problem areas for the baby Boeing included one engine fire warning, one engine overheat, a stuck throttle due to a missing bolt, and a flameout due to a failed fuel shutoff valve. Figure 5 compares the causes for T-43 and C-9 engine failures since 1976 and highlights the T-43 history of engine fire warning system failures compared to the C-9 history of fuel and turbine problems.

Other 1987 problem areas included two physiological mishaps, both involving navigator students, and our second failure of the AHRS equipment in as many years (Figure 6). An AHRS failure nearly resulted in the loss of a T-43 in 1986, and AFLC and ATC are working hard to correct this problem. New equipment is being installed and, hopefully, this will solve the problem.

Modifications

The T-43 has historically been one of our most reliable aircraft and this, in conjunction with an excellent maintenance program, has resulted in our aircraft remaining in excellent shape. The Litton Model 51 Inertial Navigation System (INS) has been replaced by an improved Litton Model 72 INS on a trial installation on one aircraft. Eventually, refit of the remaining 18 aircraft will be started when the trial is completed.

A safety initiative is underway to equip the T-43 fleet with a cockpit voice recorder and a digital flight data recorder. Neither of these valuable mishap investigation aids are currently installed, and their value has been repeatedly demonstrated in both commercial and military mishaps. Hopefully, appropriation action by the Air Training Command and the Air Force Logistics Command will be initiated in 1988.

C-22

The C-22 fleet completed its third year of service without any reported flight mishaps, and has only had one Class C mishap reported in its short history (Figure 2). The Air Force version of the Boeing 727, the C-22 is primarily involved in supporting personnel movements worldwide. The single A-model (727-100) is based at Howard AB, Panama (MAC), while the four B-models (727-100s) and single C-model (727-200) are assigned to Andrews AFB, Maryland (ANG).

Now that all six aircraft are on line, the C-22 fleet is amassing flying time at a greatly increased rate. In 1987, the C-22s doubled their total fleet time to over 4,500 hours, and the Air Force introduction of this new aircraft has gone very smoothly. While flying times for the individual aircraft vary between 10,000 hours and 52,000 hours, the six aircraft are in relatively good shape due to extensive maintenance activity prior to delivery.

Currently, two of the ANG B-models are being modified to increase fuel capacity by approximately 7,050 pounds to over 57,000 pounds, giving them a range of over 2,800 nm. A program to modify the remaining two B-models is being staffed at this time.

Other modifications planned for the C-22B fleet include installation of a new and improved altimeter, relocation of certain navigation equipment, and installation of strobe and taxi lights.

Like our other off-the-shelf aircraft, the C-22 fleet should be relatively free of maintenance problems since any future difficulties should be predictable, based on commercial experience with their Boeing 727s. The future of this aircraft is bright, and like the T-43 and C-9, the C-22 should be in the Air Force inventory well into the 21st century. ■

Figure 5

T-43 vs C-9 Engine Failure Cause Areas (1976 - 1987)

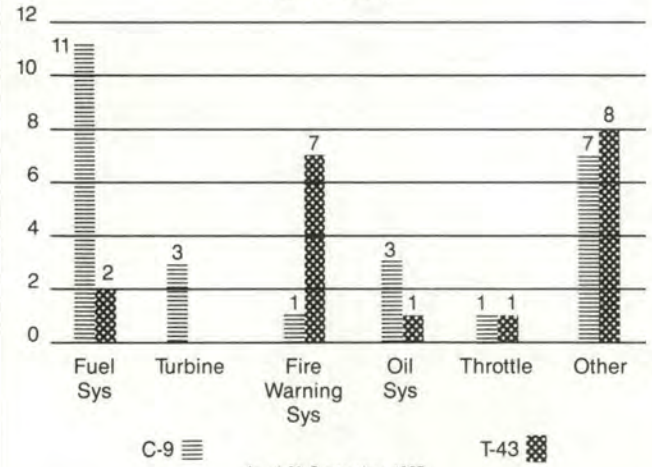


Figure 6

T-43A Class C Problem Areas

Fiscal Year	81	82	83	84	85	86	87
Bird Strikes	0	0	2	0	0	0	0
Tire Failures	0	0	0	0	2	0	0
Physiological	1	3	1	1	1	2	1
Engine Failure/Shutdown	3	1	0	0	0	0	3
Engine Fire Overheat System Failure	1	3	0	0	0	0	1
Misc (No Trend)	2	3	6	1	0	1	2
Totals	7	10	9	2	3	3	7

C-130

MAJOR DOUGLAS J. MILLER
Directorate of Aerospace Safety

■ Air Force C-130 maintainers and operators produced an excellent safety record in the first 9 months of 1987 while performing many difficult missions. C-130s logged over 274,000 flying hours in TY 87, bringing the Air Force fleet total to more than 11,245,000 hours.

This article will present some of the lessons learned from the C-130 mishaps which occurred in TY 87. We'll also look at some trends and other safety issues which we face in the C-130 business.

Class A Mishaps

There was one Class A mishap in TY 87. A C-130 was destroyed and five lives lost when a Hercules impacted the ground during a low altitude parachute extraction system (LAPES) demonstration.

Class B Mishaps

There were three Class B mishaps in the C-130 fleet in TY 87. One occurred when a C-130 was struck by hail while flying on a training mission. Another involved damage which resulted from the failure of a nose landing gear strut during taxi.

The other Class B took place when a C-130 was blown over on its wing while it was waiting for a thunderstorm to pass over the airfield. Two of these mishaps were weather related, while the other had logistics and logistics-supervisory causes.

Class C and High Accident Potential Mishaps

C-130 Class C and high accident potential (HAP) flight mishaps decreased from 134 in 1986 to 127 in TY 87. This does not show a positive trend as the 1987 reporting period was 25 percent shorter than the 1986 reporting period.

The most significant trend in Class C/HAP mishaps has been four-engine power loss. Warner Robins ALC has been investigating these mishaps and has published a TCTO to help correct faulty components. Installation of the solid state synchrophasers in the C-130 fleet should help alleviate this problem.

On the positive side, the number of reportable bird strikes has decreased. Credit is due to aircrews for their increased vigilance in avoiding birds. The Bird Aircraft Strike Hazard (BASH) Team with its many projects and programs also deserves credit for heightening aircrew awareness, as well as finding ways to minimize bird/aircraft conflicts.

The number of flight control malfunctions increased in TY 87. In one of the most serious HAP mishaps of the year, an aircrew experienced complete hydraulic failure shortly after takeoff. Superior airmanship prevented a potential catastrophe. A thorough investigation of this mishap by the unit maintenance and safety people uncovered a design defect which, when corrected, will prevent future mishaps of this type in the C-130A fleet.

Another problem area is the high number of physiological mishaps. The majority of these mishaps continue to be caused by aircrews flying with colds and by injuries in the cargo compartment. "Front enders" can help prevent injuries while aircrews are working in the back by giving warnings prior to maneuvering and minimizing abrupt maneuvers.

Lessons Learned

There are some useful lessons to be learned from the mishaps which occurred in 1987 that can lessen the possibility of future tragedies. All aircrews should take a hard look at themselves and those they fly with and ask, "Am I or any of the people I fly with taking unnecessary risks?"

continued

C-130

continued

Airshows bring out the best and sometimes the worst in aviators. Supervisors need to seriously consider the personalities as well as qualifications of those they select to participate in an aerial demonstration.

Two of our mishaps highlight the respect we should have for severe weather. In some cases, even following weather avoidance command directives cannot ensure safe clearance from hazardous conditions. Common sense and a thorough review of present and future forecasts can minimize the risk of a severe weather encounter.

One mishap sends a message to maintainers on the importance of performing required inspections on critical components. Although the NLG strut in the C-130 has a history of problems, this particular failure was the most expensive to date. A broken NLG strut on takeoff or landing could have even more serious consequences.

Safety Improvements

The health of the C-130 airframe continues to improve. The most critical structural improvement for the B and E models, the outer wing mod, is now 80-percent complete, with all aircraft scheduled for modification by December 1988. Another modification with safety implications, the replacement of carbon steel throttle cables with stainless steel cables, is also well underway.

There are other safety modifications in progress. Seventy percent of the C-130 fleet have been equipped with crash survivable cockpit voice recorders. The solid state flight data recorder modification has passed the trial installation phase and is being kit-proofed for fleet-wide distribution.

With this equipment, crew inputs, as well as aircraft performance, will be known so faulty equipment can be identified and repaired. This will minimize "cause undetermined" mishaps which have a negative impact on crew morale and confidence in their aircraft.

A contract has been awarded to install strobe lights for the C-130 fleet. Strobe lights will decrease midair collision potential and, therefore, improve the safety of C-130 flight operations.

Another safety enhancement we may be seeing in the not too distant future is some form of ground proximity warning system (GPWS). The Delaware Air National Guard is currently testing a GPWS on one of their C-130 aircraft to determine its capabilities in a tactical environment in varying terrain conditions.

Of our Class A mishaps, 22 have been collision with the ground. With approximately the same number projected through the lifetime of the C-130 fleet, an effective GPWS will be a valuable safety mod.

C-130 flight simulator training continues to provide a very positive safety enhancement for the C-130 fleet. Mission-oriented simulator training and aircrew coordination training are improving crew coordination in our crewmembers. Efforts are underway to extend this training to all C-130 aircrews.

The Future

Many positive steps are taking place in both operations and maintenance to improve flight safety in the C-130 fleet. This has contributed to our low C-130 fleet flight mishap rate in TY 87.

In the last 3 years, the number of C-130 Class A flight mishaps has gone from three, to two, to one. Let's continue this trend in a positive direction. If you, the C-130 maintainer and operator, continue to sustain a high level of safety consciousness, FY 88 may be C-130 Class A mishap free! ■

C-130 Mishap Summary

	1985	1986	1987
Class As	3	2	1
Rate/100,000 Flight Hours	0.8	0.5	0.4
Destroyed	3	2	1
Fatalities	27	14	5
Class Bs	2	0	3
Rate/100,000 Flight Hours	0.5	0	1.1
Class C and HAPs	238	134	127
Rate/100,000 Flight Hours	62	37	46
Significant Areas			
Bird Strikes	41	9	1
FOD	25	5	2
Physiological	25	21	19
Lightning Strikes	17	13	1
Foam Fires	15	4	7
Two-Engine Shutdowns	12	5	2
Flight Control Malfunctions	9	4	5
Dropped Objects	9	3	4
Cargo Leaks	9	3	4
3- or 4-Engine Power Loss	0	3	13

C/KC-135

MAJOR JAMES L. WALL
Directorate of Aerospace Safety

■ Shortly, the C/KC-135 fleet will complete its 31st year of service, logging approximately 196,425 hours in 1987. (The 1987 safety reporting year was 1 January through 30 September.) This number, added to the previous 30 years, gives the C/KC-135 a grand total of 8.9 million hours since first being delivered to the Air Force in January 1957. The basic -135 has 30 configurations and is currently being used by eight major USAF commands, the US Navy, and NASA.

This article will discuss Class A and B mishaps, review selected Class C and HAP mishaps, and highlight some of the ongoing and proposed -135 modifications.

Class A Mishaps

The two 1987 Class A mishaps increased the total number of C/KC-135 destroyed to 59. Sadly, the first mishap resulted in the death of all on board and one individual on the ground when the aircraft crashed while participating in an aerial demonstration. The crew of the second mishap aircraft experienced an explosion and fire shortly after landing. They were able to egress from the burning aircraft with only minor injuries. This mishap reinforces the fact that given the correct fuel vapor mixture and an ignition source, a fire results. Figure 1 shows the number of Class A mishaps and rate per 100,000 flying hours.

Figure 1
Flight Mishap History (1957-87)

Total Flying Hours	8.9 million
Class A Mishaps/Rate	69/0.78
Destroyed Aircraft/Rate	59/0.66

The current rate of 0.78 equates to two mishaps per year. AFISC is currently predicting three C/KC-135 Class A mishaps for 1988. Everyone associated with the C/KC-135 operations has the responsibility to help prove this prediction wrong. Only through the combined efforts of maintenance personnel, aircrews, and supervisors can we hope to reduce our current rate.

Class B Mishap

Although there were no Class B flight mishaps, there was one Class B ground mishap that needs discussing. This mishap occurred while the crew was participating in an alert taxi exercise. After taxiing a short distance, the crew experienced loss of nose gear steering and brakes. The aircraft left the taxi surface, rolled into the perimeter fence, and finally stopped. The crew egressed safely with only minor injuries to those not wearing flight gloves.

Class C and HAP Mishaps

In 1987, there were 78 Class C and HAP mishaps reported. This compares with 104 in 1986 and 121 in 1985. Some of the more interesting cases will be discussed later. Figure 2 shows the most common mishaps and how they compare with 1986 mishaps.

Figure 2
Most Common Class C and HAP Mishaps

	1986	1987
Physiological	11	15
Bird Strikes	12	10
Air Refueling	19	14
Pressurization	8	9
Engines	9	9

As can be seen, most mishaps stayed proportionally equal in this reduced-month reporting year. However, physiological mishaps have increased. These physiological mishaps have ranged from a simple sinus ear block to a heart attack suffered by an aircraft commander during initial climbout. Clearly, some of these mishaps should not have happened. In several instances, crewmembers flew with a

continued

pre-existing illness, and the result was an early termination of the mission and a visit to the flight surgeon. Many of the mishaps involved passengers flying with colds and ending up with an ear block.

Departing the Runway Surface Two KC-135s departed the runway surface — one during takeoff, the other during landing. The first mishap involved a water takeoff on a runway with an RCR of LSR 06. When water to the No. 2 engine failed, the pilot initiated an abort. Because of several factors beyond the pilot's control, the aircraft ended up 100 feet off the runway. In the second mishap, the pilot elected to land with a tailwind on a wet runway using 40-degree flaps. The aircraft stopped approximately 280 feet beyond the runway edge.

Taxiing Into Parked Aircraft The final Class C mishap involved a taxiing KC-135 attempting to taxi past several parked F-4s in a congested area. Although the right wing marshaler initially signaled that the KC-135 would clear the parked obstructions, he had second thoughts as the KC-135's wing passed his position. The marshaler attempted to stop the KC-135 but being positioned behind the aircraft made that job difficult. The KC-135's right wingtip struck the rudder of the F-4.

In each of these mishaps, had the crewmembers taken the time to think about their actions and used good judgment, most of these could have been prevented.

The Future

There are approximately 30 modifications currently being studied or underway on the C/KC-135 fleet. Three of the substantial modifications that crews will soon see are completion of the wing reskin, a new autopilot, and replacement of some of those 30-year-old wires.

The wing reskin is currently 94 percent complete. All aircraft should be completed and in the field in 1988. The current MC-1 autopilot will be replaced by a new digital system beginning in 1988. This new system will correct safety-related deficiencies and enhance reliability. Finally, the program depot maintenance (PDM) at Tinker AFB, Oklahoma, has made a proposal to replace wiring to 26 mission-essential and flying safety-related systems. This action will replace 25 percent of the total C/KC-135 wiring system. Expected start date is in 1991.

SAC's current avionics modernization proposal includes two important safety-related items: The ground proximity warning system (GPWS) and a flight data/cockpit voice recorder. We believe installation of these two devices would help prevent future mishaps.

Remember, one of your goals in 1988 is to prove our prediction of three mishaps wrong. With your help, we can make this a mishap-free year! ■

C-141

CAPTAIN BEN RICH
Directorate of Aerospace Safety

■ As we transition to a fiscal year (FY) reporting program and review the first 9 months of 1987, we find many similarities to our 1986 report — several great advances overshadowed by a few failures. The 9 months ending 30 September 1987 show 1 Class A mishap with a lifetime rate of .39 Class A mishaps per 100,000 flying hours (Figure 1). This makes the Starlifter one of our safest cargo aircraft in history with 30 Class A mishaps accumulated over 7.9 million hours of flying time.

We ended our fourth consecutive year without a Class B mishap, and the number of Class C and HAP mishaps continued to decline (Figure 2).

To accurately analyze the data, we must remember the 1986 change which raised minimum cost reporting criterion for a Class C mishap from $1,000 to $10,000. It will take several years to fully realize the effect of this reporting change, but we know one of its results was the 1986 decline in the volume of reports. The short reporting period for 1987 also contributed to the reduced numbers.

We saw several areas of improvement including the near elimination of problems associated with the engine, brakes, flight controls, and autopilot (Figure 3). Unfortunately, we saw dramatic increases in taxi mishaps and tail scrapes, and continued problems with cargo leaks. In addition, we increased the emphasis on reporting spoiler malfunctions, and as a result, we are reporting this item for the first time.

Logistics

As indicated above, the hard work of the engineers and maintainers resulted in the near elimination of flight control and autopilot mishaps and elimination of engine and thrust reverser mishaps (Figure 3). Our only flight control report involved a case of stiff ailerons and elevators resulting from misrigged ailerons and a failed elevator artifi-

continued

Figure 1
Cargo Aircraft Class A Mishap Comparison

Aircraft Type	Years	Mishaps	Cumulative Hours	Rate
C-124	50-74	132	6,627,613	1.99
C-5	68-87	13	851,610	1.53
C-130	55-87	131	11,251,056	1.16
C-135	57-87	70	8,882,394	.79
C-9	68-87	2	504,236	.39
C-141	64-87	30	7,940,176	.39
T-43	73-87	0	213,137	.00
C-22	84-87	0	4,563	.00

(As of 30 September 1987)

Figure 2
Mishap Reporting Comparison

CY	A	B	C	HAPs	Total
79	3	4	90	103	200
80	1	0	109	123	233
81	1	1	73	66	141
82	1	0	66	74	141
83	0	2	77	73	152
84	1	0	73	49	123
85	0	0	84	55	139
86	1	0	42	39	82
87	1	0	20	53	74*

*(1 January 1987 - 30 September 1987)

Figure 3
Mishap Comparison By Category

	1984	1985	1986	1987
Logistics	60	57	30	31
Flt Cont/AP	14	12	8	1
Landing Gear	7	3	1	5
Engines/TRs	4	17	0	0
Brakes	5	6	3	0
Spoilers		(Not Reported)		17
Misc (No Trend)	30	19	18	8
Operations	18	23	11	17
Taxi Mishaps	1	4	3	7
AR	2	2	3	3
Tail Scrapes	1	6	0	3
Misc (No Trend)	14	11	5	4
Others	45	59	41	26
Cargo Spills	5	12	11	9
Bird Strikes	15	19	5	3
Engine FOD	8	9	6	4
Physiological	5	15	17	9
Misc (No Trend)	12	4	2	1

(As of 30 September 1987)

cial feel spring.

We saw a slight increase in landing gear malfunctions which included three main landing gear actuator failures and one nose wheel steering problem. The fifth mishap is still under investigation.

A new area of increased emphasis concerns the spoilers. Several crews have experienced asymmetries resulting in near loss of control during the landing phase. HQ MAC directed that all spoiler malfunctions affecting aircraft controllability be reported, and the result is the massive increase in this category.

We believe this is only the tip of the iceberg, and for an unknown reason, crews are not reporting all applicable spoiler failures. All aircrews must accurately report this problem for the engineers to build a complete picture of the problem and find a timely and effective solution.

A final logistics-related problem involves the loss of the No. 2 overhead escape hatches and the resulting decompression. After four rather quick failures of this hatch (three events in late 1986), a rigging deficiency was found. Outstanding work by the maintainers at the 459 MAW (AFRES), Andrews AFB, Maryland, identified the real problem to be an omission from a rigging tech order diagram. Their findings were presented at the 1987 C-141 Systems Safety Group, and timely action by AFLC seems to have solved this problem. KUDOs to the 459 MAW (AFRES)!

Operations

C-141 crews completed thousands of challenging missions during 1987, and almost without exception, they were accomplished safely. Unfortunately, 17 crews failed to follow established directives and procedures and were involved in reportable mishaps.

We saw a repeat of three aerial refueling mishaps in 1987. There were no trends, as problem areas included a missing antenna, a brute force disconnect, and one case which is still being reviewed.

Our four miscellaneous mishaps included the mishandling of explosives, overboosting of four engines during a missed approach in known wind-shear conditions, crew-induced failure of the rear cargo doors, and possible operations factors involved with a Class A landing mishap. This last mishap has resulted in a re-evaluation of crosswind landing procedures and unusual landing configurations (approach flap landings).

Probably our biggest concerns revolve around the dramatic increase in crew-induced taxi mishaps and the reappearance of tail scrapes during landings (Figure 3).

How do we prevent taxi mishaps?

The 133 percent increase in reported taxi mishaps during 1987 is very alarming, and the solution doesn't appear to be in sight. During the period in question, crews ran their aircraft into a crew bus, a

fire bottle, a dirt mound (on a closed taxiway), and three crews taxied their aircraft off of operational surfaces. This is not only a C-141 problem. The C-130 and C-5 communities also declared open season on fire bottles, among other obstacles.

After a year's absence, the old, familiar tail scrape has returned to haunt us. Three mishaps during the August to September 1987 timeframe have driven MAC to amend C-141 landing procedures to eliminate this problem. A caution in the Dash-1 warned crews about possible pitchup during spoiler deployment after landing with an extremely aft CG.

Procedures now call for spoiler deployment after attaining a three-point attitude. This action, in addition to the airspeed command marker check added to the before landing check, should eliminate tail scrapes.

Other

Mishaps attributed to other than logistics and operational causes decreased by almost half. Bird strikes decreased by 40 percent while cargo leaks decreased by 18 percent. Aircrew awareness and alertness are required to eliminate the encounters with our feathered friends.

The cargo leak problem is ongoing, and we are losing the war. During 1987, we saw words "improperly prepared and packaged" on several mishap reports. Crews experienced JP-4 leaks from a boat, a pickup truck, diesel generator (yes — JP-4 from a diesel generator), fuel samples, and a fuel tank packed on a pallet without documentation. Other leaks included battery acid from a truck and oil from a large electrical transformer.

Any question about the potential consequences of a cargo leak or fire can be answered by a review of C-141 mishaps. The six Halon fire extinguishers on board our aircraft may not offer complete protection considering the types of materials we airlift every day, and prevention remains our best ally.

Loadmasters need to remain vigilant when supervising the loading of their aircraft, and aircraft commanders need to push for details and file accurate reports when the situation dictates. Every load has the potential for disaster, and only the crew's management of the situation will prevent this from happening.

Finally, a review of physiological mishaps for FY 87 shows little new. Crewmembers continue to be injured during falls in turbulence and continue to suffer from predictable ailments including ear blocks and dehydration.

C-141 Safety Record and Expectations

The C-141 remains one of the safest airlifters in history. The credit for this outstanding record goes, appropriately, to the operators and maintainers who ensure the C-141 fleet is constantly ready to deliver cargo anywhere in the world.

The diverse range of missions, from special operations at low level to high altitude, long range, and from aerial refueling to personnel and equipment airdrops, puts a tremendous strain on the aircraft and the people. We still do not fully understand the stresses the aircraft are experiencing during our airdrop and CATS training, and only future studies will shed light on this area.

It will take both ground support people and aircrews to accurately report and effectively fix hazards and discrepancies to maintain this aircraft's exemplary record as the safest airlifter in history. ■

E-3

MAJOR JAMES L. WALL
Directorate of Aerospace Safety

■ At the close of the 1987 safety reporting year (1 January 1987 through 30 September 1987), the E-3 had logged 23,302 hours for 1987. This gives the E-3 almost 225,000 hours of Class A mishap-free flying. In addition, there were no Class B mishaps reported, and Class C and high accident potential (HAP) mishaps increased only slightly for 1987.

Class C and HAP Comparisons

A comparison between the 1986 and 1987 Class C and HAP mishaps follows:

E-3 Class C and HAP Mishaps	1986	1987
Physiological	3	5
Pressurization	2	1
Dropped Objects	1	1

If one were to read the causes for the 1986 Class C mishaps (see *Flying Safety*, April 1987) and compare those with 1987, one might wonder if history really doesn't repeat itself. In 1986, the three physiological mishaps were caused by the following: One passenger flew with an infected ear resulting in an ear block; one crewmember experienced flu symptoms; another suffered from food poisoning.

In 1987, two crewmembers flew with colds that resulted in ear blocks; one crewmember displayed feverish symptoms in flight — later diagnosed as chicken pox; and three crewmembers became ill due to food poisoning. In 1986, the dropped object was a life raft door. Guess what the dropped object was in 1987?

In each of the 1987 physiological mishaps, an informed crew made the smart decision by terminating the mission and getting the stricken crewmember to the flight surgeon as soon as possible. The bottom line is, however, if you don't feel 100 percent — DON'T FLY!

1988 Forecast

AFISC is again predicting zero Class A mishaps for the upcoming year. However, only through the combined efforts of those who fly the airplanes and those who maintain them can the E-3 fleet continue to achieve its zero Class A mishap rate. ■

KC-10

MAJOR JAMES L. WALL
Directorate of Aerospace Safety

■ The KC-10 fleet currently consists of 56 aircraft and is still increasing. Since its initial flight in 1981, the KC-10 has logged a total of approximately 127,700 hours; 29,193 of these were flown in 1987. (The 1987 safety reporting year was 1 January through 30 September.)

The KC-10 in-flight safety record continues to be impressive. There have been no flight Class A mishaps and only two Class B mishaps; an engine FOD mishap in January of 1984 and the partial loss of the No. 2 cowling in February of 1987.

Class C and HAP mishaps have decreased for a second straight year. This article will discuss this prior year's Class C and HAP mishaps, the KC-10 ground Class A mishap, an in-flight Class B mishap, and a solved air refueling problem.

Class C and HAP Mishaps

In 1987, there were seven Class C and HAP mishaps reported. This compares to 12 in 1986 and 20 in 1985. The following figure shows the comparison of 1987 versus 1986 mishaps.

KC-10 Class C and HAP Mishaps

	1986	1987
Air Refueling	7	2
FOD	2	1
Bird Strike	1	1
Loose Cargo	0	2
Fuel Leak	0	1
Antiskid	1	0
Jet Blast	1	0
TOTAL	12	7

There were two air refueling mishaps. One involved a bent F-16 TACAN antenna when it was hit with the boom. The second involved a mechanical malfunction of the reel actuation system. Its failure to rewind after contact resulted in a lost F-18 probe and the KC-10's hose and basket.

The one reported FOD damage occurred to the No. 2 engine at an undetermined time and from an undetermined source. The single bird strike occurred while the KC-10 was on final approach. The bird struck the aircraft on No. 3 slat and caused approximately $28,000 worth of damage. For 1987, bird strikes cost the Air Force almost 20 million dollars.

Two mishaps resulted when the crew chief's pallet located in position 13L shifted in flight. Operator error was not a factor in either mishap.

The final mishap involved the failure of a fuel crossfeed manifold assembly coupling nut which allowed fuel to enter the aircraft right wheel well. This particular aircraft had not yet been modified with an outstanding TCTO to install relief valves in the manifold. It is believed this isolated mishap will be alleviated by the installation of these relief valves.

Class A Ground Mishap

The KC-10 experienced its first destroyed aircraft in 1987 as a result of a Class A ground mishap. During a maintenance ground fuel transfer operation, an explosion occurred in the fuel access compartment/center accessory compartment. The fire and additional two explosions destroyed the aircraft and fatally injured one maintenance technician inside the aircraft.

Class B Mishap

The No. 2 engine cowling had been opened for a borescope inspection. Twenty minutes after takeoff, the mishap aircraft experienced a partial loss of the No. 2 engine fan cowl. The departing cowling also damaged other aft aircraft sections.

Air Refueling Problem Solved

The KC-10 universal air refueling receptacle slipway (UARRSI) had been experiencing an abnormally high failure rate. In fact, 19 KC-10s had experienced cracks in the UARRSI during the past few years. Engineering studies revealed that the failures were caused by the initial positioning of the boom into the slipway. A plate has now been installed on the slipway that has alleviated the problem.

1988 Forecast

Although the KC-10 fleet suffered its first destroyed aircraft, the Class A mishap rate is still zero as this rate only counts flight mishaps. AFISC is again forecasting zero flight Class A mishaps for 1988. Even with the previous year's mishaps, the KC-10 fleet has a good safety record. More important, many lack of judgment mistakes that led to mishaps in previous years have been eliminated. Keep up the good work! Make 1988 another mishap-free year! ■

HELICOPTERS

MAJOR PHILLIP T. SIMPSON
Directorate of Aerospace Safety

■ The Air Force Inspection and Safety Center has transitioned from the calendar year to the fiscal year, so the mishap data presented here cover the first 9 months of 1987. During this period, Air Force helicopters experienced three Class A mishaps. Two of those aircraft were destroyed, while the third is scheduled to be repaired. The aircraft involved were an HH-3E, an MH-53H, and a UH-60A. The UH-60 mishap accounted for all four Air Force helicopter fatalities in 1987. The MH-53 mishap resulted in an Army passenger fatality.

The number of Class C mishaps and HAPs dropped from 105 in 1986 to 55 in 1987. While this number is only for a 9-month period, it is proportionally lower than for the same period in 1986. The 1987 mishap experience by aircraft category is shown in Figure 1.

HH-3E Class A

The H-3 lost in 1987 brings the total number of H-3s lost to 28. This mishap occurred during a ferry flight over high terrain. While crossing over a pass, the aircraft did not have the capability to climb as fast as the terrain was rising, and there was no room to turn around. The tip tanks were jettisoned, but this loss of weight had little effect.

The pilot landed the helicopter in rough terrain and it rolled over. The crew egressed with only minor injuries.

Supervision, mission planning, pilot proficiency, and human factors were involved in this mishap. The H-3 mishap rate for the year was 5.2, while the lifetime mishap rate for the H-3 is 4.32.

Figure 1
Class of Mishap

	A	B	C	HAP
H-1	0	0	10	10
H-3	1	0	15	12
H-53	1	0	3	4
H-60	1	0	1	0
Total	3	0	29	26

MH-53H Class A

This was the 23d H-53 the Air Force has lost since it came into service. The mishap aircraft was flying a mission to support Army training. During the approach, the tail of the aircraft struck the ground and the tail rotor disintegrated.

The pilot was able to land the helicopter, although it was heavily damaged.

During this sequence of events, one of the Army passengers was fatally injured and a number of other Army passengers received a variety of injuries.

Training and standardization regulatory guidance, exercise supervision, crew coordination and cockpit supervision, and life sciences were factors in this mishap. The H-53

force ended the year with a mishap rate of 11.2, while the lifetime mishap rate for the H-53 is 8.14.

UH-60A Class A

In 1987, the Air Force saw the loss of the first H-60 helicopter. The mishap aircraft was on a local VFR "Finis" flight for a retiring Air Force officer. After communications were lost with the aircraft, an air search was initiated. They discovered it had crashed in a heavily wooded area about 5 miles from the base. All four people on board were fatally injured.

The H-60 mishap rate ended the year at 44.5 with a lifetime rate of 5.74. However, these numbers are of questionable value since the H-60 force has flown less than 20,000 hours for an average of about 3,300 hours per year.

HAPs and Class C Mishaps

Even accounting for the shortened reporting period in 1987, the number of Class C mishaps dropped considerably. In 1986, the Air Force experienced 59 Class C mishaps, while there were only 29 reported in 1987.

Since this reporting period covered only 9 months, it would be reasonable to expect that, at the current rate of reporting, there would have been approximately 38 Class Cs for the full year. The change in Class C reporting criteria may well account for at least part of this drop. Figure 2 breaks these mishaps down further.

The biggest change occurred in engine-related mishaps, with 11 being reported in 1987 versus 37 in 1986. Three of these mishaps were actual engine failures while in flight, and all in H-1s. Out-of-limit engine indications led to in-flight engine shutdowns in both the H-3 and H-53. The remaining engine problems occurred on the ground for a variety of reasons.

The H-3 experienced a large number of one-of-a-kind mishaps that included a hung jumper using incorrect exit procedures, a jettisoned training drone, a PJ breaking his hand on a slippery floor, and a freewheeling rescue hoist.

Current Mods

A number of programs that have been ongoing over the last few years are nearing completion. The long awaited 650-gallon crashworthy fuel tanks for the H-53 are showing up in the field and may have already been put to the test during the MH-53H mishap.

New H-53 tail pylon upper hinge fittings are also showing up after it was discovered that a number of the old ones were cracking. Installation should begin next year on crashworthy armored pilot and copilot seats for both the H-53 and the H-3. The new flight mechanic's seat for these aircraft should already be installed.

The H-60 should also have its new seats by the time this article is published. The flight restriction on that aircraft is still in effect and will remain so until the installation of the cyclic stabilator slew-up switches. This modification should be completed by early 88.

The H-1 force is still waiting for the new fuel system being developed. The program is still underway but suffered a delay because of a strike at Bell Helicopter. New rescue hoists for the Hueys are being installed and, after overcoming a few installation problems, that program is just about complete.

Figure 2
HAP and Class C Mishaps

	H-1	H-3	H-53	H-60
Rotor System	1	0	0	0
Flt Controls	0	2	1	1
Engines	6	4	1	0
Drive System	4	0	1	0
Fuel System	1	3	3	0
Aircrew	1	3	0	0
FOD	1	0	0	0
Dropped objects	1	0	0	0
Misc	5	15	1	0
Total	20	27	7	1

Summary

In 1987, we did not experience a great year for helicopters, but it was a good year. Of the three mishaps this year, two were ops related, and the other was undetermined. Most of the Class C and HAP mishaps were logistics related.

Many changes are taking place in the Air Force helicopter fleet. While the numbers of H-1 and H-3 helicopters are being reduced, the planned numbers of H-53 and H-60 helicopters are on the increase. However, the bottom line is that the fleet is aging, and both mechanical and material problems can be expected.

We have to anticipate, find, and fix these problems before they become mishaps. This takes an ever increasing effort on the part of everyone involved. FY 88 can be a mishap-free year. Let's work smart, fly smart, and make it happen. ■

TY 1987 USAF EJECTION SUMMARY

LT COL JESSE F. JENKINS
Directorate of Aerospace Safety

■ During the period 1 January 1987 to 30 September 1987, 35 ejection seat or capsule-equipped aircraft were involved in Class A mishaps. These mishaps involved 53 aircrew who had the capability to eject. Of these 53 persons, 20 failed to eject, 2 ground egressed and survived, and 31 ejected. All 20 who failed to eject were fatalities. (There were 16 aircraft involved with those who did not eject.) Ejection seat fatalities totaled 30 crewmembers this transition year, 20 that did not eject, 9 that ejected out of envelope, and 1 ejection seat that failed to fire.

Out-of-Envelope Fatalities

■ The mishap aircraft was lead in an F-4, three-ship low-level mission. Until the return, the mission went as briefed. The lead aircraft entered the break at 3,000 feet from the runway threshold, and reached downwind at a lower-than-normal altitude. It also had a slightly nose-low attitude with an excessive amount of right bank. During the right bank, the nose continued to drop, bringing the aircraft short of the normal base turn position.

The WSO ejected in a near horizontal attitude but only got a partial chute opening because of the low altitude (100-150 feet AGL). The WSO died 9 days later. The pilot also ejected out of envelope and died.

■ The mishap sortie was the return flight of an F-4 two-ship, out-and-back mission originally scheduled as a low-level return. However, due to a weather delay, the mission was flown high-level to an alternate base. After contacting approach control, the flight split up for multiple approaches. The mishap aircraft had completed three ILS approaches. On the fourth approach, after acknowledging an instruction to "Turn left to 360 degrees and descend to 1,500 feet," radar contact was lost.

A dual-sequenced ejection was initiated, but it was well out of envelope. All systems functioned normally until interrupted by impact. Both crewmembers were fatally injured. The aircraft impacted the water and was destroyed.

■ Mishap aircraft was lead of a two-ship formation of F-111s which departed to fly a flight lead upgrade sortie. Weapons deliveries were accomplished on two ranges prior to descending low level for a simultaneous Pave Tack toss on a simulated target.

At the initial point, the IP established himself on the left at 4,000 feet line abreast, and the lead AC accelerated the formation to 540 kts true airspeed for the delivery. With approximately 25 seconds time to go (TTG), the IP checked right to center his steering. At 22 seconds TTG, the lead pilot began his pull, and approximately 2 seconds later, the IP began his pull.

The IP observed the lead aircraft until it began a nose high turn away at approximately 60 degrees of bank at which time he began concentrating on his own maneuver. The IP remained below the clouds, which were approximately 2,700 feet MSL (2,200 feet AGL).

Meanwhile, the lead aircraft entered the weather during the toss recovery. It emerged extremely nose low and impacted the ground, fatally injuring both crewmembers.

■ The mishap pilot was No. 2 of an A-10A three-ship on a TGM-65 Maverick training mission. The flight was performing nontactical Maverick practice in essentially a trail formation, with the "shooter" in front, a safety observer following, and the third aircraft in trail.

At completion of the No. 2 pilot's practice, the flight lead (the middle aircraft of the trail formation) initiated an in-place 180-degree turn to reposition the flight and place No. 3, the new "shooter," in front, with No. 2 in trail. The mishap pilot initiated a hard (4 to 5 g) turn instead of the 2 to 3 g turn briefed by the lead, resulting in a flightpath conflict between him and lead.

Both pilots recognized this conflict, and No. 2 passed approximately 500 feet above lead on a reciprocal heading. The No. 2 pilot continued to turn and climb, apexing at 2,000 feet AGL, 170 KIAS, in a near inverted position headed away from the other aircraft. He then attempted a split-S type maneuver to get in trail with the flight. Passing 700 feet AGL, the pilot grabbed the ejection handles but was descending far too rapidly to initiate ejection prior to impact.

■ The mishap aircraft was scheduled as a single-ship adversary for four C-130 aircraft. While maneuvering to keep visual contact with a C-130, the mishap aircraft entered a stalled, loss-of-control condition from which it was not recovered. The dual-sequenced ejection attempt was out of envelope and fatal to both aircrew members.

Table 1 depicts the number and type of aircraft involved and the number of individuals who did or did not eject.

The 31 aircrew who ejected were involved with 19 aircraft. The nine fatal ejections were all out of envelope for the respective aircraft. The 21 successful ejections accounted for a 68-percent survival rate. Table 2 shows the injuries by aircraft.

Table 3 provides another way to look at 1987's ejection information.

All of these data are drastically lower than the 1986 statistics. This year's data have indicated that when a mishap occurs, if you don't eject, or if you eject out of envelope, you will be a fatality.

The decision to eject must be made during mission planning. Be sure you are intimately familiar with the ejection envelope for your aircraft, and be alert for situations during the mission that place you out of envelope. The ejection decision frequently must be made quickly without a lot of time for analyzing the situation. Several of this year's out-of-envelope ejections were only 2 to 3 seconds past being survivable. Know your aircraft, know your situation, and have a plan to "step over the side." ■

Table 1
Ejections By Aircraft

Aircraft Type	Number of Aircraft	Persons Ejected	Persons Did Not Eject	Fatalities
B-1B	1	4	0	1**
A-10	5	1	4	5
AT/T-38	3	1	4	4
OA-37	1	1	0	0
A-7	1	0	1	1
RF/F-4	8	10	6	12
F-16	9	7	3	3
F-15	3	1	2	2
F-111	3	6	0	2
TOTALS	34	31	20*	30**

* Note: All nonejections were fatal.
** Two additional fatals not included here since they were not ejection-seat equipped.

Table 2
Nonfatal Ejection Injuries

Aircraft	Major	Minor	Minimal	None	Total
B-1B	0	0	0	3	3
AT-38	0	1	0	0	1
OA-37	0	0	0	1	1
RF/F-4	1	0	2	1	4
F-16	0	1	2	4	7
F-15	0	1	0	0	1
F-111	2	0	0	2	4
Totals	3	3	4	11	21

Table 3
Overall Ejection Results

	Number	Percent
Ejected and Survived	21	39.6
Ejected and Fatal	10	18.9
No Ejection and Survived	2	3.8
No Ejection and Fatal	20	37.7
Total	53	100

THERE I WAS

■ There I was — a new T-38 instructor on my first dollar ride with a student. I didn't realize Murphy was going to go with us.

The profile called for an afterburner climb to 45,000 feet and acceleration to supersonic. This was followed by a descent into the low altitude working areas for more demonstrations of aircraft performance characteristics.

Everything had gone perfectly as we progressed to the final demonstration before heading back to the pattern. I took the aircraft and told the student to shut down the right engine. I lowered the landing gear and showed him that one engine provided enough hydraulic power for this operation as well as enough power to fly the aircraft with the gear and flaps down.

I then showed him that if I began moving the stick rapidly around the cockpit, the hydraulic pressure would drop enough that the gear would not retract when I raised the handle. My smooth patter continued as I said, "Now watch. When I freeze the stick, the hydraulic pressure will recover and the gear will retract."

Just as I had said, the pressure came up to normal almost immediately. But, the three green lights for the gear remained on, and the gear didn't retract even though the handle was up. This had never happened to me before. With only a slight pause and keeping my cool, though, I said, "Sometimes you have to recycle the handle."

That didn't work either, so I said, "Let's restart the engine and then the gear will retract." We did, but it didn't.

Out of ideas, low on fuel, and no longer so confident, I declared an emergency with the center and got clearance directly to the base. There were no alternate fields, and a quick calculation told me we didn't have enough fuel to get home with the gear down.

I recycled the gear handle several times on the way home because I figured it would be better to get home than have to eject over the mountains. If we got home and had to eject because the gear was stuck up, we would be in the flatlands and less likely to be injured as well as easier to pick up.

After recycling the gear handle what seemed like at least a hundred times, the gear suddenly retracted. We made it home with very little fuel, the gear extended normally, and we landed uneventfully. Maintenance found nothing wrong with the aircraft, and no one could give me any reason why the gear wouldn't retract for us. It had to be Murphy.

What did I learn other than a little humility? I learned to plan my missions to provide the greatest possible margin for error. From then on, I performed that demonstration early in the mission while I still had plenty of fuel. I carefully reviewed every profile in terms of gaining maximum training with maximum safety.

In your mission planning, do you consider Murphy? ■

OPS TOPICS

Poor Connections

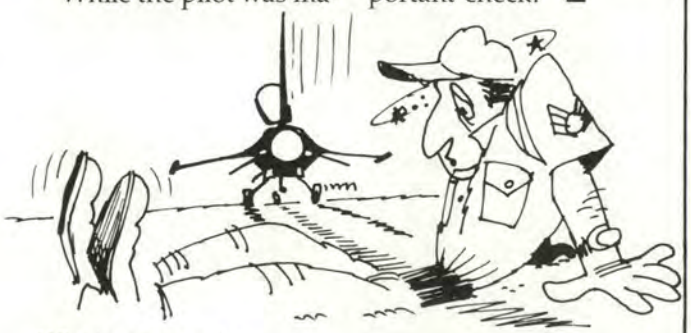
■ The T-33 pilot was participating in a routine target mission at 25,000 feet MSL when he began to feel dizzy. He selected 100 percent oxygen and performed a PRICE check. The oxygen regulator blinker did not move, and there was no pressure in the mask when the pilot selected pressure. All connections appeared secure.

The pilot declared an emergency and descended below 10,000 feet. Shortly thereafter, all his hypoxia symptoms disappeared. He selected emergency oxygen but didn't feel any pressure.

While the pilot was maneuvering for final approach, he discovered his oxygen hose disconnected from his CRU-60P. He reconnected the hose, left the regulator set on emergency oxygen, and made an uneventful landing.

When the pilot initially strapped in the aircraft, he connected his oxygen hose incorrectly. He could breathe normally, but he was only getting ambient air which led to hypoxia at altitude. He didn't find the error until the hose disconnected.

Remember, a careful PRICE check will prevent this kind of error. Don't rush or gloss over this important check. ■



Who's on First?

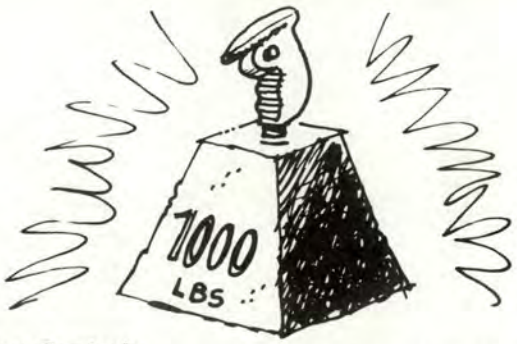
The F-16 had just returned from a mission and was marshaled in front of the shelter by an assistant crew chief. The pilot signaled for an immediate shutdown and saw the crew chief go under the aircraft to install the chocks.

The pilot assumed the chocks were in place and shut down the engine. In fact, the chocks had not been installed. The crew chief was concerned about the immediate shutdown, and suspecting an emergency, looked over the aircraft for problems.

The crew chief then saw the canopy open, so he got the ladder and put it in place. As the pilot started to climb out of the cockpit, he saw a chock on the ground and asked if the aircraft was chocked. The crew chief said no and turned to get the chocks.

As if on cue, the aircraft began rolling backward. The pilot tried to stop the aircraft with normal brakes and parking brake. The crew chief attempted to stop it by placing a chock behind the rolling left main tire. The blast fence finally made the stop when the aircraft rolled into it.

Why the pilot was in such a hurry is a mystery at this time. But, this is a classic case of what results when we mix assumptions and distractions with a lack of communication.



Heavy Controls

Approximately 1 mile prior to refueling while leading a 3 ship of FB-111s, the pilot felt heavy forward stick pressure. Neither stick trim button would relieve the force. The auxiliary pitch trim was finally able to relieve the pressure, and the crew completed the air refueling uneventfully.

During post air refueling and formation breakup, the aircraft pitched down twice in rapid succession to about 10 degrees nose low. The crew completed applicable emergency procedures and made an uneventful recovery at home base.

Improper stick forces and unscheduled flight maneuvers are definite indications of flight control problems. As happened in this case, the problems may get worse. If you experience any flight control problems, you should terminate formation flight and air refueling unless it is necessary to continue. ■

MAINTENANCE MATTERS

JACK AND JILL WENT UP THE HILL, BUT ONLY JACK CAME DOWN

■ Following the first mission of the day, the crew chief found his F-4 needed a main tire change. He removed the worn tire and wheel without any problems. But when he went to install the new wheel and tire, the tread of the new tire dragged against the ramp, making it difficult to push the wheel into the brake head.

After he stroked the jack handle a few times to raise the aircraft, he heard a loud pop and saw hydraulic fluid spraying in a mist from the end of the jack.

As the aircraft began to slowly descend, the crew chief obtained a wing jack to keep his Phantom from settling on the partially installed wheel.

When this unit submitted a materiel deficiency report (MDR) to determine the cause of the jack failure, they found there had been three other MDRs on the same type of jack. In fact, the unit's telephone conversations with the project technician revealed that part number (PN) 4920 represents the oldest 15-ton jacks in use.

A replacement jack (PN 8925) had already been identified, but early production problems resulted in a mass recall. The aging 4920 jacks are being replaced by attrition, but only as replacements become available.

Meanwhile, since the 4920 15-ton jacks are prone to fractures in the base plate, perhaps units still using these items may want to increase their inspection intervals to prevent another failure on the flightline.

Our tha .ks to the Air National Guard, 123d Tactical Reconnaissance Wing, Standiford Field, Kentucky, for sharing this maintenance matter with our readers.

T-37: LAW OF LAST CHANCE

Did you ever hear of the so-called law of last chance? Judges use it quite frequently in determining responsibility in questionable traffic court cases. They sometimes surprise both parties involved by ruling that either of them could have taken some action to prevent the mishap. You may recognize a strong parallel in the following explosives mishap.

An aero repair (AR) technician was dispatched to a T-37 to install and rig the canopy actuator. The left seat was removed for maintenance, and all lines were disconnected and safety pins installed.

Standing in the cockpit and holding up the canopy with his back toward the front of the Tweet, the AR troop asked the assistant crew chief to help reset the declutch cable.

The crew chief leaned over the canopy rail and pulled what he thought was the canopy handle, but the handle would not move. The AR technician told his helper to remove the safety pin and try it again. The crew chief removed the pin and pulled the canopy jettison handle. The initiator fired, filling the cockpit with smoke.

When working in and around aircraft cockpits, use special caution. If you're unfamiliar with some of the cockpit switchs, buttons, or handles, stop immediately and get the right technical expertise. This also applies if you doubt the word of a coworker who appears unsure.

Don't be the person who missed the "last chance" in an explosives mishap in your unit.

HAIR RAISING TAKEOFF

As the copilot advanced the throttles on a multi-engine aircraft during takeoff, he noticed the No. 2 engine pressure ratio (EPR) indicated 2.10, instead of the normal 2.01 with 94 percent RPM. When he pulled the No. 2 throttle back, the EPR stayed at 2.10.

The aircraft commander (AC) took control and confirmed the engine did not respond to throttle input. With the engine stuck at 2.10 EPR and 95 percent RPM, the AC initiated an abort. When the AC selected reverse thrust, the aircraft veered sharply to the right due to the engine going to full reverse. To maintain directional control, the AC shut down the right engine. The rest of the abort was uneventful.

Investigators discovered the No. 2 engine thrust rod was disconnect-

ed from the crossover shaft. The castellated nut on the bolt connecting the thrust rod and crossover shaft had completely backed off, allowing the bolt to fall out and the thrust rod to disconnect. The castellated nut, bolt, and washer were in the cowling, but a cotter pin that secures the castellated nut was not found.

The aircraft had recently completed an isochronical (ISO) inspection. Due to the thoroughness in documentation and followup inspections by quality assurance, investigators determined the cotter pin was installed at the completion of the ISO. Following the ISO, the aircraft developed recurring discrepancies with the throttle friction.

Maintenance actions included removing, relubing, and reinstalling the throttle friction brake assembly, followed by a throttle rig. However, investigators found the throttle rigs in the unit were not being performed in accordance with the technical orders. Because there was no formal training or certification required for technicians performing throttle rigs, an incorrect "word-of-mouth" procedure had been passed along.

Since the mishap, this unit's maintenance organization has developed a certification program requiring indepth training prior to technicians performing critical tasks such as throttle rigs. Perhaps other units may want to review similar critical task-training procedures.

A cotter pin in a bench stock bin or a trash container may seem like an insignificant item. Yet, in a high performance aircraft, a cotter pin can make the difference between a takeoff being uneventful or a flight mishap.

OA-37B: HOOD HAZARD

After experiencing a bird strike to the right windscreen, the OA-37 pilot declared an in-flight emergency and returned to base.

Immediately following the "Dragonfly" landing, a firefighter walked up to the right side of the aircraft carrying the hood to his firesuit in his hand. As he approached the cockpit, his hood was sucked up against the right engine screen.

Firefighters aren't the only folks whose business may bring them close to operating jet engines. An incident like this also should be a reminder to maintenance people to be careful.

A-10: HASTY FUNCTIONAL CHECK

A weapons crew was dispatched to an A-10 to perform a triple ejector rack (TER) functional/stray voltage check. Using hand signals, the crew completed the check and then started to perform a post-load inspection.

The crew supervisor carted the No. 3 breech of the TER on station 8. Prior to carting the No. 2 breech, he noticed the TER electrical safety pins were not installed. This made the functional/stray voltage check invalid.

Forgetting for a moment about the carted No. 3 breech, the supervisor directed his crew to perform the voltage check again.

After this second check, a crewmember noticed the No. 3 breech was seated on station 8. Although the breech felt warm, the crewmember didn't think anything was wrong.

When the crew supervisor followed up with the post-load inspection the second time, he recalled the cart inside breech No. 3. The cart had fired.

Keep this incident in mind when you're tempted to perform a system check with hand signals instead of using head sets and communication cords. And once you've established proper communication, don't forget to follow the checklist and technical orders.

SIMPLE AS . . .

Anyone who works on the flightline knows that marshaling an aircraft or chocking the main wheels are both simple tasks. Yet even these simple tasks, often taken for granted, can turn into unexpected mishaps.

As the crew chief marshaled his F-4 in a right turn for parking, the pitot tube struck the exhaust port of a −60 electrical power unit, pulling the pitot tube out of the radome.

After a C-21 returned from flight, a contract maintenance technician chocked the nose tire instead of the main tires and began to refuel the aircraft parked on a 2 percent downgrade. The aircraft jumped the nose chock and rolled forward, striking a parked vehicle.

While we are each highly qualified in our respective fields, we should never take for granted those tasks that seem easy. ■

NITED 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.

AIRMAN FIRST CLASS

Jeffery J. Amy

2066th Communications Squadron
Myrtle Beach AFB, South Carolina

■ On 19 March 1987, Airman Amy was the Myrtle Beach AFB RAPCON east approach controller working Grand Strand Airport traffic. The airport had a 300-foot ceiling, 2½ miles visibility in fog, and the ILS was the only usable approach. The radar's programmed indicator data processor was inoperative which increases the controller's workload. At one time, he was controlling eight aircraft, two of which had serious aircraft malfunctions.

A Beechcraft Bonanza reported in with gyro problems, and Airman Amy immediately began issuing no gyro radar vectors to the localizer final approach. Immediately behind the Bonanza, a Cessna Cardinal reported in with electrical problems and a request to land expeditiously. Observing that the Bonanza was unable to track on the localizer course, Airman Amy issued a missed approach using no gyro vectors. He then directed a short box pattern back to final while vectoring the Cardinal across final for sequencing.

Again, the Bonanza was unable to maintain the inbound localizer course. Airman Amy gave the Bonanza no gyro vectors for missed approach while vectoring the Cardinal to the localizer final approach. The Cardinal was beginning to lose battery power, and Airman Amy backed the pilot up through a safe landing.

Meanwhile, he vectored the Bonanza back around for a third attempt at the localizer. When the pilot was unable to maintain the localizer course, Airman Amy gave him an inbound VOR radial to fly that would be closely aligned with the localizer. As the pilot approached minimums, he drifted off course and turned away from the airport.

Airman Amy then directed the pilot to fly along the coastline while he called out the airport position and direction relative to the aircraft. At 2 miles, the pilot saw the airport and was able to make a safe landing. WELL DONE! ■

☆U.S. GOVERNMENT PRINTING OFFICE: 1988 — 779-045/60007

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
William V. Cagle

CAPTAIN
Patrick D. Mullen

27th Tactical Fighter Wing
Cannon AFB, New Mexico

■ On 15 February 1987, Captain Cagle, IP, and Captain Mullen, upgrading IP, had just entered a low level route at 500 feet AGL when a large bird struck the right forward windscreen of their F-111D aircraft. The bird strike left an 8- by 15-inch hole in the windscreen and scattered bird remains, plexiglass, and metal fragments throughout the cockpit. Both men were dazed and suffered numerous cuts and bruises. Captain Mullen, in the right seat, avoided serious injury by ducking just prior to the impact as the bird and shattered plexiglass demolished the top of his seat. Captain Cagle's right arm was severely bruised.

Fighting disorientation from the wind blast, Captain Cagle maintained aircraft control, called "knock-it-off," and initiated a climb. Seeing his wingman's difficulty, the flight leader joined on the disabled aircraft and began leading it toward the nearest suitable airfield which was 100 miles away.

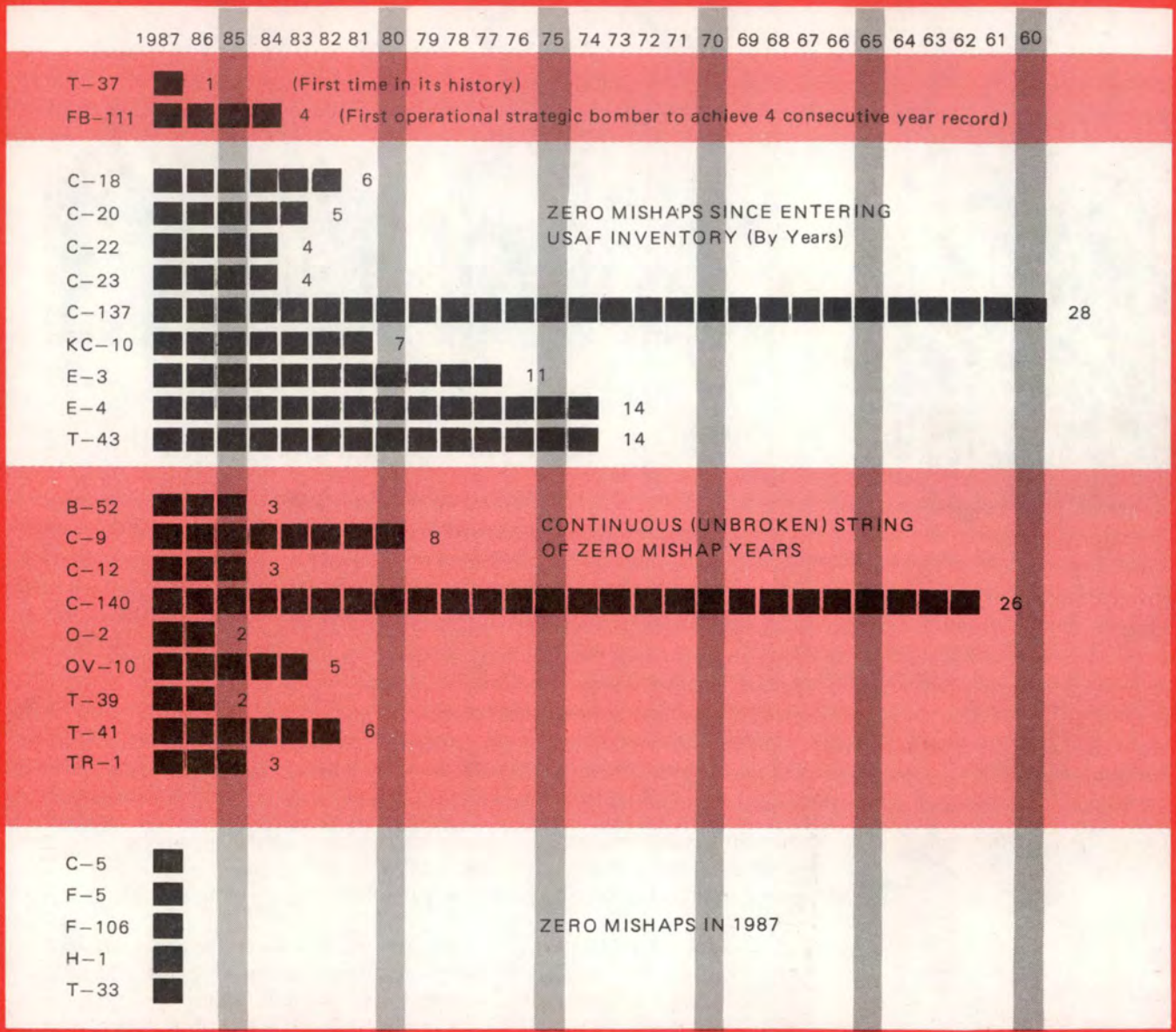
The severity of the wind blast through the hole in the windscreen was so deafening that neither Captain Cagle nor Captain Mullen could talk to each other or their leader. Because the crew could not receive or transmit on the radio, the flight leader coordinated with all controlling agencies en route to the recovery base.

While accomplishing the necessary emergency checklists despite extremely limited communications, the crew discovered the bird had destroyed the center circuit breaker panel. This prevented dumping the fuel and necessitated an alternate gear extension. At the landing base, they successfully completed a heavyweight, approach-end barrier engagement.

The superior airmanship and crew coordination demonstrated by Captain Cagle and Captain Mullen saved a valuable combat aircraft. WELL DONE! ■

ZERO MISHAP RECORDS

(Class A Mishaps)



Congratulations . . .

To everyone involved in the flying, maintenance, and handling of these aircraft in achieving these ZERO MISHAP RECORDS: Well Done!