flying SAFETY

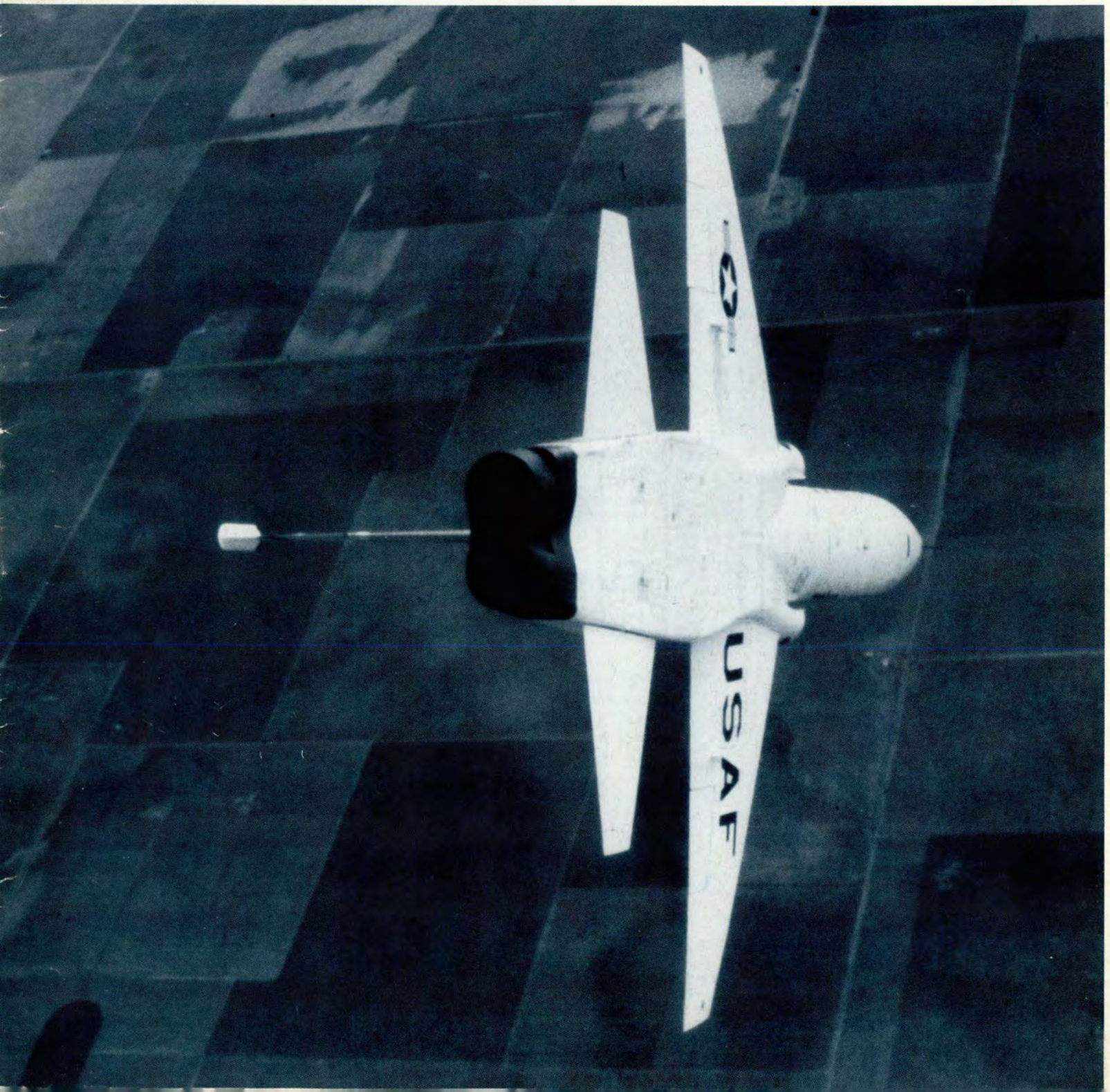
Cockpit Management Training Program

CRM for the Single Pilot (and married ones too)

A True Story

Annual Trainer Summaries

DECEMBER 1991



THERE I WAS

■ I started skydiving back in 1973 because it was cheaper than flying. To date, I've accumulated over 900 jumps. About 5 years ago, I was finally able to afford flying lessons. Since then, I've logged 1,200 hours — over 600 hours as a skydiver driver for Archway Parachute Center. While flying jumpers, I wear a parachute, so I wouldn't hesitate to jump from a disabled aircraft — that was, until Easter Sunday. One of my passengers was a nonskydiving 4-year-old.

It was slow at the Archway drop zone because the winds were barely inside the maximum skydiving limits. I was 7,000 feet over Sparta Airport in Archway's Cessna 182 with two skydivers on board. A mother and her son were also riding along as observers; i.e., they intended to land with me instead of jumping.

The engine suddenly lost power and started shaking like it was running out of fuel. I reached down to reset the fuel selector thinking one of the jumpers had accidentally bumped it. This happens a lot, so I wasn't too concerned. Suddenly, there was an explosion, and flames engulfed the nose of the airplane. My first instinct was pure fear. I was afraid we had turned into a flying inferno.

Things get blurred about this point, but I do remember shutting down the engine while simultaneously yelling "Get out!" to the jumpers. For an instant, I considered leaving, too, until I remembered the two observers in the back of the plane. The flames died out, so I knew we weren't in immediate danger. I gave a thumbs-up to the observers and concentrated on getting us safely back to earth.

I trimmed for best glide speed and headed for the airport a mile off the nose. I couldn't get a response from Scott Approach until I turned the master switch on. I don't remember shutting it off, but nobody else could have. I also don't remember undoing my seatbelt, but I must have because it was lying at my feet. I guess my desire to jump had been stronger than I thought.

Things were less tense now. I wished my legs would stop shaking. I didn't know how much damage the engine had suffered, but from the amount of oil on the windshield, it must have been substantial. I entered downwind at 2,000 feet and flew a tight pattern for a final approach 2,000 feet out and 800 feet high. I was aiming for a point one-third the way down the runway so I'd have a margin for error.

After I was sure I'd make the runway, I lowered the flaps and concentrated on airspeed. It was a little difficult to judge the flare point because the oil had obscured most of my forward vision, but I managed somehow. We touched down on the mains, let the nosewheel down softly, and coasted to the runway exit. As soon as we cleared the runway, I stopped the plane and followed the observers out the door. We'd been lucky so far, and I didn't want some vagrant flame to spoil it.

I have mixed feelings about my performance. There are things I should have done differently, and things I shouldn't have done at all. We're still alive because of preparation and the grace of God. I routinely practice emergency landings and, while flying jumpers, always stay within gliding distance of the airport. It finally paid off. ■

UNITED STATES AIR FORCE

Flying SAFETY

DECEMBER 1991

AIR FORCE SPECIAL PUBLICATION 127-2

VOLUME 47, NUMBER 12

page 12

page 16

page 21

SPECIAL FEATURES

REGULAR FEATURES

CONTRIBUTIONS

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

DEPARTMENT OF THE AIR FORCE • THE CHIEF OF SAFETY, USAF

PURPOSE — *Flying Safety* (ISSN 0279-9308) is published monthly by the USAF, Norton AFB CA 92409-7001, 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 at San Bernardino Postal Service, 1900 W. Redlands Boulevard, Redlands, CA 92373 and additional entries. **POSTMASTER:** Send address changes to *Flying Safety*.

T-37

MAJOR DANIEL CHAPMAN
Air Force Safety Agency

■ While my student and I awaited fuel at a civil field stopover, a silver-haired corporate pilot, with nostalgia glistening in his eyes, came over to admire our sporty little aircraft. Peering over the rail, he gasped, staggered back, and mumbled to me something about the antique value of all those round instruments.

After assuring him it was all standard T-37 avionics, he shook his head in wonder that we still actually trained guys on those things. Then he dazzled us with the glass cockpit, GPS, INS, LORAN, storm radar, and autofile features of his boss's Gulfstream.

For 35 years, a generation of pilots have had their feathers groomed in the venerable Tweet. This not only includes our military pilot fraternity, but by now, a major section of our commercial pilot force as well. Virtually ALL of today's USAF pilots have T-37 time somewhere on their Form 5.

T-37 training started off with a bang by suffering 50 Class As in 5 years (1958-62). As it approaches the autumn of its life, it has mellowed considerably and proven to be not only a durable trainer, but extremely forgiving, as well.

It's now been 2½ years since our last Class A. In fact, 3 of the last 5 years have been mishap free! We've beaten the Grim Reaper's (computer) forecast which predicted an aircraft lost each year. Does that

For the past 35 years, virtually every USAF pilot has logged time in the Tweet.

mean the risk is over? Absolutely NOT! Remember, 73 souls have perished over the years in (or from) a T-37 flight. The potential to kill will remain as long as we fly it. Fortunately, it's been 8 happy years since our last fatality. In fact, you can't find a trainer that comes close to matching the Tweet's safety record.

The T-37 recently has averaged 310,000 flight hours annually to accumulate almost 11 million flight hours. During those hours, we've had 128 Class A's for a record low, lifetime rate of 1.17 mishaps per 100,000 flight hours. Consistent with the rest of the Air Force inventory, 75 percent have been caused primarily by the operator. Only 1 out of 5 (20 percent for you bean-counter statisticians) were maintenance or logistics. The vast majority of losses were "pilot-induced-control-loss," a term generally meaning they stalled it, or spun it in.

We've grown accustomed to such an aggressive stall/spin training program we've almost forgotten the threat even exists. Tweet crews would do well to consider our recent successes were preceded by a legacy of death and destruction from ham-fisting the stick "back in the old days."

The second and third leading operator causes are collision with the ground and midairs. Moving over to the nonoperator causes, engine malfunctions dominated followed by structural failure and fuel system problems.

That last one got my attention. How many experienced Tweet drivers have never terminated early for an annoying fuel problem? This year will be a challenge with regard to the conversion to JP-8. Last year's experience with Jet-A showed how cold weather, high altitude, and idle power can lead to a flameout. This winter, listen for "the sounds of silence" if you're sipping Jet-A or JP-8.

Some other problems have been and will continue to stay with us. Physiological incidents should be avoidable, but no pressurization, and marginal air-conditioning, combined with low-experience students, make earblocks, motion sickness, and hypoxia events very likely.

Did you know T-37s have the most "jerks" of any USAF aircraft? It's true if you understand a "jerk" is a physical unit of G-onset rate. (Actually, the most human jerks are arguably in the F-15/F-16 world — you pick). With the fastest Gun in the West (G-force gun, that is), the T-37 blacks out and puts to sleep 80 percent of the USAF's GLOC victims.

The J-69 engine is emerging as a potential trouble spot as it begins to show its age. In fact, our last Class A involved a failure of the compressor rotor due to fatigue. Fortunately, our "Loggy" friends are meeting the challenge head on with actions to ensure engine reliability in the years to come. In the past 3 years, they found five bad compressor rotors *before* they cost us any airplanes.

They're also continuing the Structural Life Extension Program (SLEP). SLEP will mean beefing up the wing, fuselage, and tail section. With this facelift, the airframe will not only be as good as new, much of it will actually BE new. For the really tired ones, an honorable retirement in Arizona is being arranged. Already, our fleet has dropped from 640 to well under 600.

So what do the naysayers forecast during FY92? The computer (we always blame the computer) predicts a 28 percent chance of having one T-37 Class A. If we do lose one, it will most likely be due to an engine problem, or perhaps by pilot-induced control loss. Let's keep the roll going. We've beaten the computer before; let's make this the third mishap-free year in a row. ■

In almost 11 million flying hours, the Tweet has maintained an impressive 1.17 mishap rate.

T-38

MAJOR DANIEL CHAPMAN
Air Force Safety Agency

■ Undoubtedly, the hottest trainer of this century is the T-38. Looking to the future, the hottest trainer early in the next century probably also will be the T-38. Talon drivers can boast being among the first to fly a craft of the 2001 era!

Having grown up with the baby boomers, the T-38 is 34 years young and going strong. By now, the folks who have "driven" the white rocket could fill a large stadium. Today, ATC devotes the majority of T-38 hours to train the next generation of pilots. Most of the balance of T-38 flying goes to TAC, SAC, and AFSC. Tomorrow's fighter pilots fly the AT-38 at Holloman AFB, New Mexico, while today's SAC copilots gain valuable experience in the accelerated copilot enrichment program.

Of course, test pilots and astronauts do their "right stuff" thing in the trusty Talon also. Over 800 birds are still flying, racking up more than 350,000 flying hours in FY91. That's more than any other aircraft except the F-16. Since 1960, the fleet has amassed just over 11 million hours aloft!

The T-38, *Talon*, also provides valuable experience in SAC's accelerated copilot enrichment program.

Mishap Summary

During its illustrious lifetime, Northrop's best success story has enjoyed one of the Air Force's safest records. Keep in mind it's a *trainer* and, therefore, it's even more amazing how well it has stood up to the abuse of over 50,000 student pilots. Since the first training flights, misfortune struck with 183 Class A's, destroying 177 aircraft. The Grim Reaper robbed us of 133 lives, showing how unforgiving a crash can be in this vehicle.

In its worst decade (1965-1974), 95 aircraft were lost, taking 72 lives in the process. Once we figured out how to fly the final turn, the angry beast was tamed a bit. In the long run, the T-38 has enjoyed a lifetime rate of 1.67 mishaps per 100,000 hours. On the average, this means if two squadrons flew steadily over a 3-year ATC tour, one aircraft would be lost.

Recent years have been *much* better, giving us rates that have declined to figures like 0.54 in 1988 and 0.28 in FY91. Mishap frequency has plunged to about one-tenth of those really bad years.

So, what made the difference? Mostly, it was improvement *in the*

After 34 years of service, the T-38 fleet has flown more than 11 million hours.

pilot. "Operator factor" was cited in 61 percent (i.e., 111) of the Class A's. About half that many were logistics/maintenance related.

One Class A — No Class Bs

In spite of all the good news, we saw the ugly side this year as two fellow aviators perished in our only FY91 Class A mishap. The mission was the very first T-38 sortie for the student, and everything was normal up through pattern entry. On one of the student's pattern attempts, the aircraft was flared high and began to wing rock.

The RSU sent them around, and the aircraft veered well off of runway heading as the wing rock persisted. The jet appeared to be recovering as it approached the edge of the airfield. There, the crew faced the tower, fuel dump, and other base structures. At this point, the aircraft pitched up sharply, exhibited another wing rock cycle, and sliced to the ground.

Problem Areas

Based on the above, we still aren't completely immune to the treacherous stall behavior which plagued the Talon's early years. Actually, it's a credit to the designers that, in many respects, all performance is fairly benign. The T-38 gives plenty of warning, it has no abrupt loss of lift, it has immense spin resistance, and it doesn't even want to depart controlled flight. Still, the wing rock can be taken as the T-38's feeble efforts to *try* to depart.

Although lift production remains adequate at stalling angle of attack (and beyond the stall, for that matter), roll control at extreme angles is unacceptable. It's far better to sacrifice 5 to 8 percent of your max lift potential than to have it all, but have it pointing sideways. The cure is as simple as it is timeless: Don't pull the stick too hard.

Mechanically, the T-38 continues to struggle with perennial engine stalls and flameouts, cabin depressurizations, and an assortment of minor electrical and gear problems. The logistics folks are earning their keep working upgrades in the J-85 compressor and carefully managing a fatigue problem with the side brace gear trunnion. Tire failures gave a number of wild rides, but problems with the 14-ply tires will hopefully be avoided by earlier change-outs.

The Outlook is Bright

Careful attention to the whole system is giving the White Rocket enough longevity to take it well into the next century. Pacer Classic mods are beefing up the flight controls, fuselage structure, and cockpit enclosure. A really neat improvement (dependent on funding) is the new birdproof windscreen. We almost lost a student last year when a bird penetrated the front cockpit.

Besides stopping feathered bandits, the new screen is scratchproof. It actually heals itself in a matter of minutes! With more area given to transparency and less to opaque frame support, visibility will make back-seat landings a snap with about 2 more inches in the bottom quadrant.

Undoubtedly, many T-38 fliers will retire well before the airplane will. As the T-1 Jayhawk rolls out this year, the UPT flying demand will shrink for the T-38, giving it even more of a break. With the teamwork of sound mechanical health and conscientious pilotage, let's make sure you and the airplane both make it to a peaceful, honorable retirement. Fly safe in '92! ■

OV-10

LT COL PETER SCHALLER-KALIDE, GAF
Air Force Safety Agency

■ It is time to say goodbye! This year, 1991, will be the final deadline for the OV-10 Bronco in the USAF. In mid-December, the last Broncos from an original 157 the USAF owned, will be flown away and ferried to their new owners. An era of 24 years of Scout- and FAC-flying Broncos will be over. Almost one million (987,048) hours were flown during this period. This was an enormous amount of work for all of you — the pilots, the maintenance folks, and all supporters. Congratulations for a job well done!

But where there is happiness, too often there is also sorrow. During this period, we lost 33 aircraft, 20 pilots, 4 helo pilots in two midair collisions, and 2 OV-10 passengers. The combat losses accounted for another 49 aircraft.

The first 5 years the OV-10 was flown in the USAF were the worst: 1969 (7), 1970 (4), 1971 (2), 1972 (4) Class A mishaps for a total loss of 17 aircraft, 8 pilots, and 2 helo pilots.

The following decade's ups and downs produced a total loss of 13 aircraft, 12 pilots, 2 helo pilots, and 2 passengers.

Since 1983, we lost only three aircraft, with no fatalities. A great score — especially when we think of the many single-engine recoveries, very often performed in a hot and high environment. Unfortunately, we suffered another Class A mishap this fiscal year.

Looking at the figures above, and comparing them to the total flying hours, the Broncos experienced a 3.34 mishap rate. Compared to other aircraft flying in the same regime and environment, this is not bad. Overall, I must say, an outstanding and professional job was accomplished by all of you in the OV-10 community. You can be justifiably proud of your effort.

Wherever you go, whatever your assignment, whatever aircraft you fly, the Air Force Safety Agency and I, your OV-10 Action Officer, wish you much good luck, many happy landings, and "Hals und Beinbruch." ■

Cockpit Management Training Program

WHO? WHAT? WHY? WHERE? WHEN?

ALAN DIEHL, PH.D.
Human Performance Technical Advisor
Air Force Safety Agency

■ Judgment errors associated with cockpit management have always been the largest cause of civilian and military mishaps. Such errors include loss of situational awareness, poor crew coordination, and faulty decision making. In fact, many people actually used to feel such mishaps were the "cost of doing business."

But in the last several years, innovative training programs have helped some organizations drastically reduce such errors. Comprehensive cockpit management programs currently provide techniques for dealing with attention, crew, stress, mental attitude, and risk management issues (see figure). It is important to know how the major commands are now using cockpit management training to enhance safety and effectiveness.

Of almost 50 operation-related Class A flight mishaps occurring in FY90 and '91, none involved crewmembers who had received cockpit management training.

Early Thinking

Learning by trial and error can be very dangerous. But the belief in doing just that came from many aviation pioneers. In fact, Wilbur Wright said, ". . . if you really wish to fly, you must mount a machine and become acquitted with its tricks by actual trial."

Training was always viewed as a basic method of enhancing flight safety. However, our formal training programs have historically focused enhancing aeronautical knowledge, procedures, and "stick-and-rudder" skills. Cockpit management and judgment faculties, in contrast, were largely viewed as byproducts of flying experience.

Thus, as the figure suggests, formal training programs traditionally focused on the basic faculties rather than judgment. Of course, some enlightened instructors and leaders have always found informal ways of developing the judgment in their

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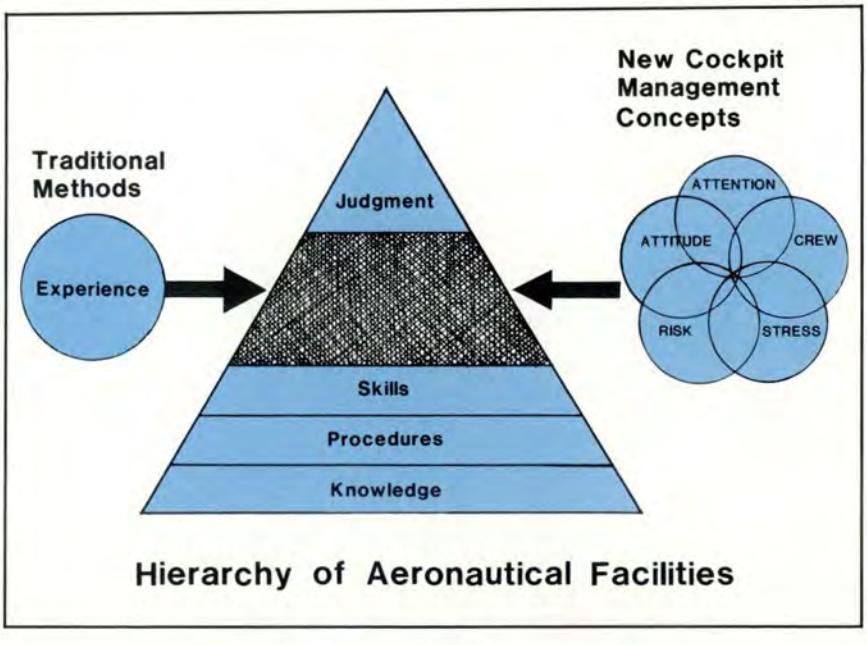


Hierarchy of Aeronautical Facilities

Cockpit Management

folks (e.g., hangar flying, "There I Was" articles).

Emerging Concepts

Aviation traditions die hard. But by the mid-seventies, better mishap investigation methods, including cockpit voice recorders, had revealed the magnitude of judgment and communications problems. Moreover, human factors research had begun suggesting the possibility of **formally** teaching such cockpit management faculties. For example, the recently introduced Mission Oriented Simulator Training and Line Oriented Flight Training concepts were proving their worth.

Major transformations were also taking place during this era in both the civilian and military aviation operational environments. The increasing fuel costs, caused by the OPEC oil embargo, had raised fears low-time general aviation pilots would be forced to decrease their proficiency flying.

To counter this problem, the Federal Aviation Administration commissioned a study which suggested pilot judgment and decision-making faculties could be improved through innovative training concepts. These training concepts included behavioral modification, risk recognition, and stress management techniques.

In 1978, Congress passed the airline deregulation act which, among other things, was expected to decrease the experience levels in that industry. Then, in December of that year, a highly experienced airline crew became distracted with a landing gear problem and ran out of fuel during a night approach.

The National Transportation Safety Board (NTSB) subsequently issued a landmark recommendation which led various airlines to implement Cockpit Resource Management (CRM) programs. These programs, which teach methods of enhancing crew communication, leadership, and assertiveness training, were undertaken with assistance from the National Aeronautics and Space Administration.

About this time, USAF was in the process of replacing the venerable two-place F-4 with the single-seat F-15. In 1976, F-15 replacement training units began practicing situational emergency training concepts in their cockpit procedures trainers. The purpose was to teach pilots how to manage workload during Emergency Procedures rather than adding more "boldface" items to their checklists.

A few years later, the Air National Guard became concerned about another attention-management issue. They were apprehensive about

Current MAJCOM Programs

IN COCKPIT MANAGEMENT

In cockpit management, formal training programs developed separately by the major commands have drastically reduced the numbers of judgment-related flight mishaps in recent years.

Air Training Command

Pilot/Navigator Performance Enhancement Program (PEP) The CAE-Link Company and the command's program manager have developed workbooks and audiovisual materials. By August 1991, an initial cadre of instructor pilots and navigators was trained. They, in turn, trained all other instructors. Students receive biweekly briefings on PEP. The POC is Major Howell (HQ ATC/DOTZ).

Crew Resource Management (CRM) This training is part of the T-1A tanker/transport SUPT contract with McDonnell Douglas. These materials will be integrated into academics, simulator, and flight training when the program becomes operational in 1992. The POC is Maj Rick Keys (HQ ATC/XPRS).

Military Airlift Command

Aircrew Coordination Training (ACT) Crewmembers typically receive a 2-hour introduction at the RTUs, followed by 4 hours at the operational wings plus an annual 4-hour simulator training session with no/minimal ACT academics. This training is conducted primarily by three different contractors (CAE-Link in C-130, Hughes in C-141, and Flight Safety in C-5). These pioneering programs have

continued

Training Program

continued

their A-7 pilots' abilities to maintain proficiency in low-altitude tactics (especially with limited monthly sorties). In 1983, they introduced the Low Attitude Training (LAT) concepts into academics, simulator, and flight training. This highly structured RTU program helped pilots to comprehend the pitfalls in this time-critical and dangerous flying environment.

In 1985, the MAC Commander directed implementation of the first command-wide cockpit management program, Aircrew Coordination Training (ACT). This training was essentially a militarized version of airline CRM training programs.

The USN followed in 1988 with versions of these programs in their helicopter and later their A-6 RTUs. These Navy ACT courses also incorporated the FAA judgment training concepts along with the CRM materials.

Program Effectiveness

A recent review by the Air Force Safety Agency* summarizes the evidence on the effectiveness of such training. This evidence includes information from three sources: Conclusions from accident/incident boards, data resulting from controlled experiments, and the mishap statistics of user organizations.

The NTSB recently concluded CRM training was valuable in preventing what should have been a totally catastrophic accident. This incident involved a DC-10 that suffered an uncontained failure of its center engine which severed all aircraft flight controls. Similarly, recent military boards have concluded cockpit management training was associated with a number of "saves" in a wide range of aircraft types. For instance, a Navy A-6 crew, which had a total hydraulic failure, was able to safely recover. (Note: This was a "first-ever" for that weapon system.)

Likewise, a recent US Air Force mishap board concluded cockpit management training was valuable in the recovery of a C-141 which had suffered a severe landing gear malfunction.

Several controlled experiments have been performed to document the effects of cockpit management training on pilot behavior. In six different studies with inexperienced pilots, individuals who were given judgment training averaged 8 to 46 percent fewer errors than those who received the conventional curriculums. Airline crewmember performance has likewise improved af-

* Reference: Diehl, A.E. (1991), "The Effectiveness of Training Programs for Preventing Aircrew Error," In Proceedings of the Sixth International Symposium of Aviation Psychology, Columbus OH.

CURRENT MAJCOM PROGRAMS

continued

not been significantly modified since 1986. HQ MAC has requested that AFSA review potential methods of updating these programs. The POC is Maj Jack Svoboda (HQ MAC/XOTTY).

Strategic Air Command

Crew Resource Management (CRM) Hernandez Engineering, Inc., is the contractor on this comprehensive, state-of-the-art program. Training began in 1990, and over 40 percent of the SAC crewforce has received this course consisting of a 2-day workshop and 4 hours of simulator training. Sophisticated interactive video disk technology is also being used. To date, no graduate of this program has been involved in a Class A mishap. The POC is Maj Don Miller (HQ SAC/DPSPA).

US Air Forces Europe

Cockpit Attention and Task Management (CATM) Hernandez Engineering, Inc., and command personnel are in the process of modifying SAC CRM materials for use by fighter pilots and WSDs. The program is expected to include a multihour workshop. The POC is Maj Paul Avella (HQ USAFE/DOOT).

Tactical Air Command

Aircrew Attention Awareness Management Program (AAAMP) HQ TAC personnel are rapidly developing this program as an in-house effort without contractor assistance. The initial focus is a 3-hour

continued

Current MAJCOM Programs IN COCKPIT MANAGEMENT

continued

lecture on human factors given by Physiological Training Officers (PTO) in Basic Fighter Transition (BFT). Note: Specially trained PTOs are being assigned to BFT and each RTU.

The BFT curriculum began in October 1991, with other weapon systems specific training following in the next few months beginning with the F-16. PTOs will coteach these courses with IPs at RTUs. Continuation training is expected to begin in early 1992. The POC is Maj Ron Smits (HQ TAC/DOTF).

Pacific Air Forces

This command has endorsed these concepts and is reviewing other MAJCOM programs, especially those of TAC and USAFE. It should then adopt/develop a particular program which is most appropriate to its needs. Beginning September 1991, their squadron commanders' course included a 2-hour cockpit management training block. The POC is Lt Col Ron Ohlendt (HQ PACAF/DOOT).

AF Reserves/Air National Guard

Both commands have shown strong interest in this type of training; however, neither command has established a formal, command-wide program other than the Low Altitude Training Program in the ANG). Several individual units have purchased programs, while some members are receiving such training from their airline employers. The ANG POC is Lt Col Garfield Fricke (NGB/SEE), and the AFRES POC is Lt Col Fred Cronk (HQ AFRES/SEF). ■

Cockpit Management Training Programs

continued

ter receiving cockpit management training courses.

More importantly, other data has confirmed mishap rates associated with aircrew errors decreased dramatically in organizations which have adopted cockpit management training programs. The amount of this improvement ranged from 28 to 81 percent. For example, in the 5 years after MAC instituted this training, their rates decreased by 51 percent, while those for the rest of the USAF improved by only 21 percent. Interestingly, the Navy A-6 community made the largest improvement. Their rates decreased by 81 percent in 4 years.

There is also important evidence indicating such techniques can enhance effectiveness as well as safety (e.g., B-52 bomb scores). Furthermore, there is general agreement these programs have been well accepted by most users.

For instance, the squadron commander of a KC-135 unit, which was deployed to southwest Asia immediately after his unit received cockpit management training, wrote a letter of appreciation. This letter explained how valuable the training had been to his crews in the demanding wartime flying environment. Thus, it appears **cockpit management training is valuable in peacetime and invaluable in war.**

Air Force-Wide Interest

Because of several human factors-related mishaps in fighters, HQ USAFE requested assistance from Systems Command in extending cockpit management concepts to the USAF fighter aircraft. The Air Staff provided an introductory briefing on these issues at the July 1990 "Constant Vigil" Conference.

The Air Force Inspection and Safety Center then held the first USAF-wide workshop on this topic in August 1990. There, the potential merits of various programs were discussed and analyzed, including those of MAC, SAC, ANG-LAT, USN, and a prototype effort developed by AFSA, labeled "Tactical Task Training."

The possibility of developing a single cockpit management program was discussed. But the tentative conclusion was the individual MAJCOMs could more efficiently develop customized programs to support their specialized requirements. This workshop also established the basic methods of deploying this training:

- In-house, the programs can be developed and taught by indigenous command personnel.
- Contractor assisted, where a contractor develops the materials and trains the command's instruc-

CRM trains single-seat pilots to manage the workload during emergency procedures rather than adding more Bold Face items to their checklists.

tors who, in turn, teach concepts to the rest of the command.

- Contractor turn-key, where the contractor supplies the training to all the command's personnel. The sidebar is a description of the various USAF cockpit management programs.

Conclusions

There is strong evidence that such training can help reduce aircrew error mishaps. It is likely these programs act as a catalyst for other beneficial results. Note the more sophisticated programs:

- Focus on enhanced effectiveness as well as safety.
- Utilize innovative computer-based technology.
- Target broad audiences (e.g., instructors and commanders, not just operators).
- Have necessary built-in update mechanisms.
- Employ humor and aesthetics.

As a result of the considerable insight and initiative, the USAF has made important strides in implementing these programs, especially in the past year. Obviously, there is considerable interest from all levels of command. To evaluate your personal cockpit management faculties, test your own abilities with the quiz at right. ■

COCKPIT MANAGEMENT HABITS QUIZ

A quick check tool that can tell you how professionally you're managing your cockpit.

■ The following is a survey of cockpit management items. The 10 questions relate to the cockpit management tools depicted in the figure on page 7.

Directions: Candidly answer each question according to your "normal" habits. Give yourself the following number values for the corresponding frequency:

1 - Always 2 - Often 3 Sometimes 4 - Seldom 5 - Never

1. ____ I rely only on ATC for traffic separation.
2. ____ I use the same type instrument scan for all approaches.
3. ____ I launch without organizing my maps, pubs, etc.
4. ____ I skip reviewing familiar approach plates.
5. ____ I hesitate to correct more senior pilots.
6. ____ I discount advice from low-time crewmembers.
7. ____ I feel I have to satisfy management's desires.
8. ____ I hesitate to relinquish the controls even when busy.
9. ____ I'd fly immediately after a death in my family.
10. ____ I'd fly with a hangover.
11. ____ I fly when I am hungry or thirsty.
12. ____ I let myself get out of shape physically.
13. ____ I handle the most demanding tasks easily.
14. ____ I feel circumstances are the causes of my problems.
15. ____ I feel most aviation dangers are exaggerated.
16. ____ I hesitate to make go-arounds.
17. ____ I'd fly in scud without an instrument clearance.
18. ____ I'd take off with a little frost on the surfaces.
19. ____ I'd fly an aircraft which was slightly over gross.
20. ____ I'd go slightly below minimums, if necessary, when shooting an approach.

Add up your score and compare it with the ranges found in the inverted box below. (Adapted from the Fall 1991 issue of *FAA Aviation Safety Journal*.)

HOW DID YOU FARE?

Under 20 — Count again.
20-40 Definitely need CRM training.
41-60 Could benefit from some CRM training.
61-80 Have probably had some CRM training.
81-100 Prudently apply the CRM principles.

These numbers are subjective and may not be a true indicator of your cockpit performance. However, if you did score very low, it might be a good idea to review your cockpit management techniques. ■

CRM for the single pilot....

and the married ones too

CRM in light airplanes is a lot more than making sure the radios are tuned correctly.

MAJOR ROY A. POOLE
Editor

■ "Daddy, Timmy's putting jelly beans into the sick sack!"

"I am not! When are we goin' ta land? I haf to go bafroom."

"Dear? Could you turn the radio down a little bit? It's starting to give me a headache. Suzy, hold onto Fluffy tight. We don't want her getting loose right when Daddy's trying to land."

"Cessna three five Charlie, start your base turn **now,** you're cleared to land on Runway two eight. Caution, wake turbulence, departing heavy seven four seven."

"Three five Charlie, this is Downtown Tower, say again. Your last transmission was weak and barely readable."

"Mommy, Fluffy got away and she's hiding under Daddy's seat."

"HONEY, LOOK OUT! Oh, I'm sorry. That airplane's landing on the other runway."

Have we made our point? Is there a place for cockpit resource management (CRM) in light airplanes) According to the hapless pilot of three five Charlie, it's either CRM or, let's say, three consecutive terms of life imprisonment.

We are indebted to Sandra Provenzano, a Certified Flight instructor from Houston, Texas, for many of the ideas for the following story on CRM for the single pilot (and married ones, too).

In-Flight Management

Management of the flight deck of a large aircraft seems like an obvious requirement. Even the management of a formation of fighter aircraft is a necessity. For a long time, pilots thought the operations of a light airplane were so simple, things could be taken care of as they arose. Sometimes, as our introduction shows, too many things can start happening even in the smallest of airplanes.

The routine problems, and those which should be planned for, include adverse weather, special-use airspace, aircraft systems, en route and local navigation, compliance with regulations, and maintaining clear communications.

A good idea can be used from the bigger aircraft operations: Maintain a "sterile" cockpit. Not always, of course, but certainly when below 3,000 feet AGL. And, especially, enforce silence from family members who are not part of your "crew." In fact, if you can put them to work being a productive part of your cockpit workload, they are almost guaranteed not to become an added distraction to you.

Managing Your Resources

Even a single pilot of a light airplane has many resources to deal with and to use during a routine flight. Review the following and decide if you have been managing all your resources, or if they have been controlling you.

—*Maintain a consistent set of rules.* These should be developed during your flight training. Use your biennial flight reviews as a way to update the rules.

—*Develop and practice good habit patterns.* Everyone has learned a "before landing" check, but often it gets abbreviated when things get hectic. Stick with the good habits, especially when stresses start piling up.

—*Use Total Cockpit Approach.* Get your whole cockpit organized. This means all the maps ready (folded before takeoff), all the radios set, all the charts opened, all checklists out, and all the tools (like flashlights and computers) within easy reach. Lastly, put your passengers in their places and brief them on the flight.

—*Establish a system for managing your fuel.* Far too many forced landings and fatal mishaps are caused by nothing more complex than running the tanks dry. Some people switch their wristwatch from one arm to the other every 30 minutes to keep track of which tank is being used. Whatever technique you use to manage your fuel, make it a habit and a rule.

—*Set up your radios for each phase of flight.* Even though a lot of pilots are using headsets with push-to-talk switches, keep the old hand-held microphone out just in case. Read the owner's manual for all your radios. The chances of having two different radios with two different indications is very high. If you use headsets, you also are able to hear better without annoying your passengers or destroying your own hearing.

—*You don't manage the weather, you manage your flight through it.* Get every bit of information from as many sources as possible. These include newspapers, television weather channels, other pilots, and Flight Service Stations. When planning for en route weather, here's some good advice: "Anticipate, update, hurry up, and wait."

—*Be prepared for whatever happens.* During each phase of flight, you should be planning for the worst. Can you still abort the takeoff? Is there a safe field to land on if the engine quits en route? If the radios quit, how are you going to land at your destination? The time to solve these problems is *not* when a panic stricken spouse is gripping your arm in terror.

Flight Management 101

You've almost finished the course in cockpit resource management for the single pilot. The three most important objectives for the final exam are:

1. *The Plan* What is your plan on this flight, from preflight through the end of your emergency?
2. *The Process* How will you manage all your resources, use your equipment, and carry out your plan?
3. *The Result* Is each and every flight you make flown like a "pro"? When you're the pilot, there is nothing less to give than your best.

The final exam will be taken the next time you fly your light aircraft. This will be a pass/fail examination. Good luck. ■

Once Again, Thanks For Your Support!

AND THE WINNER
FOR THE JULY 1991
DUMB CAPTION CONTEST IS . . .

SSgt Joseph P. Ficklin
AFROTC Det 855
BYU
Provo, UT

During this holiday season, the dumb expert caption contest judges would like to thank all of you who spent untold amounts sending them special, edible contributions for a job done medium rare. However, their dentist has advised them to treat every bribe (Oops! We mean "promotional item") with great care.

First, there was the candy. One judge was unable to speak for hours after promptly biting into a stale, albeit "jolly" piece. His teeth were stuck so tight, not even hot coffee sipped through a straw could loosen them. Then, there was the popcorn. Little did the judges realize the difference between the kernel and the fluffy white things. So when they received an envelope with the former, they promptly started chewing. Their caps will be ready sometime next week.

We won't say if SSgt Joseph Ficklin or any of the ten honorable mention winners sent these holiday treats along with their contest entries. However, if their captions had not kept the judges laughing through the dental appointments, you might be looking at a blank page this issue. So please, join SSgt Joe Ficklin in keeping the funny stuff coming. Check out our new contest on page 15.

Honorable Mentions

Gentlemen other than cockpit — from L to R — nos. 1 through 6.

1. No. 1 Hey, Virgil, I thought you said you knew how to land that thing! No. 2 It's on the ground, ain't it?
   Kurt Schueler, 35 CRS/MACM, George AFB CA
2. **Hey, Joey, let's go check out the Jorgeson's field! I hear they're growing submarines over there!**
   SSgt Joseph P. Ficklin, AFROTC Det 855, BYU, Provo UT
3. **Let me do the talking.**
   SSgt Henry R. Harlow, USAFR, 907 CAMS/MAAA, Rickenbacker ANGB OH
4. **No. 5 Then he wanted to know if he could shelter it in my barn, and I said I reckoned he might as well seein' as he'd already pastured it in my field, and he got in a huff and left.**
   Jim Burt, Academic Training, Bldg 1824 NAS, Corpus Christi TX
5. **Well, first he went up, and right after that, I asked him what the red handle was, and he said it was to turn the gas off, and I said "like this," and we came down.**
   Jim Burt, Academic Training, Bldg 1824 NAS, Corpus Christi TX
6. **I guess that means I don't get the F-16 slot.**
   Col Stu Bradley, 12 FTW/MA, Randolph AFB TX
7. **No Billy, Simon didn't say "Push Stick Forward."**
   TSgt Richard M. Maier, 71 FTW/SE, Vance AFB OK
8. **No. 1 (thinking) Well, so much for my "Bear in the Air" career . . .**
   Jim Burt, Academic Training, NAS Corpus Christi TX
9. **Look! I told you I knew how to fly. I never said nothing about knowing how to land!**
   SSgt Joseph P. Ficklin, AFROTC Det 855, BYU, Provo UT
10. **No. 6 Billy! You and Joey get away from there . . . and don't touch that airplane. You don't know where it's been!**
    Jim Burt, Academic Training, NAS Corpus Christi TX

WRITE A DUMB CAPTION CONTEST THING

Will you all excuse us, please? We need to take an editorial "time out" here. It seems Byron Q. Lackluster, President and Bellicose Briber of the United Organization of Dumb Caption Writers of America (U.O.D.C.W.A.), has not been taking our judges' subtle requests for edible bribes seriously. While they may still be waiting for the fragrant boxes of chocolate chip cookies, there's no excuse for the blow to the stomach delivered by Byron.

Sure, this is the season for fruitcake, but the block of dough and fruit from the U.O.D.C.W.A. was lethal. Two of our judges are still chewing antacid tablets, and a third has developed a strange twitch anytime somebody opens a lunch sack. Byron won't tell us how long he's had the fruitcake, but our local lab says they'll need to carbon date it to be sure.

Please send in as many entries to this month's Dumb Caption Contest Thing as possible. Our judges could really use the cheering up, even if they don't get any cookies. (Some of them won't be eating solid food for weeks to come anyway.)

Tear out this page so nobody else can enter the contest. Do not put your name anywhere on the page. Write one, and only one, caption and put it over their dumb caption. Hang on to your entry for a month before you send it in. — BQL

Send your entries to "**Dumb Caption Contest Thing**" • *Flying Safety* Magazine • HQ AFSA/SEDP • Norton AFB CA 92409-7001

A True Story

PEGGY E. HODGE
Assistant Editor

The following article is about a flight mishap involving the crew of a Russian-built Tupelov airliner. The lessons are universal, however, and transcend politics. The ground is a political neutral at the point of impact. This type of mishap could just as easily have happened to any aircraft and its crew and is, therefore, a useful lesson to promote flying safety. — Ed

■ Have you ever experienced any of the following?

- An extended crew duty day.
- A hot crew compartment on the ground.
- An improper checklist procedure.
- A wrong turn.

- An inoperative ILS.
- A VFR clearance with a cloud deck below.
- An ignored ground proximity warning system (GPWS) or radar altimeter.
- A language problem with the tower.

Most likely you have experienced at least one of these items at one time or another. Several years ago, the crew of a Soviet-built Tupelov 134 experienced **ALL** *of these — plus several others.*

What Happened?

On an early morning, the Tupelov jet (a twin-engine jet similar to a McDonnell Douglas DC-9) departed Zambia for the nearly 3-hour flight back to Maputo, Mozambique. It carried 9 crewmembers and 35 passengers.

The flight, routine for the experienced crew, met with disaster as the aircraft descended for landing to what they thought was the Maputo Airport.

As they neared the city, the Captain exclaimed, "There is no Maputo!" Three minutes later, the navigator added: "No, no, there's nowhere to go, no NDBs[1], there's nothing." The captain further complained — "Neither NDBs nor ILS!"

At approximately 1921, the Tupelov 134 impacted the ground, fatally injuring 34 persons.

What happened?

It Was Not The Aircraft!

The aircraft had been properly maintained, and its documentation was in order. It was airworthy, properly loaded, and there was no technical failure or malfunction in flight prior to impact. Radio navigational aids on the ground and in the aircraft were adequate for letdown and ILS approach.

The crewmembers were qualified and properly licensed to operate the aircraft and had experience operating into Maputo at night. There was no evidence of crew disability prior to impact. The weather at the destination airport was not a factor, and the runway lights were operating normally.

It was *not* the aircraft, it was *not* the crewmembers' qualifications, and it was *not* poor weather that led this flight to disaster.

Crew Performance

Gross errors and lack of flight discipline by the crew led this airliner

continued

[1] NDB — nondirectional beacon — a simple radio navigation transmitter.

to disaster. Highlights of the errors emphasize lessons for all of us and point out the seriousness of proper crew coordination:

- No flight plan was filed or given over the air, the number of persons on board was incorrectly given, the endurance of the aircraft was miscalculated, and, as a result, there was not enough fuel to divert to the aircraft's alternate field.
- The navigator made an unexplained right turn[2] diverting the aircraft from its expected flightpath. He executed this turn without question from either the pilot or copilot.
- During the descent, the crew faced a variety of distractions which drew their attention away from the vital task of monitoring the aircraft's flightpath.

A True Story continued

—The cockpit voice recorder (CVR) showed the copilot was listening on the HF radio to a radio broadcast in his native language of music and news right up to impact.

—The captain was engrossed in one discussion regarding previous flights when the fuel had also been low, and another discussion regarding an allocation of beer and cokes to the members of the crew.

—The inattentive copilot apparently selected a South African VOR frequency instead of the Maputo VOR as they proceeded to the initial approach fix. The nav, who couldn't see which frequency had been selected, began tracking to the erroneous VOR.

[2] Airline procedure directs the pilot and copilot control vertical changes while the navigator controls the course changes en route. Doppler radar is used for the primary navigation system and effects course changes through the autopilot heading commands.

"There is no Maputo," exclaimed the Captain. Before they realized what had happened, the crew were beyond the Maputo localizer lateral limits which they had misinterpreted as ILS failure.

Before they realized what had happened, they were beyond the Maputo localizer's lateral limits, which the crew misinterpreted as ILS failure. The prescribed procedures require a verbal callout check of the frequencies selected. The CVR, however, revealed a complete absence of any form of cross-checking of frequencies between the crewmembers.

—ATC clearance had been given specifically to 3,000 feet and no lower unless the runway lights were in sight. Although neither the runway lights nor those of Maputo City were in sight, the pilots descended below 3,000 feet.

—The GPWS audio warning sounded and operated for 32 seconds, terminating some 7 seconds before impact. The crew almost totally ignored the warning. The only response from the crew was the captain's exclamation of "Damn it" associated with a very slight noseup pitch of the aircraft.

The whole situation could have been resolved if the crew had climbed to a safe altitude and made a rational assessment of the navigational information available and displayed. The crew had no justification for assuming the alarm was spurious, especially since they were uncertain of their position.

What Was the Major Problem?

This mishap emphasizes so many lessons learned that it reads like fiction — but it is a true story! It can, it does, and it did happen!

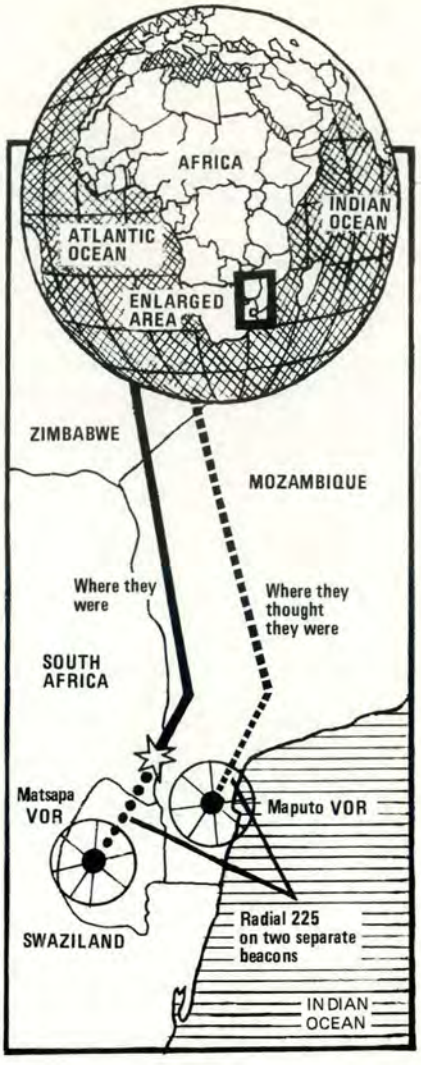
Although many human factors were involved in this disaster, a lack of proper crew coordination was the major problem. This mishap, as well as many others, demonstrates crew coordination cannot be overemphasized.

As a direct result of the limitations and imperfections of individuals, multicrewmember aircraft cockpits are designed to ensure needed redundancy. Yet, this system of redundancy has failed in many cases. It has failed because crewmembers have not heeded the warnings of others or because those who possess adequate information have, for some reason, not provided it to others.

Each crewmember is responsible for many tasks throughout a mission. The proper execution of these tasks demands constant vigilance, cross-checking, and sharing of information. This is true for a flight of single seaters as well a for multicrew aircraft.

The safe accomplishment of a mission is a team effort — every crewmember must be aware of where the aircraft is going and what it is doing. This all adds up to a requirement for effective crew coordination.

A multicrewmember aircraft involves more than running checklists, systems knowledge, and good piloting technique — it requires clear, concise communication and effective group interaction to maintain group situation awareness.



All We Need Is You!

To prevent these types of mishaps, all we need is you! Through effective crew coordination, we can accomplish our mission without needless loss.

General John A. Shaud (Ret), now Director, Air Force Aid Society, while he was Vice Commander of SHAPE, stressed further the impact and necessity of team play: "We must deeply instill the understanding that the capability to act decisively, as individuals and as a crew, spells the difference between failure and mission success. Indeed, it spells the difference between life and death."[3] ■

[3] "Aircraft Coordination in Training in U.S. Air Force Air Training Command," *Aviation Space and Environmental Medicine*, June 1989.

Plug yourself into this survey and see if you get a new slant on the meaning of CRM.

Crew Resource Management

A QUIZ TO HELP YOU COMPARE YOUR PERCEPTIONS WITH PILOTS WHO WERE RATED OUTSTANDING

While this article was written for commercial crewmembers, the concepts also apply to USAF crews.

Courtesy *Business Aviation Safety*, Vol 6, 1990

■ Any time an operation gets big enough to either require two pilots, or to be substantially safer with two, crew coordination becomes a critical factor. Yet crew coordination is something which has been difficult to quantify, predict, or promote.

Now, research provides hope cockpit cooperators can be more easily spotted by the simple expedient of asking pilots a dozen-plus questions and seeing how they respond.

The questions — and answers — sprang from ongoing research by a team of investigators from the NASA Ames Research Center Department of Psychology and People's Express Airlines. The goal was to cover any relationship between a person's attitudes about cockpit management and his or her actual performance. More than 600 Boeing 727 and 737 pilots from three major airlines completed a confidential questionnaire gauging their attitudes about a variety of cockpit management situations.

They were then evaluated in their normal flight duties by at least two professional check airmen working for the airlines, all extensively trained in the evaluation of cockpit resource management (CRM), who rated the pilots on a 1 (extremely poor) to 5 (outstanding) scale.

The analysis was done only on those pilots rated at the extremities, "outstanding" or "extremely poor." Their attitudes as revealed on the questionnaire neatly sorted them into two groups. What follow are 15 questions found to best discriminate the outstanding from the extremely poor performers. Take this test, and see how you stack up according to those evaluators. Bear in mind your particular leadership style may put you at odds with some of the answers, but that's what cockpit resource management is all about.

It gives you a forum in which to air your ideas about the best way to achieve safe, comfortable, and profitable flight operations. Why not bring your test results and your ideas along to your next recurrent training session?

Here are the questions. Look for the answers given by those rated "outstanding" below.

YES NO

1. My decision-making ability is as good in emergencies as in routine flying situations. ☐ ☐

2. Captains or aircraft commanders should encourage their copilots to question procedures during normal flight operations and in emergencies. ☐ ☐

3. Pilots should be aware of and sensitive to the personal problems of fellow crewmembers. ☐ ☐

4. Training and development of crewmembers in techniques, methods, and actual day-to-day activities is a necessary part of a captain's responsibilities. ☐ ☐

5. If the copilot detects his well-intentioned corrections are annoying the captain, he should keep his ideas to himself. ☐ ☐

YES NO

6. Copilots should not question the captain's decisions or actions except when they threaten the safety of the flight. ☐ ☐

7. The pilot flying should verbalize plans for maneuvers and should be sure the information is understood and acknowledged by the other pilot. ☐ ☐

8. Pilots should feel obligated to mention their own psychological stress or physical problems to other flightcrew personnel before or during a flight. ☐ ☐

9. Captains should employ the same style of management in all situations and with all of the crewmembers. ☐ ☐

10. Conversation in the cockpit should be kept to a minimum except for the necessary operational matters. ☐ ☐

YES NO

11. Instructions to other crewmembers should be general and nonspecific so each person can practice self-management and develop individual skills. ☐ ☐

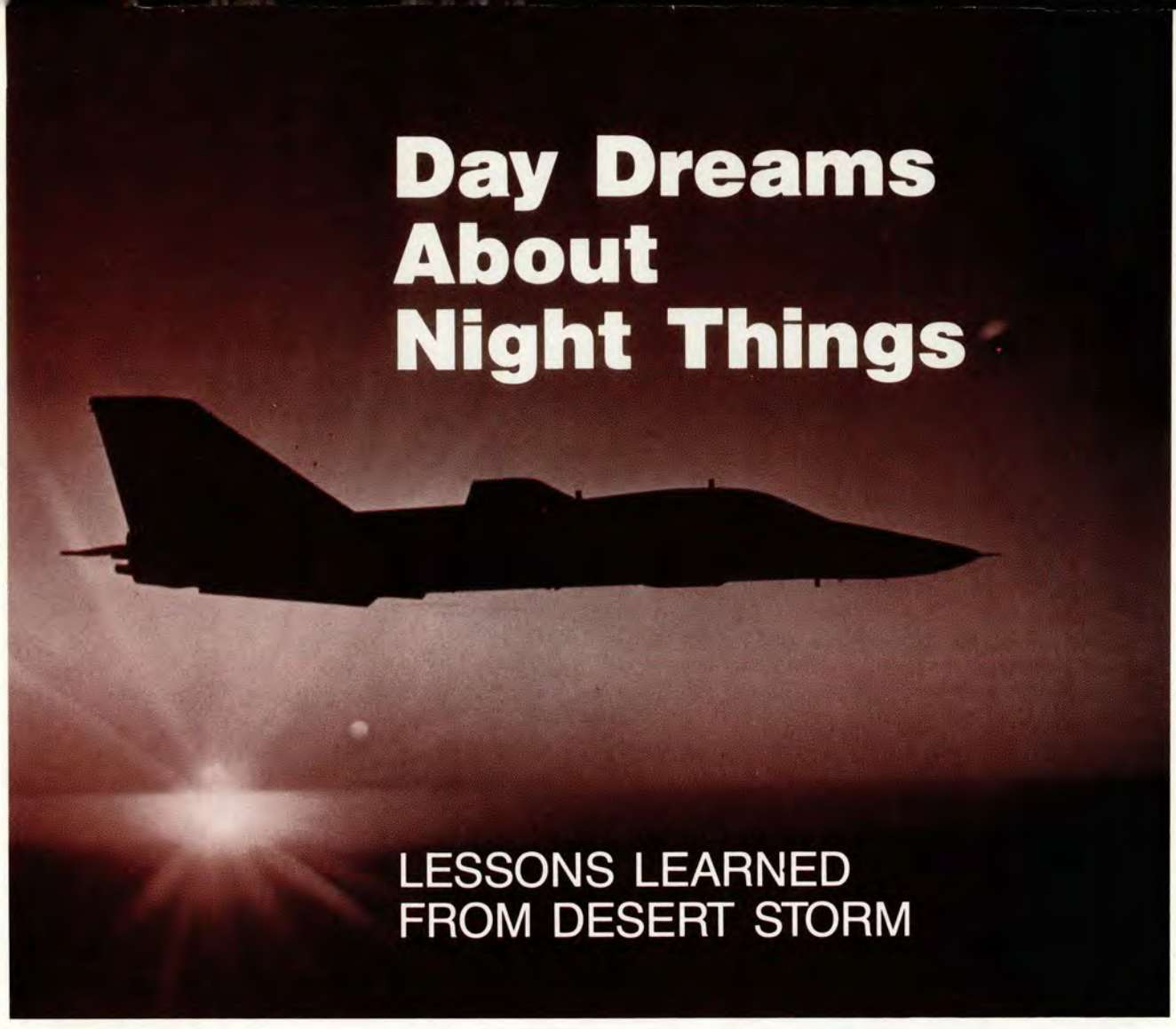
12. Training is one of the most important and critical responsibilities of a captain. ☐ ☐

13. A relaxed attitude is essential to maintaining a cooperative and harmonious flightdeck. ☐ ☐

14. The captain's responsibilities include coordination of cabin crew activities. ☐ ☐

15. The captain should provide clear, direct orders concerning all of the procedures to be followed in *all* situations. ☐ ☐ ■

Crew Resource Management Answers: 1. No; 2. Yes; 3. Yes; 4. Yes; 5. No; 6. No; 7. Yes; 8. Yes; 9. No; 10. Yes; 11. No; 12. Yes; 13. Yes; 14. Yes; 15. No.



Day Dreams About Night Things

LESSONS LEARNED FROM DESERT STORM

COLONEL DAVE SKAKAL
Director of Flight Safety
Air Force Safety Agency

■ Operation Desert Storm was successful for many reasons, but one frequently discussed is that Air Force training programs allowed our forces to "fight like we train." The same phrase was said another way for many years prior to the Gulf War — "train like we intend to fight" — and that peacetime attitude was instrumental to our success.

My own experience during the war revealed situations where aircrews performed mission elements for which they had *not* properly trained. This wasn't a big surprise to me or anyone else — we all expected the unexpected.

As Chief of Combat Plans, 7440th Composite Wing (Provisional), Incirlik AB, Turkey, I was responsible for a group of highly capable people who produced the "frag." This document assigned all aspects of daily operations. Typically, it included target data, numbers of attack and support aircraft, munitions, timing, frequencies, code words, search and rescue data, and a myriad of other mission details. Additionally, I flew about every third day as an EF-111A pilot.

I flew one night mission during the war. After 2 weeks of regularly tasking crews to fly in the dark, I felt a responsibility to fly the night frag and better understand the differences between what I had already seen during daylight hours. The mission was against a highly defended target in North Iraq and included a "typical" package of about 50 aircraft. Some of my observations follow.

Briefing, start, taxi, and takeoff had become routine by now, except that it was *dark* — and I'm not talking peacetime dark. Everything seemed to progress at a slower pace. Deconfliction between aircraft was now a bigger deal as evidenced by the detailed spacing and timing assignments coordinated between each flight. Other things also seemed more complicated, starting with join-up on the tanker, and continuing through post-air refueling rendezvous.

Keeping track of the "players" was equally important as it was in the day, but it was done differently since visual acquisition is a problem at night. For example, you *need to know* where those Weasels are when a HARM comes off the rail. It's also comforting to know the Eagle CAP locations. Progressing to the target area was an eye-watering experience compared to what I had seen in the day. Everything shot from the ground was now visible, making threat avoidance somewhat easier

continued

DAY DREAMS ABOUT NIGHT THINGS

Lessons learned from Desert Storm

continued

During Desert Storm, keeping track of all the players was vital to mission success, especially during night missions.

(except for the F-111s and B-52s on their final bomb runs).

At the same time, I was more tense because I **could** see everything come up. The AAA was eerie; more incredible (and strangely beautiful — at a distance) than any Fourth of July show I had ever seen, yet we all knew it was deadly. Throughout all of this, I practiced the composite instrument crosscheck that had become almost subconscious but is so vital to successful night flying.

Every aircraft and aircrew made it back from that mission, and our success against the target that night was good. Following the mass debrief (yes, we had that luxury in our composite wing at Incirlik), I learned that even though there had been a high learning curve at first, most of the big issues had been resolved by now, and crews were feeling as comfortable as one can ever feel in combat.

I felt better about the night frag, but realized in flying this one mission, there were many other factors which contribute to successful night operations I hadn't experienced — such as problems associated with adjusting body clocks, ensuring base support services are available for night fliers, providing separate quarters so day fliers don't interfere with crew rest, etc., etc. Personally, I was happy to go back on the day schedule!

In my current position as Director of Flight Safety at the Air Force Safety Agency, I occasionally reflect on past experiences to see what lessons might be applied to preserve combat capability for the future (after all, that's what safety officers are all about). As you might guess from the previous paragraphs, **night operations** stand out as an area where I see potential for significant peacetime training challenges.

Some weapon systems (e.g., F-15s and A-10s) were called upon during Desert Storm to perform night missions despite limited training exposure. Others had trained harder for the night role (F-15E, F-16 LANTIRN, F-117, F/EF-111, KC-10/135,

B-52, C/MC/EC-130, etc.). Few, however, had practiced large force packaging at night to the degree it was tasked during the war.

Still, we clearly demonstrated the US Air Force has a night capability second to none. Aircrews did a magnificent job. Assisted by the intensity of combat and high sortie rates, they became increasingly proficient as the war progressed.

Even though I am now out of unit-level flying operations, my guess (and hope) is that squadron and wing planners have been actively applying Gulf War lessons to future training programs. At the same time, reduced levels of activity, unit redeployments, resumption of peacetime training routines, and the onset of summer months with fewer night hours created a potential for high risk.

The winter season is upon us, with greater opportunity for night training. Now is the first time many units will put lessons learned from wartime night ops into practice. You know better than I how your mission will be different. What I want to convey is that simply because it **is** different is reason for concern. Mission changes, combined with the inherent higher risk generally associated with night flying, should make us sit up and take notice.

How do we safely accomplish night training in this, our first winter since Desert Storm? My answer is simple — do it the same way we have in the past.

Air Force training programs, day or night, have proven effective as long as the basics of **discipline** and **supervision** are properly applied. Aircrews and support personnel must have the discipline to adhere to established procedures, know their limits, and knock it off early when things *begin* to look bad.

Supervisors at every level must ensure training programs use the building block approach and are tailored to the experience of those participating. Additionally, they must know their people and create an atmosphere of mutual trust, never allowing the peacetime mission to exceed the bounds of safety.

During Desert Shield, the "train like we intend to fight" philosophy was challenged when a couple of mishaps identified thought processes which questioned peacetime training programs. Some aviators decided adherence to peacetime regulations was too restrictive to allow for realistic training and took matters into their own hands rather than follow well-established guidelines. The tragic result was unnecessary loss of life and aircraft. Similar temptations might exist now — if aircrews lose sight of the fact we are no longer **at** war, even though we must remain prepared.

The peacetime mission is vital to our preparedness, and many similarities exist between peacetime and wartime flying. I believe *peacetime training requires a slightly different mindset.*

Consider this thought: Risk, due to threat, seldom drives violation of peacetime training rules — you can usually minimize the effect of a successful hostile engagement while still following peacetime rules.

The F-117 proved to be an extremely valuable weapon during night operations.

Remember, the opening sentences of this article said we were successful because we fought like we trained. It also said the reason we could do that is because we trained like we intended to fight. We've all heard the expressions "No peacetime mission is worth loss of lives or equipment," and "A training loss is as good as a combat kill for the enemy." These aren't just trite statements offered by senior officers during commander's call. They are time-honored principles written in blood!

Night operations will continue to be a crucial element of successful air combat. This is especially true for the US Air Force, since our capability has been significantly enhanced with new systems like the F-117, F-15E, and LANTIRN. We have an obligation to capitalize on the lessons learned during Desert Storm. Train hard, but keep your eye on the ball. Discipline and supervision will make the difference. Fly smart! Fly safe! ■

Both aircrews and support personnel must follow established procedures during combat.

When in Doubt... SHOUT IT OUT!

One advantage of flying with a crew is that there is always someone around to catch your dumb mistakes.

MAJOR PHILLIP T. SIMPSON
Directorate of Aerospace Safety

■ When was the last time you were about to do something really dumb and another crewmember kept you from doing it? Maybe you forgot to put your gear down, or you didn't compute power correctly, and someone else caught it before it caused a problem.

Chances are it has happened to most of us at one time or another. That's one of the good deals about flying with a crew. There is always someone around to help keep you out of trouble. In fact, we depend on other people helping us just as much as they depend on us to help them. That is part of what crew coordination is all about.

At least, this is how it is supposed to work but, unfortunately, it doesn't happen that way all of the time. Over the past few years, there have been many instances where an aircraft was being flown into a hazardous condition, but no one spoke up to stop it, even though they may have had time to do so.

People tend to think the other person must know what they are doing, otherwise why do it? Although the mishaps discussed here deal mostly with helicopters, this attitude can probably be found in just

about every type of aircraft. Look around and see if you can spot it the next time you fly.

A few years ago a helicopter was conducting a night, over-water mission. During the mission, the crew had to establish their position and set up a holding pattern. After spotting a light on the water's surface, the aircraft commander started an approach to get a closer look.

As the approach progressed, the aircraft was flown into a condition of zero airspeed with insufficient power applied to stop the descent. Although the other crewmembers monitored the approach, they did not advise the pilot to recover and go around until it was too late. The aircraft impacted the water and rolled over.

Had the crew known what the outcome of the approach was going to be, they certainly would have taken action to stop it. However, they assumed for too long the pilot knew what he was doing when, in fact, the pilot himself did not know he had lost control until it was too late to recover.

A high percentage of helicopter mishaps do occur during the approach and landing phase, and this is when all crewmembers must get involved to make sure the approach is being flown properly.

During an approach to a remote site pad, an aircraft commander allowed the aircraft to go below his intended flightpath. Both the copilot and the flight engineer were monitoring the approach, and both had a good view of the intended landing site.

The flight engineer stated later shortly before impact he felt they were not going to make it to the pad, but he said nothing to the crew. The relatively inexperienced copilot said he wasn't sure what his actual duties were, so he didn't say anything either. Both crewmembers had an opportunity to advise the pilot the approach wasn't looking too good, but neither did, and the aircraft impacted the ground short of the pad and rolled over.

Although you might expect an inexperienced copilot to sit through a bad approach, you will find this has happened to experienced pilots as well. While preparing for an approach to a remote site pad, the crew incorrectly computed their power requirements and didn't realize they were flying the helicopter into a condition exceeding its capabilities.

While other crewmembers did make suggestions to increase the margin of safety, the pilot continued on, and no one pressed the issue. The copilot, a fully qualified flight examiner, only watched as the pilot flew the aircraft through a deteriorating approach and on into the power deficient condition. The aircraft landed short of the pad on a steep slope and rolled over. In this case, the crew did express concern about the safety of the approach, but no one took that final step of calling for a go-around.

Although the other crewmembers monitored the approach, they did not advise the pilot to recover until it was too late.

A C-130 copilot and navigator certainly wish they had taken that step during a landing being made by an experienced pilot. He had allowed the aircraft to drift off the centerline on final and did a number of S-turns trying to get realigned. During one pass over the runway, he decided it was time to land, so he planted it hard about 200 feet past the approach end. The gear collapsed, and the aircraft slid to a stop on the runway.

Afterwards, both the copilot and navigator said the landing should have been aborted, but they had confidence in the pilot and thought he could get down okay, so they didn't say anything. The pilot said he knew the landing wasn't looking too good, and if someone had said something, he would have taken it around. The crew was certainly polite, but they sure didn't help each other much.

So what does all this mean? Well, for one thing, it means the Air Force has lost both people and airframes because nobody spoke up when they should have. Sure, it's easy to sit here and point out what could have been, or should have been, done differently, and these crewmembers must have had reasons for their lack of actions.

It's tough to tell someone you think they are doing something unsafe, especially when you might feel that person knows more than you or is a better pilot than you.

Would I risk challenging a pilot more experienced than myself if I thought it was going to prevent a mishap? With me in it? You bet I would! And I'm sure it does happen quite often. Unfortunately, we seldom hear about the mishap that didn't happen because someone was smart enough to stop the operation when it needed stopping.

All mishaps are preventable in one way or another. These kinds of mishaps are even more preventable than most because they don't require reg changes, tech order changes, aircraft mods, new procedures, hours of practice, staff studies, or even luck. To prevent these mishaps, all we need is you. "When in doubt, shout it out!"■

Reprinted from *Flying Safety*, October 1987

The Their

MAJOR ROY A. POOLE
Editor

■ "Great," thought Sgt Bobby Jones, "one little lens missing on top of the jet, and it's grounded until I replace the lens." Looking down the length of the KC-10's fuselage from his position in front of the no. 2 engine intake, a 4-inch lens hardly seemed worth worrying about. But the T.O. is not to be ignored, and Bobby hopped onto the cherry picker to go find a replacement.

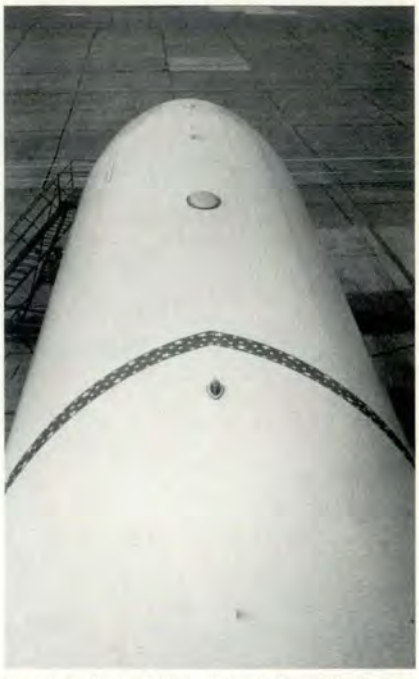
"Hey, Sgt Smith," began Bobby, "Am I gonna have to run all over the base to get a replacement lens for the top of this bird?" The line chief's answer was able to save him a little time in getting the replacement lens. She told him the lens was in a kit which he could pick up from the COMBS technical representative. But Bobby needed more than an easy-to-locate kit to save some time.

Had the line chief taken a moment to look at the bigger picture, she would have comprehended the nature of Bobby's task. She would also have asked if he had ever done a lens replacement before. And, she would have offered to go over the kit with him and answer any questions before he got started.

"Isn't there some kind of kit I'm supposed to get?" asked Bobby.

"Nope," said the tech rep without looking up from the inventory card, "but you can borrow the T.O. and order what you need. It's all in the bins back there."

Light of Lives



Improperly installed, this $200 anticollision light *will* eventually come off in flight.

Balancing the illustrated parts catalog on his knee while leaning up against the supply cage, Bobby tried to visualize the replacement procedure and order the necessary parts. Since this was his first attempt at the job, Bobby couldn't have known the T.O. fails to describe the need for a couple of different rubber gaskets and a handful of spacers.

The box of parts Bobby walked away with from supply *looked* like they would get the job done. After all, the COMBS rep hadn't told him anything was missing from his "kit."

When he reached the aircraft, replacement wasn't as easy as disassembling the old, broken lens and rebuilding a new one. Apparently, the reason the old lens had broken was because it, too, wasn't assembled correctly. With nothing but very general T.O. guidance to help him, Bobby used the bad example before him for help.

The missing gaskets, seals, and spacers were there to provide more than a good fit. When properly installed, they prevented overtorquing and excessive stresses on the glass lens. Without them, it was only a matter of time until the lens cracked once again.

This time, it cracked during a climb to 28,000 feet. And this time, portions of the lens flew right into the no. 2 engine intake. The crew and passengers were lucky. The no. 2 engine did not tear itself apart when the compressor blades were damaged. Not that it didn't try. By the time repairs to the engine and frame were completed, the bill to the Air Force would rise to more than $3.8 million.

The Air Force Safety Program doesn't investigate incidents like this to fix blame. That would be too easy, and it wouldn't keep the same incident from happening a few months from now. What the program tries to do is look at the sequence of events, and reasonably address solutions to all of the critical actions which led up to the emergency.

For example, Sgt Bobby Jones was not trained for the job he had to do, since the full extent of training for this task was not known.

The T.O. wasn't much help either. Five critical steps to the lens installation procedure are not covered by the T.O. Additionally, the instructions don't provide a good way to check the replacement kit, if you can find one. The use of the illustrated parts catalog to build your own kit is also no help, since it doesn't show all the parts of the lens assembly.

Nobody in this entire sequence of events started the day thinking they would intentionally cause an accident. They didn't *intend* to treat the lens replacement so casually. They just didn't see how the single light on top of an aircraft was very critical. But it was. It was almost the light of their lives . . . and dozens more. ■

Although the engine did not completely come apart, the ingested light caused $3.8 million in damages.

MAINTENANCE MATTERS

Pitot Pinch

■ Shortly after takeoff on a night reconnaissance mission, the RF-4C's crew noted the airspeed indicators in both cockpits drop from 200 knots to zero. At the same time, both pressure altimeters became unreliable. The crew declared an emergency. The SOF coordinated a rejoin with another of the unit's aircraft, and the malfunctioning aircraft was led on a formation approach to a safe landing.

An analysis by Quality Assurance revealed this was the first flight after a new radome had been installed. When instrument specialists completed the pitot-static checks as required after the installation of a new radome, they assumed additional maintenance was to be performed, and they left without retorquing the radome.

Some time later, the crew chief secured the radome and torqued it in accordance with TO directives. Unfortunately, the crew chief failed to notice the pitot-static line was pinched between the radome and the aircraft fuselage, causing all systems requiring pitot-static inputs to fail in flight. Had he followed the TO, he would have noticed the CAUTION note which requires specialists to "Make sure the pilot-static line does not become pinched when closing the radome."

Failing to observe a "CAUTION" in a TO can lead not only to equipment damage, but, as in this mishap, can also lead to an in-flight emergency . . . or worse.

Aircraft Wiring

In today's aircraft with black boxes and modular avionics systems, wiring problems account for a small percentage of malfunctions. However, nearly 50 percent of all reportable maintenance-related flight mishaps are caused by improper wire installation techniques.

These statistics reflect two problems: Aircraft wiring discrepancies and inexperienced maintenance personnel with basic wiring knowledge. Because of advancing technology with black box removal and replacement on the flight line, wiring maintenance expertise is not common. The fact is, except for electrical systems specialists, most maintenance folks are rarely required to install or replace an aircraft wire, and when the time comes, Murphy's law often prevails. ■

☆U.S. GOVERNMENT PRINTING OFFICE: 1991-679-016/40012

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.

FIRST LIEUTENANT

John D. Noah

906th Tactical Fighter Group
Wright-Patterson AFB, Ohio

■ Lieutenant John D. Noah was flying as no. 2 in a four-ship of F-16s on a clear VFR day. After completing a low level, the flight began climbing into the air-to-air training area. During the climb, Lt Noah felt a subtle engine vibration. Scanning the instruments, the only visible irregularity was the oil pressure gauge which was fluctuating between 16 and 20 psi.

Responding to the engine oil problem, he set the throttle at midrange, exchanged airspeed for altitude, and notified the flight lead of the problem. As the flight turned towards the nearest normal divert base, Rickenbacker ANGB, Ohio, Lt Noah was informed his aircraft engine was now on fire. He retarded the throttle to idle, jettisoned the wing tanks over an unpopulated area, and radioed he would not be able to make it to the original divert field.

The good visibility allowed the flight to spot Ross County Airport which had a 5,400-foot runway, and Lt Noah continued with his emergency procedures as he glided towards the civilian field. Next the hydraulic/oil light illuminated, and a scan of the gauges revealed the engine oil pressure was now below 10 psi. Both hydraulic systems indicated normal, but oil pressure dropped to zero as the engine fire extinguished itself.

Lt Noah continued his descent, manually activated the emergency power unit (EPU), and accomplished a flawless simulated flameout approach and landing at the civilian airfield. During landing roll, he shut down the engine and brought the aircraft to a safe stop. He set the parking brake and turned off the EPU prior to his emergency ground egress. The professional and timely actions of Lt Noah resulted in the recovery of a valuable combat aircraft and prevented possible loss of life. WELL DONE! ■

Who's in charge?

Cockpit management can make all the difference