UNITED STATES AIR FORCE • JANUARY 1972

Aerospace SAFETY

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Aerospace SAFETY

FOR AIRCREWS, MAINTENANCE & SUPPORT TECHNICIANS

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DEPARTMENT OF THE AIR FORCE • THE INSPECTOR GENERAL, USAF

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THE HELICOPTER Will Not FLOAT

I don't suppose that I've given too much thought to aircraft accidents. Except for monthly meetings, bulletin boards, and occasional messages, my main reaction to aircraft accidents is a feeling of profound relief that they've always happened to someone else. All pilots feel untouchable in this regard. Like the snake charmer who has such faith in his flute that he believes the cobra will never bite him. Or the sailor who's never been over on his side in a strong wind. We don't really believe it can happen to us. But it can. It happened to me.

I fly UH-1 helicopters. Our mission one day last summer was to act as safety chase for another helicopter which carried a new type rocket pod. The other bird was to check the aerodynamics of the new pod by flying through various flight regimes. The flight was scheduled over a Gulf of Mexico water range. I was to fly a loose trail formation, observing the test helicopter and its rockets, yet not interfering with its maneuvers.

Ron, my copilot, and I checked out some water survival gear on our way out to the helicopter; two LPUs and two one-man life rafts. The LPUs we planned to wear. The life rafts would be stowed just aft of the center console where they would be available if needed. We decided to fly with the cabin doors pinned open since we were to be the only two on board.

The weather was fine. Another hot, clear day. A good day for fishing, or sunning on the white sand beaches . . . or even for flying. What wind we had was gently out of the west. The Gulf waters weren't calm, but the seas were only two feet. The temperature was about 90 and we really felt it when we were in the cockpit running the checklists. It was a relief to finally get the rotor turning and manufacture some breeze. The checklists were completed with no indication of the troubles that were just 35 minutes away.

The prospect of an overwater flight in a single engine helicopter always makes helicopter pilots attentive. We don't brood about it, but the awareness of potential disaster is there. Only one thing is worse than the glide angle of a helicopter: the "sink angle." Without pontoons or sponsons they will sink spectacularly and immediately to the bottom. The Dash-one says it more bluntly: "The helicopter will not float."

But problems of any kind seemed far away as we began the mission. The UH-1 was responding and the test mission seemed to be going well in the other helicopter. I turned the controls over to Ron after about 30 minutes, glanced at all the gages, and swiveled slightly in my seat to look back at the Gulf coast, seven miles away.

The UH-1P has an audible and visual low RPM warning system. If the engine RPM drops out of the flight range, you are cautioned by an insistent beeper in the intercom and a red light on the instrument panel. Normally it's just a strident reminder to add more throttle. It also can mean the engine has failed.

When our warning system activated, I turned back to the left and heard the other pilot say, "The engine's failed!" The helicopter sagged and started down. I took the controls. A quick peek at the engine tachometer . . . it was peeling back, now passing through 5500. From our flight altitude, 700 feet, to the water is about 20 busy seconds.

"Mayday, Mayday, Mayday!" We were on a tactical frequency with the other helicopter. "My engine just failed and we're going into the water!" I could hear the other helicopter relay to the radar controller back on land: "We've got a Mayday out here. Granger 86 has an engine failure and is going into the water."

The collective pitch was full down and I dropped the nose slightly to gain some airspeed. The rotor RPM began to increase. The beeper in my headset continued and the low warning light was still on. I thought, my God, we're really going to crash.

"We're low, you'd better start your flare," Ron yelled, and there was the water, just below the skids.

I eased back on the stick and we flared just over the tops of the swells. At what I guessed to be zero airspeed, I pushed the nose back over and pulled up on the collective to cushion the landing. The helicopter gave a shudder as the rotor RPM decayed and we settled into the water.

The salt water poured immediately into the cockpit. I let the controls go and pulled the emergency door release and the door fell off the hinges. I could hear the rotor blades still slowly turning, swish, swish. . . . Glancing to the left, I saw that Ron hadn't gotten his door open yet. (We found out later that the emergency release had malfunctioned.) Grabbing the cyclic again, I tried to tip the helicopter over on its left side so that we could climb out my door. But it was too late. A swell smashed into us and over we went. The blades hit the water and the 'copter shuddered again. I unfastened my seat belt just as the water rose over my head. The last look I got was of Ron's legs disappearing up and out his door. He'd managed to get it open at the last possible moment. (I found out later that he'd had to reach out through the window and around to the door handle and open it that way. Armor plating on the seat restricted him from quickly opening it from the inside.) I gave a push upward, standing on the side of the center console and popped up on the surface.

The helicopter was sinking and all that remained above the surface was about four feet of tail boom. I was having trouble staying afloat and remembered to inflate my LPU. The strap latch across my chest had become unfastened and when I pulled the lanyard, the LPU inflated and moved off in the vicinity of my elbows. I had to climb into the harness again. Ron was paddling about nearby and one of the life rafts was inflated near him. The other had stayed in the helicopter. My checklist also floated nearby.

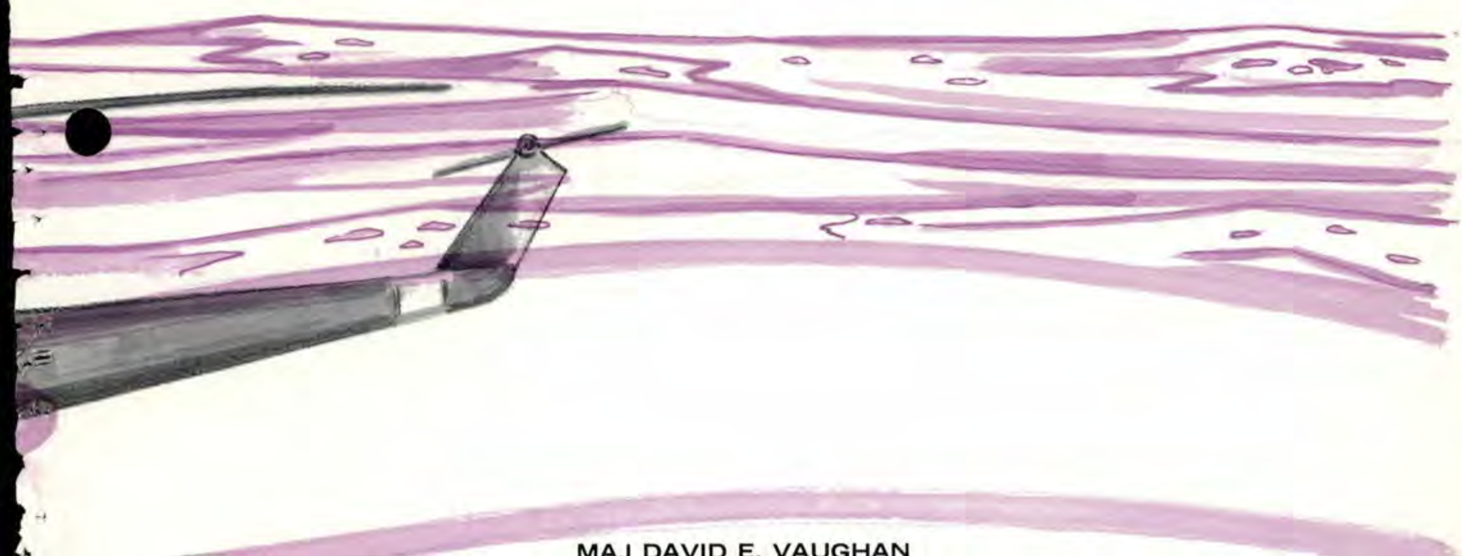
Ron and I clung to the sides of the life raft and watched the 'copter sink. I recall thinking how fortunate we were not to still be in the cockpit.

After about ten minutes in the water we were picked up by a fishing boat, the people on board adding us to a catch of mackerel and bonita.

Back at the base, the business of finding out why we were in the water had already begun. The Accident Investigation Board was forming. As we were being given checkups at the hospital, we were told to report to the Safety Office, where our statements would be taken. The hospital checks consisted of blood and urine analysis, and an extensive form to fill out regarding our activities and diet over the past three days. After completing that, we changed out of our sodden flight gear into duty uniforms and reported to the Safety Office.

During that initial meeting, four hours after we had been fished out of the water, my main emotion was still relief that I was away from disaster. The implications of having an accident hadn't occurred to me yet.

The helicopter had sunk in 78 feet of water. The Board wanted to have it raised to find out what went wrong. From their objective point of view, engine failure was only a suspected cause of the accident. Perhaps something else had gone wrong. Did the helicopter have plenty of fuel or was it fuel-starved? Did the engine overspeed to destruction through some mechanical or human malfunction? And did things happen as the pilots said they did, or was there some pilot factor in-



MAJ DAVID E. VAUGHAN
3246 Test Wing, Eglin AFB, Florida

volved in the accident? Was the fuel contaminated? Did the engine instruments all function properly or did they "trick" the pilots into their course of action? As these alternatives to what seemed to be a simple thing occurred to me, I became a bit apprehensive and also wanted very much to have the bird lifted off the bottom of the Gulf.

Four days after the crash, with the help of some frogmen and a barge, our helicopter was hauled to the surface. Salt encrusted all the metal switches in the cockpit. Four octopi had taken up residence and moved on reluctantly when the bird was raised. The altimeter had wound backward until it broke under the three atmospheres of pressure. But the helicopter was intact. The only damage was to the nose as it struck the bottom, and a broken pitch link that had snapped when the blades hit the water.

The engine, after the helicopter had been photographed from all angles, was removed and sent to a facility where it would be checked out. The Accident Board was very pleased that the helicopter could now be examined and I was too. I was sure that the cause, whatever it was, would be immediately found.

Several days later, the engine was put on a test stand and . . . it ran. The engine was run up to 87 percent and no difficulties were encountered. Perplexing news. And not designed to calm my apprehensions. After hearing that news, I spent a bad afternoon and night, wondering if, after all, I had caused the accident in some way.

The Board, except for the Flight Surgeon and his questions about my being "accident prone" and measurements of my body for his forms, had no communication with me during the investigation. I certainly didn't feel that no news was good news and tried to get in touch with someone on the Board each day.

The second day of the engine tests, it ran again. Only this time, without warning, it flamed out. The engineers conducting the tests ruled out the fuel control because the tests were done using manual (emergency) fuel. They went directly to the engine driven fuel pump. A tear down showed materiel failure in one of the drive gears causing a pressure loss and subsequent flameout.

I was extremely relieved. The Accident Board concluded its work with two days of formal meetings, hearing every witness who could contribute to their efforts. Not only the aircrew, but operations supervisors, division chiefs, maintenance men and maintenance supervisors were brought before the Board. Every possible aspect of the accident was explored through questions and answers so that sound recommendations could be made by the Board.

In the future, in addition to monthly meetings, bulletin boards, and occasional messages, my reaction to aircraft accidents will be personal concern. It can happen to me . . . or you. Here are some lessons I learned from all this:

- Believe in your emergency procedures. They *have* to be habit in a short time situation. Many bold print items are easy to memorize, but knowing how to handle the emergency (like autorotate, or complete a flameout landing) is something else. Something that requires practice.

- Know your egress procedures. How unsettling it would be to linger in your aircraft because you don't know how to make an emergency escape.

- Have faith in the Board. If you've done your job, don't worry. The Board will do theirs. ★

Why pilot error?

MODERN PSYCHOLOGY has done so much to explain the breakdown of normal human behavior (whatever that is) that we can literally get away with murder, provided we have the semblance of an excuse and a well-paid lawyer. But what has this blossoming fund of insight into the human error mechanism done to help us solve and prevent accidents which seem to originate in the cockpit?

Some have said that we should get off the pilot's back and stop using the painful term "aircrew error." We are daily reminded that our accident investigations are failures because, at best, we can pinpoint only *what* the pilot did wrong, not *why* he did it. To maintain our self respect—and our jobs—we hide our ignorance behind inoffensive recommendations that call for engineering or procedural changes. In other words, we tend to keep the pilot's halo shining by inferring that there were no bad guys in the cockpit at the time of the mishap.

Who are we fooling, besides ourselves? Do we really know so little about what makes a pilot do the wrong thing when, supposedly, he should have known better?

Let's first discuss what makes a man do his job the right way. It doesn't take a course in management to realize that we must give him the necessary knowledge, skill and tools. What is less understood is that the proper use of these three ingredients is governed by the man's attitude. Without getting involved in the tons of material written on the subject, we will say that a man has the proper attitude when he has the *willingness to use what he has learned and do what sound judgment tells him to do.* It is our contention that true aircrew error exists only where this willingness is absent—where the man follows his ego rather than his reason. We further contend that there's only one man who knows why he violated the dictates of learning and common sense —the pilot, if he's still alive.

Let's look at an example: You're driving your V-12 Jaguar down the pike between Dallas and Fort Worth. As a good, law-abiding citizen you keep your speed right at the legal limit. Your thoughts are still in the cockpit—where you got a snide remark from an approach controller about an hour ago—and you are formulating a devastating letter to the regional FAA man. Suddenly an old, rusty VW pulls alongside and pauses there, while the teenage occupants regard you with haughty smiles. A few seconds later you are staring at the ugly tail of the defiant beetle.

What are you going to do now? Your ego cries out for revenge. Reason tells you to ignore the chal-

lenge and stay in your traffic lane. Intellect, knowledge, training and judgment are smothered by the accumulated humiliations of the past few hours, and off you go in hot pursuit. As you break to the outside lane, there is a great gnashing of gears and tires—and your beautiful paint job is mixed with the ugly black and white from the patrol car chasing the VW!

THE PATROLMAN listens to your story, smiles and gives you a ticket. You protest, weakly, that he didn't have his red light on. He keeps smiling. He knows you did something against your better judgment. He doesn't care why.

Why pick a highway accident to illustrate "operator error"? Frankly, we felt it was the only way to approach a pilot's problems without aggravating him. The example is universal; it applies to any situation where, with hindsight and hidden remorse, we have to admit that we ignored our better judgment and learning.

Everyone agrees that someone with severe emotional problems should not fly. But if every pilot with marital, financial or health problems grounded himself, we'd be back in the bicycle shop where it all started. Yet it doesn't take Hollywood style stresses to make us ignore our better judgment. The slightest inflation or deflation of our ego may induce us to jeopardize human lives and costly equipment.

Suppose you're making an ILS approach and notice that you are slightly low over the middle marker. You have already decided to increase power when your copilot points an apologetic finger at the altimeter. He doesn't really want to criticize you but, at the same time, he hates to be blamed in case things go wrong. You ignore his gesture—and your own better judgment—by leaving the throttles alone. The aircraft touches down within the first feet of the runway. During the rollout you tell your assistant, "Why don't you take her on in?" with the blasé air of a man who is wasting his time on kid stuff.

What have you accomplished? Next time your copilot thinks the master of the ship is going to get in trouble he'll act like a dummy and sit bravely—and silently—through the crashing ordeal. Naturally the accident board will make some acid comments on the copilot's failure to act. But deep down in the caverns of your conscience you know that you caused this accident when you killed the concepts of team flying and shared responsibility in your cockpit.

AIRCREW ERROR? Yes, and of the purest sort. Can this type of error be uncovered by a thorough accident investigation? We doubt it. One doesn't need the Fifth Amendment to shut up and protect his ego. Can this type of error be prevented? YES! Even if we put on an act before our colleagues and the accident board, we can't fool ourselves for very long. At least once in a while —usually in the shakey aftermath of a near-disaster—we are forced to recognize the weakness in our makeup that suppresses our willingness to stick to our learning and sound judgment. But why wait for an accident to develop this self-knowledge? We can study and learn to control this judgment-destroying mechanism in practically every phase of our daily activities.

If this begins to sound like revival talk, it is simply because the true pilot error accident stands for lack of self-discipline and touches, therefore, on human behavior in general. We don't believe that a man who, with the slightest provocation, ignores his better judgment at home or on the road could be a striking example of composure under airborne stress. There's nothing that sets a pilot aside from the rest of mankind; the hallmark of professionalism in any field is discipline.

What else is there to say after beating aircrew error to death for the nth time? There is just one more admission to make: the most insidious killer in aviation—true aircrew error—may be beyond the control of safety programs and safety experts.

One man in particular, however, can rightfully appeal to the pilot's integrity, professional pride and reason: his immediate supervisor. He must do this in terms that leave no doubt about the pilot's ultimate and total responsibility for the use of his own good judgment. And, of course, he must practice what he preaches.

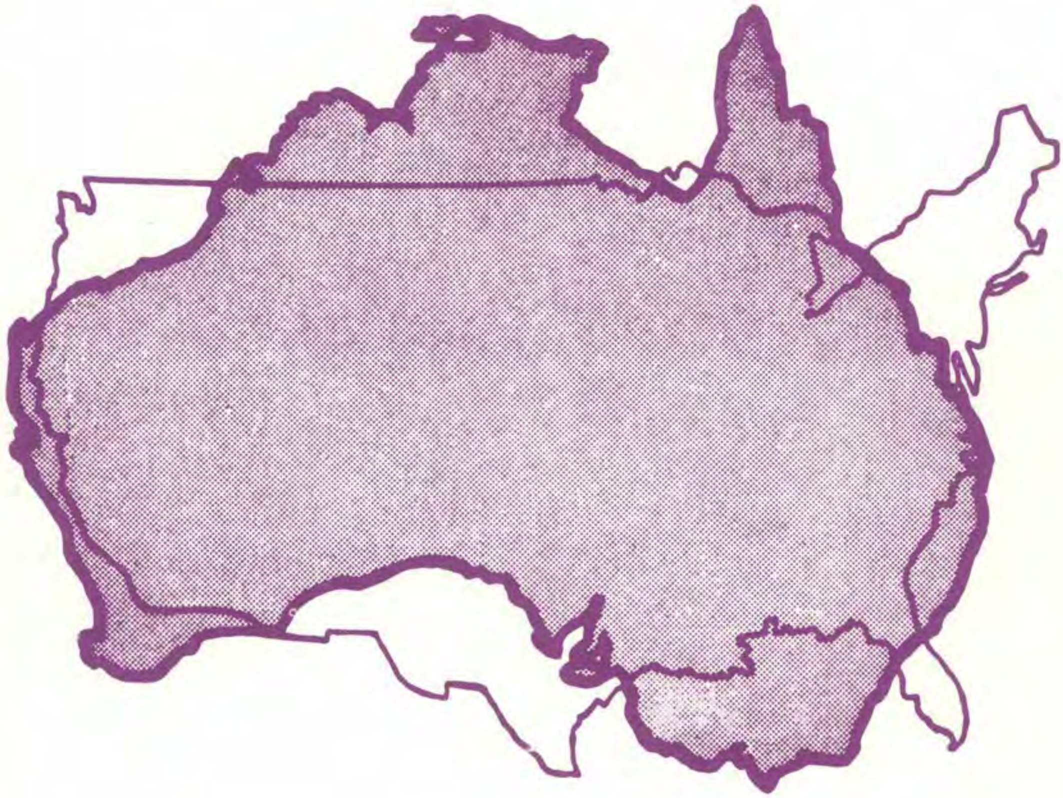
Beyond this, the only person who can really have an effect on the incidence of pilot error—real pilot error—is the pilot himself. Once he has been provided with the tools, training and equipment, it becomes an individual effort to use what he has learned and abide by his good judgment.

If this seems like a hopeless task, consider this: a pilot has already exhibited, to a remarkable extent, his ability to behave in a consistently rational manner—else he would not have those wings decorating his pocket.

We would venture a final wish: Let's temper that showmanship, touchiness and steely-eyed impatience in the cockpit with a strong dose of humility and self-restraint. Like a high-stakes poker game, the front office of an airplane is no place for emotional involvement. ★

—adapted from U. S. Army Aviation Digest

REMEMBER WHEN...or...



let's not forget the basics

No matter how long you have been flying, it seems as though the memories of Flying Training School endure. Remember your first flying instructor? The skill and professionalism with which he flew surely meant that he must have been flying since Pontius was a Pilate! How about when the Flight Manual was second only to the Bible—and you were not sure that seniority didn't have something to do with that anyway?

And you'll never forget the time that half the class rendezvoused at 8000 feet and had the best "hassle" that any group of 25-hour aces ever had. Of course, when you were all confronted by the Chief Flying Instructor and were told that the "discrete" frequency you had agreed upon was the bombing range frequency at another base and you had jammed out a flight of B-57s . . . you'll never forget that either! Why, then, if all these memories remain so clear, do so many pilots seem to forget some of the basic principles so painstakingly taught them?

Sqn Ldr DONALD MELVIN, RAAF, Directorate of Aerospace Safety

Don't take my word for it, though; I'll try to convince you with a few case histories.

• A C-47 was scheduled for an instrument proficiency and pilot upgrade flight over a route which basically consisted of a low-frequency airways structure. TACAN stations were sited enroute, but the aircraft was flying with an open TACAN discrepancy which had been carried forward over four flights. A limited radar monitoring service was available but was not requested; and after some initial ground communications difficulties, the crew made an IFR departure.

Station passage of a low frequency beacon was reported 12 minutes after takeoff, but intermittent contact with conrol agencies was again experienced and some minutes later was permanently lost. The aircraft was ultimately located 12 miles east of course where it hit a mountain at its assigned altitude. Both pilots were fatalities.

Reconstruction of the flight path revealed that the aircraft must have turned short of the beacon, even though station passage had been reported. A ground speed of 240 knots would have been necessary to have made good the reported position—no mean feat in a Gooney Bird.

The inherent inaccuracies of these beacons, especially under IFR conditions, are well known. But why did two very experienced pilots assume station passage four minutes before ETA? Were they distracted by the radio problems? Had they become so reliant upon modern aids that they forgot about the effects of weather on an old "bird dog?"

• A C-124 departed on an eight-hour, computer flight plan, overwater flight to a northern destination, in IFR conditions at 8000 feet. Everything was normal at the last call received 30 minutes before ETA. Then, contact was lost. It took three days for the weather to clear enough for an effective airborne search to be made. The wreckage was located at the 8000-foot level of a glacier on an 8215 foot volcano. This volcano was only eight miles to the right of the flight planned course.

Investigation revealed that the aircraft commander and the navigator had accepted a computer plan which was obviously designed for high altitude, and which offered no obstacle clearance guidance. The inadequacies of the computer plan were brought to their attention, and they agreed to, and filed for, and en route altitude of 10,000 feet. As soon as they were comfortably en route, however, they requested a descent to 8000 feet! The navigator had received a specific briefing on the high terrain surrounding destination prior to departure from home base, and had even gone to the trouble of obtaining an ONC chart of the area. Why, in the face of all this did they *insist* on an en route altitude well below MEA and even below the minimum altitude for reliable nav-aid reception? ? ?

Both these accidents could have been prevented by the application of *basic* navigation principles.

We spoke of Flight Manuals. Here are three cases where disregard of specific warnings caused loss of life and aircraft.

• A U-10 aircraft was returning to its home base on a routine cross-country proficiency flight, but was forced to RON at an intermediate stop because of destination weather. The next day the AC called his base, but was told the weather was still unsuitable and to check again in 24 hours. Despite local low ceiling, high winds, and forecast icing, the AC departed IFR on the third day without contacting his base! Soon after takeoff, the pilot requested a lower altitude as he was encountering icing conditions. A few minutes later he requested the lowest altitude available but was informed that he was already there. The aircraft was next observed by ground witnesses when it appeared beneath a low cloud bank. They commented upon its pitching and rolling motions and the abnormal engine noise before it nosed sharply into the ground and was destroyed. The three crewmembers were killed.

The primary cause was determined to be operator factor in that the pilot disregarded a warning in the Flight Manual and filed and flew into forecast icing conditions. The result was loss of power and aircraft control.

Two other cases involved C-123K aircraft performing identical maneuvers. The first aircraft executed a steep rolling pull-up after a low altitude, high-speed pass as part of a demonstration flight. At the apogee of the maneuver, with approximately 90 degrees of bank, the nose rapidly dropped and the aircraft rolled to a near vertical attitude. Recovery was impossible even though the pilot overstressed the aircraft to a point where the horizontal tail surfaces failed. Tragically, 17 crew and passengers were killed.

CONT'D

The other UC-123K made a low pass and pulled up parallel to the active runway. An identical flight condition ensued, and the aircraft crashed on the airfield in a near vertical attitude. This troop had resolved to be really spectacular, as during the course of the investigation a smoke grenade was found wired to the rear of the fuselage, and he had mentioned trailing smoke to some friends the evening before the accident. Five crewmembers perished.

A look in the Flight Characteristics section of the Dash One will reveal a warning note prohibiting power-on stalls, because no aerodynamic warning precedes an abrupt roll and downward pitch. Therefore, the high angles of bank (increasing the stall speeds by as much as 300 percent) and rapidly decreasing airspeeds placed the unwary pilots in an almost inextricable situation. The best guidance in the world is wasted unless it is heeded.

For the grand finale, a mishap falling into the category of an accident looking for a place to happen.

A C-47 was scheduled on a round-robin passenger mission to depart early morning and arrive back at base early evening. The first two legs proceeded normally, but the terminal forecast for the third leg back to their departure field (commercial) was 100 feet, one-half mile, rain or snow showers, and fog. This was confirmed by the duty forecaster at an Air Force base near the field. The AC decided to proceed to destination and attempted an ILS in WX conditions that were as forecast. A missed approach was executed and a second ILS attempted although the weather was still below minimums. A missed approach was again accomplished and the aircraft was cleared to hold at the ILS outer marker. Some 23 minutes later, the aircraft was cleared for a third ILS. A normal report was made at the outer marker, and witnesses then observed the aircraft descend through low clouds to the left of and at an angle to the runway. It banked slightly right and power was heard to be applied, but definite engine roughness was apparent. Before a climb was established, the right wingtip struck the ground, the aircraft crashed and burst into flames. The four crewmembers and one passenger all died.

The investigation revealed several circumstances which, although individually not responsible for the accident, cumulatively indicated a high accident potential.

a. Both pilots had 15½ hours crew duty at the time of the crash. However, they had only six hours bed rest prior to reporting for duty. So a fatigue element was present.

b. Neither pilot had provided for inflight meals, and neither was known or observed to have eaten any solid food on stopovers.

c. The AC did not report to Base Operations for any of the preflight briefings or preparations. He proceeded directly to the aircraft shortly before scheduled takeoff time.

d. The passenger traveled the entire flight without any record being made on a manifest or other document.

e. The AC had glasses prescribed for flying, but had been observed by a number of former crewmembers to still have visual acuity problems. This was neither reported to nor known by the flight surgeon.

f. No report was made to the AFB command post approaching destination, as required by directive.

Examination of the wreckage indicated that the mixture levers were in auto-lean, propellers most probably at a 2150 rpm setting, and the carburetor heat full cold. It was obvious that cruise configuration had been established during the holding patterns, but that the before-landing checklist had not been accomplished prior to final approach.

A tail wind component of 18 knots during the approach, coupled with the prevailing temperatures, dictated a power setting at which carburetor icing would almost certainly occur. The combination of engine detonation (high boost/low rpm/lean mixture), carburetor icing, a density altitude of 6000 feet, and the 20 degree bank angle made the go-around an impossible maneuver. The FAA flight checks of the localizer on record indicated that it broke sharply left below decision height, and this accounted for the displacement of the aircraft when it broke through the clouds.

The primary cause was assessed to be pilot factor in that the pilots failed to properly configure the aircraft, descended below decision height in IFR conditions, and subsequently placed the aircraft in a position from which they could not recover. What made them persevere with repeated approaches when they had adequate fuel for flight to a clear alternate even when they crashed? Why did they choose to attempt a landing in those conditions with an 18 knot tail wind to complicate the issue?

All the pilots involved in the mishaps described had many things in common. All had been assessed as mature, responsible individuals who either held IP/FE status or had been selected for upgrade. They were flying "docile" aircraft on routine missions, not pushing modern aerodynamic marvels to their limits. But they all perished due to fundamental errors—basic navigation, not heeding the Dash One, descending below minimums, and others you can no doubt identify.

It is not suggested that we should return to flying school thinking—that would be a retrogressive step. That indefinable term—airmanship—enables us to make decisions based upon experience, knowledge, skill, and many other factors. However, there are certain fundamental truths which respect only common sense—so *"let's not forget the basics."* ★

Ricochet

LT COL JAMES D. DUNN
Directorate of Aerospace Safety

KER ZING! If you could hear them or if there were some way to convert those training projectile ricochets into tracers that you could see, you'd know that you've been encountering some pretty heavy flak on those ho-hum range missions. Although we've moved the foul line back and up and given increased attention to film assessment programs, we still have ricochets and, more important, ricochets that hit aircraft. In fact, it appears that our aircraft are encountering more ricochet damage today per round fired than ever before.

Why? That's a good question. Maybe we can blame the heavy saturation effect our ranges have been exposed to with the SEA commitment of the last five to seven years, coupled with an accumulation of many projectiles which have not been picked up due to limited policing times or inadequate equipment. Perhaps soil composition, temperature, and humidity can somehow combine to deflect rather than absorb projectiles under certain conditions, especially the higher velocity 20mm.

The extremely heavy use of the new acoustical scoring targets (any flight of four likes to know who's the beer buyer while still airborne, right?) and their general lack of portability to another panel may also be a factor. But whatever the cause, we do know that ricochets pose a real accident potential to our weapons system resources and aircrews. We also know that ricochets not only can knock out your engine, but they can cause you to lose your canopy; and at 400+ knots on the deck, even if you're not seriously injured, it's questionable whether you can maintain aircraft control.

So how about it? Next low angle strafe mission, talk about the problem. If you don't have or use the double visors on your hard hat, you're missing some good insurance. And if you really want to reduce your exposure rate, ask the armament officer to procure enough tracers so that you can load 100 percent on that first strafe training mission and once a year for your continuation training. Firing tracer ammo is guaranteed to not only give you a graphic and visual portrayal of those blackboard briefings on vector analysis and feet per second ballistics, etc., etc., but will make this entire subject a personally emotional experience that will not soon be forgotten. ★

WOW!! IT WORKS!

The prospective passenger arrived at flight operations for his first orientation ride in the OV-10, and was sent to the Life Support section to pick up survival gear. There he was briefed on the operation of life support equipment and the OV-10 egress system.

The passenger and the pilot then walked to the aircraft, where the pilot personally strapped the passenger into the rear seat, reviewing with him the briefing on the egress system. Specifically, he cautioned the passenger not to pull the D ring unless told to do so.

The pilot then got into the front seat, strapped in and started his engines. After removing the safety pin, he directed the passenger to do the same. The passenger stated that the pin was a little snug but with a little jiggling he was able to remove it. He took the pin and the attached strap and was reaching for the thruster safety pin on top of the instrument panel. Suddenly he smelled something burning, heard a hissing noise and was ejected out of the cockpit! The ejection was successful, and the passenger landed 48 feet away, with no serious injury.

The conclusion of investigators was that the passenger pulled the D ring and S.I.E.'d (self-induced-ejection). Examination of the seat showed that both initiators in the dual system had fired with the activating pins pulled. The graduated metal flanges on the seat-activating D ring handle were bent and broken in such a way as to indicate that the D ring was UP at the time of impact.

Investigation points to the following sequence of events: As the thruster pin end of the streamer was placed on the instrument panel, it became lodged on the metal flanges of that panel. The streamer was then routed either through the D ring handle or in such a way as to become tangled with the handle when the D ring safety pin was removed. When the passenger attempted to secure the seat actuating pin, he raised the seat pin end of the streamer to the height of the instrument panel—creating, in effect, a movable pulley arrangement (with the thruster pin end lodged in the flanges atop the instrument panel) which would enable the passenger to lift the D ring and actuate the system with roughly half the force normally required.

The passenger stated later that he was unaware that the thruster safety pin was on the other end of the seat pin streamer. He also stated that he had not actually sat in the seat during his life support briefing (the seat was TDY to another location for aircrew training).

Several questions come to mind:

• Was the original life support briefing adequate without the practice seat available?

• Was the pilot's briefing detailed enough to make up for the inadequacy of the life support briefing?

• Was this passenger really mission essential?

The corrective actions taken and recommended indicate a "no" answer in each case. There was a lot of slack in the system, and nobody bothered to take it up—until after an accident. ★

REX RILEY'S CROSS COUNTRY NOTES

876-2633 AUTOVON

Last year we made some great strides in the quality of transient service provided by almost all of our bases. To make this year even better, I'll review some of the major points that determine a base's qualification for inclusion on the "Recommended List."

Attitude: In almost every case this one factor is the most important in Rex's evaluation. All areas of a base may be up to snuff, but if the attitude of the troops we come in contact with is one that makes us feel they are doing us a favor by providing fuel or a place to sleep, then they just have to lose points.

TAQ: This is another area we hope to improve in 1972. I've seen good and I've seen poor quarters but, unfortunately, I can't see all of them. So, we'd appreciate a note from *you* letting us know about those bases that excel as well as those that need some attention.

Refueling: Not every transient uses the "Qs" but just about everyone needs gas. The quality of fuel service is an obvious indicator as to how much attention is given to transient facilities by the commander. A two-hour delay for fuel tells me that nobody cares about *my* mission. I was caught several times last year by exercises—this is a way of life—but it still makes me wonder if one fuel truck could not be labeled "transient" and reserved for such contingencies.

Transient Questionnaire: I know of one base that makes effective use of comments by transient crews. Each relevant report is aired at the Air Traffic Control board meeting. I was impressed with the coordination this fosters between Tower, RAPCON, and Base Ops. Of course, it's hard to do this unless you have the questionnaires readily available at Ops. Does your base?

Your Job: One of the comments from a transient type in a recent letter to Rex goes something like this, "How can you justify keeping this base on the List? They are terrible." If Rex's only job was flying from base to base evaluating, it would still be impossible to get to everybody. So it's up to all transient crews to let me know when you are dissatisfied *or* happy about your treatment. Keep me informed; I'm as close as your telephone. Your comments determine who goes on and who comes off my List. With your help, maybe we can clear up all the transient shortcomings and make all our facilities outstanding by the end of '72. ★

THE

REX RILEY
Transient Services Awar

LORING AFB	Limestone, Me.
McCLELLAN AFB	Sacramento, Calif.
MAXWELL AFB	Montgomery, Ala.
HAMILTON AFB	Ignacio, Calif.
SCOTT AFB	Belleville, Ill.
RAMEY AFB	Puerto Rico
McCHORD AFB	Tacoma, Wash.
MYRTLE BEACH AFB	Myrtle Beach, S.C.
EGLIN AFB	Valparaiso, Fla.
FORBES AFB	Topeka, Kans.
MATHER AFB	Sacramento, Calif.
LAJES FIELD	Azores
SHEPPARD AFB	Wichita Falls, Tex.
MARCH AFB	Riverside, Calif.
GRISSOM AFB	Peru, Ind.
CANNON AFB	Clovis, N.M.
LUKE AFB	Phoenix, Ariz.
RANDOLPH AFB	San Antonio, Tex.
ROBINS AFB	Warner Robins, Ga.
TINKER AFB	Oklahoma City, Okla.
HILL AFB	Ogden, Utah
YOKOTA AB	Japan
SEYMOUR JOHNSON AFB	Goldsboro, N.C.
ENGLAND AFB	Alexandria, La.
MISAWA AB	Japan
KADENA AB	Okinawa
ELMENDORF AFB	Alaska
PETERSON FIELD	Colorado Springs, Colo
RAMSTEIN AB	Germany
SHAW AFB	Sumter, S.C.
LITTLE ROCK AFB	Jacksonville, Ark.
TORREJON AB	Spain
TYNDALL AFB	Panama City, Fla.
OFFUTT AFB	Omaha, Nebr.
ITAZUKE AB	Japan
McCONNELL AFB	Wichita, Kans.
NORTON AFB	San Bernardino, Calif.
BARKSDALE AFB	Shreveport, La.
KIRTLAND AFB	Albuquerque, N.M.
BUCKLEY ANG BASE	Aurora, Colo.
RICHARDS-GEBAUR AFB	Grandview, Mo.

FLIGHT

VERNET V. POUPITCH, Directorate of Aerospace Safety

A study of flight control malfunctions indicated that in recent years the annual cost to the Air Force has been 58 million dollars. The figure covered the loss of aircraft with flight control failure as well as secondary damage to other aircraft in flight or on the ground as a result of the original failure.

Flight control system failures frequently result from design deficiency. In a recent study of accidents attributable to design deficiency, flight control failure led the list (Fig. 1).

Flight control failure is particularly critical in today's high performance aircraft. Therefore, it is necessary to provide protection to the basic system in terms of multiple redundancy in relevant mechanical, electrical and hydraulic systems. This becomes a challenge of major proportions on smaller aircraft because of limited space. Nevertheless, it is essential and this feature is being incorporated into a new fighter.

To give you an idea of what we mean by design deficiency, the hydraulic actuators on one aircraft were designed with a common wall between two systems. Cracks in the common wall went undetected until an external leak developed, culminating in complete loss of both systems. The crew was forced to eject. Unitized construction had saved weight—at the cost of an airplane. (This was just one of several such cases, and there were others in which the crews got the aircraft home.)

Protection of electronic systems from the environment by shielding and sealing is vital. There have been many reports of moisture entering electrical components, with serious results. When this happens in an automatic flight control system, an event such as the following might occur:

> **A fighter on takeoff rolled right when left rudder was applied. Water was found under the rudder summing network module located at the base of the autopilot calibrator.**

Detailed study of autopilot reports discloses severe pitch-ups during formation, porpoising during tanker refueling, controls oversensitive, hard rollovers, lateral oscillations and violent noseover occurrences during intercepts. Some of the known causes were:

- Wires shorted, corroded or occasionally making contact.
- Defective autopilot amplifier.
- Channel out of trim.
- Rate gyro out of adjustment or failure.
- Yaw canceller malfunction.
- CADC signal erratic.
- Coupler failures.
- Unknowns—spurious signals that couldn't be traced.

Weight is always a major consideration in aircraft system design and when other aspects are involved tradeoffs must be made, but with prudence. For example, while most modern aircraft use steel tubing on the pressure side of the hydraulic system, aluminum tubing is frequently used on the return side. Both tubing and fittings of these return lines are subject to fatigue, and in event of fire, offer negligible resistance to fire damage. Also, failure of the return system can result in complete loss of fluid. Therefore, for maximum safety and reliability, it is desirable to use steel or a fire resistant material for both the pressure and return lines.

Moreover, we must so route hydraulic tubing that failure of an adjacent or remote linkage, an actuator support, flap or speed brake will not sever the tubing. A late model aircraft was lost when a speed brake actuator attaching bracket failed, severed the bundle of hydraulic tubing, and caused loss of flight control.

To obtain maximum aircraft performance we resort to high lift devices—slats and flaps. One modern aircraft has 42 movable aerodynamic surfaces in the high lift device system. Simplicity of slat and flap systems is difficult to achieve, but it is mandatory in order to obtain a high reliability factor. Symmetry, of course, is critical but we do not always achieve it because of failures of the drives, linkages, actuators, and structural failure of the attaching brackets. For example:

> **When the flap handle was raised after takeoff, the aircraft rolled left. Control could not be regained. Primary failure of the flex cable permitted an uncontrollable asymmetric flap condition. The contributing cause was design deficiency of the asymmetrical flap detector system.**

Design deficiency combined with maintenance malpractice can be a disastrous combination. Numerous

CONTROLS

aircraft have been lost because of crossed controls. The flight control system, whether conventional or fly-by-wire, must be designed so that control linkages, wiring, etc., cannot be improperly connected. Failure to do so could lead to disaster; for example:

> **The flight controls on a fighter froze and the pilot ejected. The primary and secondary pressure hoses were found reversed on the rudder actuator. Reversal of the hoses depleted the primary hydraulic system and caused primary pump failure followed by depletion of the secondary system and subsequent pump failure. The actuator hydraulic fittings were identical.**

Disconnects are another cause of numerous aircraft accidents. Loss of bolts in control system connections has made the use of self-retaining bolts at critical points mandatory. *No case is known where a fastener secured properly with a nut and cotter pin loosened*. Yet, we have a history of disconnects.

> **Fighter aircraft rolled to the right. No corrective measures were effective. The pilot ejected. A bolt connecting the auto pilot roll impulse rod to the right aileron actuator control bellcrank disconnected. The nut was not safety wired during overhaul.**

One solution to the maintenance problem lies in packaging. For example: Package the related assemblies into plug-in type hermetically sealed modules. Then, in the event of a component failure, only the readily replaceable, plug-in, sealed module would be replaced in the field. Plug-in connections could be made simultaneously with electrical, mechanical, and hydraulic connections. No adjustments would need to be performed by line personnel, who would merely replace the sealed units. Repair, overhaul, replacement and adjustment of the components in the module would be performed only in a shop-controlled environment by highly skilled shop personnel.

A larger inventory would be needed, or a rapid repair cycle established, to logistically support the module concept, but the savings in aircraft would justify it and maintenance error would be virtually eliminated.

We have been successful in reducing the number of accidents in all cause factor areas. As we continue to reduce the human factor, we must keep pace in the materiel area. This includes improvements in design, even to the point where design precludes mistakes during maintenance. The challenge is great but the rewards will be commensurate.★

FLIGHT CONTROLS

Flight Controls	24%
Engine	14%
Fuel System	13%
Structure	13%
Landing Gear	10%
Brakes, Hydraulics, Electrical and Miscellaneous	26%

Fig. 1. Design Deficiency Cause Factor Accidents

They Said "IT" Couldn't Be Done

The Hairy Tales column is open to anyone who has a message concerning safety, but would like to remain anonymous. If you have one of these experiences buried in your bosom, write it down and send it to us, signed or unsigned. Maybe your HAIRY TALE will save someone's life.

I've been procrastinating for weeks now, but I can't seem to forget "it," so I'll tell about "it" in the hopes that "it" won't happen to you. Then maybe, at least, something positive will come of "it." Here goes

I'm the flight commander of a two-ship, weekend student cross-country. I've been around five years, 2500 hours, and can look back on several "its," most of which are not so vividly intimate. I thought "it" didn't happen anymore, at least to professionals, and for sure not in my outfit.

We're late and had to get airborne prior to sunset. Center didn't have our stop-over clearance and we were hacked off because we didn't get any approaches. After landing we ran into base ops and on the way asked the fuel truck to get us first since the "thud" parked between us was RON.

We came back out and the fuel truck was just finishing my bird. I called to the other guys to expedite. I took off on the wing this leg and we launched into the fading twilight for—you probably guessed—Las Vegas. Just after we got airborne, lead began a very abrupt 180 back to the east where it's black and there's mountains—and I lost him. I called on departure frequency, then Guard—nothing! I looked for a flash of fire—nothing. I called tower and they said they thought he just landed but he was not talking. I returned and landed. Lead was on the ground, thank God.

You probably still haven't guessed "it" unless you started at the end of this story. The fuel truck skipped his aircraft and he took off with no gas! The fuel-low light and master caution came on just after liftoff and this was his first realization that all he had was fumes in the tanks.

You say inconceivable? We have 781s, checklists, we all look at those gas gages several times before liftoff. "It" happened to a well qualified, well thought of IP, a good head, who doesn't make mistakes. "It" could have been a catastrophe. ★

HOW FAR can you see?

We thought by now that everyone was familiar with the terms we use to describe how far we can see. A quick check around the flightline proved us wrong, though—a few pilots still get them tangled up. Here, then, are some handy definitions of terms, couched in language any jock can (hopefully) understand.

Visibility is the distance at which objects, such as trees or houses, can be distinguished as such. This distinguishing is made from a stationary platform, however, and probably by someone who is not particularly excited about it. Any correlation between this distance and the distance at which a pilot peering through the murk can distinguish the profile of a strange airfield is purely speculative.

Prevailing Visibility is the greatest horizontal visibility through at least half of the horizon circle. As examples, let's look at two hypothetical situations: in figure A, by definition, prevailing visibility is seven miles; in figure B, prevailing viz is two miles. From these examples, you can appreciate the problems involved in trying to give you, the pilot, a truly representative visibility value—either as an observation or a forecast.

NOTE: Neither of these values relates, in any predictable way, to inflight visibility. And that archvillain, slant range visibility, has so many variables (such as approach speed, pilot fatigue, windshield geometry and angle of approach) that it is virtually impossible to anticipate.

Runway Visibility (RV) is that value, derived visually or by instrument, that best represents the horizontal distance someone can see along a particular runway. This value is reported *only* if the prevailing or runway visibility gets down to one mile or less.

Runway Visual Range (RVR) also tells you how far someone can see down a particular runway, but RVR is derived differently. This time the data come from sensors along the runway which are calibrated with reference to high-intensity runway lights or other targets of great visual contrast. RVR is taken as a one-minute average and a ten-minute average, and is measured in hundreds of feet. Both averages are transmitted locally for use by air traffic controllers, but only the ten-minute average is sent to other bases for flight planning purposes.

Now do you see? ★

FIG. A

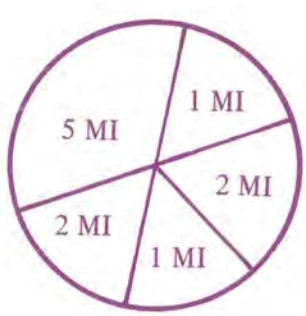


FIG. B

THE I.P.I.S. APPROACH

By the USAF Instrument Pilot Instructor School, (ATC) Randolph AFB, Texas

ILS GLIDE SLOPE

Q What is the significance of an underlined glide slope intercept altitude on an ILS approach chart?

A The legend page of the low altitude instrument approach procedures booklet explains this one. "Glide slope intercept altitude is the same as the minimum altitude over the LOM for localizer only approach, except as noted." Unless a different final approach fix altitude is designated, maintain the published glide slope intercept altitude until past the localizer final approach fix.

Q Does glide slope intercept altitude also apply to other approaches, such as VOR or TACAN, published in conjunction with the ILS?

A Yes. Unless there is a specific FAF altitude published, the published glide slope intercept altitude is a minimum altitude until passing the final approach fix for a non-precision approach. For example, consider a VOR/ILS approach with ILS, LOC, VOR, and circling minimums published, and no specific final approach fix altitude designated. When flying either the LOC or VOR approach, maintain the glide slope intercept altitude until past the FAF.

AFM 60-16

Q AFM 60-16 allows me to file to a base and begin an approach under "visibility only" criteria. Does this also allow me to take off using visibility only criteria?

A Yes. "In the absence of command-established takeoff minimums, no takeoffs are permitted when existing weather is below applicable landing minimums suitable for use by the aircraft concerned." (AFM 60-16, para 8-9a.) The weather is below landing minimums when the *visibility* is less than that specified for the applicable procedure. (AFM 60-16, para 8-15a and para 8-16.)

BELOW MINIMUMS

Q I have initiated an instrument approach and the visibility goes below minimums. In lieu of descending to the proposed MDA or DH, may I fly the final approach course descending no lower than final approach fix altitude?

A Yes. We know of no possible conflict that would arise in this situation. Traffic separation would be provided both at FAF or MDA/DH altitude. However, if your MAJCOM supplement to 60-16 authorizes you to descend to minimums, you would be depriving yourself of the possibility of landing even though the visibility is *reported* as below minimum.

INSTRUMENT FLIGHT

Q Under what conditions may I log instrument time in the 781?

A AFM 60-1, Attachment 6, defines instrument flight as "Flight conducted in weather conditions that do not permit flight with visual reference to the horizon, ground, clouds, or water." The pilot must determine when these conditions are met.

TCAs

Q Where can I find information on Terminal Control Areas?

A Newly established TCAs are depicted in the Special Notices and Procedures section of FLIP II.

They are published there for three issues and then "incorporated with other data." Other data right now means the new VFR terminal area charts (available from commercial sources). TCA charts are also published by the National Ocean Survey and are available at Navy base operations facilities. Graphic portrayals of individual TCAs, their effective dates and operating rules and procedures can be found in the Airman's Information Manual, Part I and Part III. You can avoid the issue completely by operating under IFR while within TCAs.

HANDY HINTS

Ever been strapped in your bird and suddenly found that you need something to write on right now? Most well-equipped pilots will have some scratch paper, an extra Form 70, or an old SID that will serve the purpose. If those sources fail you, try one of the approach booklets. There are usually six or eight blank pages in the back which will serve nicely for note taking, clearance copying, and other purposes. It also saves a lot of doodling on enroute and approach charts.

AFM 51-37

By this time, the new issue of AFM 51-37, *Instrument Flying*, should be in your hands. Virtually the entire manual has been rewritten. For this reason it would be impractical to attempt to list all the changes and the rationale behind them in this article. All changes were made with you, the pilot, in mind. The basic objective was to simplify procedures where possible and to clarify wording which was susceptible to misinterpretation. We sincerely hope that this manual will satisfy the needs of the using agencies. Please help us keep this manual current and responsive to your needs. We encourage your use of the AF Form 847, Recommendation for Change of Publication, for this purpose. ★

GEN SPRUANCE EDUCATION AND TRAINING AWARD

SMSgt Thomas W. Linam, Jr., Colorado ANG, was honored for his contributions to aircrew safety when he was awarded the General Spruance Education and Training Award at the Ninth Annual Symposium of the Survival and Flight Equipment Association. The award was based on SMSgt Linam's many innovations in creating a realistic training program for pilots in ejection and emergency ground egress procedures.

LT COL GERALD A. JONES
Directorate of Aerospace Safety

Supposedly, all helicopter drivers are aware of the effects a tailwind or downwind condition can have on aircraft performance during takeoff or approach. However, occasionally we find the need to review and reemphasize these effects. The following are summaries of two recent accidents which occurred during downwind operations:

A CH-3E was on a mission to airlift personnel into and out of a helicopter landing zone (HLZ). The HLZ was approximately 300 feet by 100 feet, surrounded by trees approximately 75 feet high, and oriented to the northeast on slightly rising terrain. An approach was made to the center of the HLZ into an eight to ten knot wind from the northeast. After the transfer of troops was completed, the aircraft commander brought the helicopter to a hover, backed up slightly and turned to the west-southwest to make a downwind takeoff toward slightly lower terrain and trees. He lowered the nose of the helicopter and began a slow acceleration and climb. Within seconds the rotors began contacting several small trees near the edge of the HLZ. A right turn was made to take advantage of lower trees, and acceleration reached 10-15 knots groundspeed. At this point the aircraft passed the edge of the HLZ and the ground effect was lost due to the steep drop in terrain. Having insufficient power to remain airborne without ground effect and not having reached sufficient speed to gain translational lift, the aircraft settled into the trees. The aircraft commander and four others died in the crash and ensuing fire.

In another accident, an HH-3E was on a mission supporting training of survival students in vectoring rescue aircraft by use of emergency radios. Several signal evaluations had been flown and on this evaluation the vector resulted in a seven to 15 knot tailwind. The altitude was 250 to 300 feet AGL, and the airspeed was approximately 65 knots with the aircraft descending at 200 to 300 feet per minute with power at 35 to 40 percent torque. The aircraft continued this flight path toward slightly rising terrain for approximately 1200 feet. When approximately 100 feet above the ground and at an airspeed of 45 to 50 knots, a 20 degree nose up attitude was assumed. This attitude caused a near zero airspeed and a settling condition was encountered. Power was increased; however, the nose was not immediately lowered. Full power, 110 percent torque, was subsequently used, and the nose was lowered, but not in time to arrest the descent prior to contact with a tree and gully bank. The aircraft suffered major damage and the aircraft commander received major injuries. The copilot and the helicopter mechanic received minor injuries.

In each of these accidents, the downwind condition played a signi-

SCRATCH TWO... downwind

ficant role. In the first case, shortly after the accident, another CH-3E at the same gross weight departed the HLZ into the wind without a problem. In the second case, although the unchecked settling condition was the real culprit, the downwind condition may have been the final deciding factor.

In many cases the true effect of a downwind condition can be deceptive. If we note the effect of a tailwind on power required to hover, it may not appear to be significant; however, trouble begins as we move forward on takeoff. In a stationary hover with a ten knot tailwind, we are in effect flying backwards at ten knots. To attain translational lift airspeed of approximately 20 knots we must accelerate 30 knots as opposed to only 10 knots with a ten knot headwind. Obviously considerable more distance will be required for a downwind takeoff under limited power conditions. If we attempt to shorten this distance and climb prior to attaining translational lift, we will find ourselves in the situation encountered by the pilot in example number one. Without translational lift and out of ground effect the power required to remain airborne will approach that required for an out of ground effect hover. And if we don't have this capability, we can't stay airborne.

Our problem during an approach with a tailwind is somewhat reversed. Here we are concerned with the loss of translational lift before entering ground effect. We normally fly an apparent ground speed during an approach. Consequently, we can easily find that we are below translational lift airspeed while well above our ground effect altitude. Here also the power required can greatly exceed power available. Although we will pick up ground effect as we approach the hover, a high rate of descent may develop which cannot be arrested in time to prevent ground contact.

We can compensate for this, somewhat, by maintaining our airspeed above translational lift until we pick up ground effect. But then we will be concerned with the problems of stopping the helicopter while at a lower altitude and with a relatively high ground speed. We may be risking tail rotor-to-ground contact or a possibly dangerous overshoot.

In short, downwind approaches and takeoffs should be undertaken only when absolutely necessary and operationally justifiable. And certainly only after we have assured that it can be done with complete safety. Even then, we must continue to bear in mind the increased criticality of a power loss while downwind at a low altitude and airspeed. ★

air force's new fire resistant

HYDRAULIC FLUID

GUS S. ECONOMY, Directorate of Aerospace Safety

The familiar red hydraulic fluid (MIL-H-5606B) has been with us a long time—since 1945 to be exact. As a hydraulic fluid, it has done its job well, but it has always had one significant drawback. *It is highly flammable.* Its fire point is 225°F, only a few degrees above the boiling point of water.

Fires involving hydraulic fluid have cost the Air Force millions of dollars and several lives. Because of this, a replacement for MIL-H-5606B with a fire resistant hydraulic fluid has been researched for many years. Many candidate fluids were considered which did have excellent fire resistant properties. However, technical problems existed such as compatibility with existing aircraft hydraulic system components (seals, pumps, actuators), lubricity, high and low temperature requirements and other properties. A fire retardant fluid presently used in commercial aircraft was also considered. However, it was not compatible with present Air Force hydraulic system components.

A new hydraulic fluid has been developed and is designated as MIL-H-83282, Hydraulic Fluid, Fire Resistant Synthetic Hydrocarbon Base, Aircraft. Compatibility problems with Air Force existing systems have been overcome and MIL-H-5606B fluid in current aircraft can be replaced merely by draining, flushing and refilling with MIL-H-83282. Compatibility of the two fluids has been resolved to the extent that no intermediate flushing fluid is required.

Results of tests such as gunfire, flash and fire-flame ignition and flame propagation have been very satisfactory. Operational evaluation in test aircraft has been very successful. (Tests are still in progress and additional tests have been programmed.) Some of the significant comparative hydraulic fluid oil properties are listed in the accompanying table.

Action is now being taken by AFLC to introduce MIL-H-83282 hydraulic fluid into the Air Force inventory (with emphasis on priority introduction to the F-4 aircraft at the earliest possible date). Production facilities and Air Force priorities will have to be established in order to phase in the new hydraulic fluid. Hydraulic system specifications and federal stock numbers must be rewritten and assigned before Air Force requirements can be fulfilled. It will take time, but an end to catastrophic hydraulic fluid fires is in sight. ★

	MIL-H-83282 New	MIL-H-5606B Old	Commercial Hyd Fluid
Flash Point	400° F	200°F	360°F
Fire Point	475°	225°	470°
Auto Ignition	650°	437°	1000-1200°
System Compatibility	Yes	Yes	No
Hi Temp Limits	*425°	275°	275°
Lo Temp Limits	-45°	-65°	-65°

*Pump test just completed

NIGHT FLYING OPERATIONS

How long has it been since you, the commander, the ops officer, maintenance officer, the fly safety officer, or supervisor, took a good hard look at your night flying operation? Here's what one alert supervisor found. He's taking steps to correct his deficiencies. Do you have problems like this? Would you know it if you did?

Night flight line safety surveys conducted during recent weeks have revealed a serious, almost flagrant disregard for common sense safety precautions. Lack of adequate FOD control, speeding near parked aircraft and on flight line, driving under aircraft wings, non-use of technical data, and maintenance with no lighting or inadequate lighting are becoming the rule rather than the exception.

FOD control, for example, is one of the most serious problems we are encountering. Yet, we continue to find replacement parts, tools, and safety pins for aircraft left lying loose under wings, in front of aircraft, and blowing down the line during windy periods.

We are all aware that night hours are also the critical safety hazard hours, yet it seems that our safety conscience sinks into the west with the setting sun. The prevalent attitude seems to be, "We can get the job done now that it is dark, because we can do away with that damn checklist," or, "I don't need to chock my vehicle because it's dark now and nobody will catch me anyhow." This is an attitude that we not only can, but we must, do away with.

The protection of our resources *is everyone's responsibility,* and each individual must pull his share of the load if we are to reverse this alarming trend during night operations. ★

TOUCHE

MAJ EDWARD FRANCIS, CF
Directorate of Aerospace Safety

The T-bird taxied into a fuel truck! Minor damage only, this time, but if they'd bumped a little harder you could have seen it from orbit. (Fortunately, there wasn't enough $1/2MV^2$ to set the whole thing off.)

Just because it was a little one instead of something that lit up the sky doesn't mean we shouldn't review the action with a critical eye toward keeping ourselves out of this kind of really bad trouble.

Let's see what happened—

The T-bird had just landed at home base and turned off the runway at a perpendicular taxiway which intersected a parallel taxiway in a civilian aircraft parking area. The parallel taxiway, 50 feet wide, was marked by a centerline stripe, but its boundaries were not defined in the ramp area. A civilian aircraft was improperly parked on the ramp, close to the taxiway, and was being refueled there because an attempt to move it to a more suitable location had been abandoned when the engine would not start. It was daylight and visibility was unrestricted. With the red and white painted fuel truck on the side of the taxiway, the stage was set.

As he entered the ramp area, turning left onto the parallel taxiway, the pilot was completing his after landing check and was following the yellow taxi line. He did not realize the fuel truck was on the taxiway until the last moment. In the collision the bottom of the right tip tank and the top of the truck's left front fender were dented.

Two contributing causes were identified in this case —the fuel truck improperly parked on a portion of the active taxiway, and the lack of clearly defined taxiway boundaries. However, the primary cause was the pilot's failure to exercise due caution while taxiing in a congested area.

This incident emphasizes once again that a congested area is no place to be doing checks on the move.

One other thing. What was the copilot doing at the time?

PULL CHECK?

Another T-Bird was the target for intercept training with an F-4. After the third intercept, the T-Bird started a 2-3G left descending turn at 300 knots. Suddenly the aircraft shuddered, as though it had passed through jet wash. The pilot had no reason to believe jet wash was present, so he slowed the aircraft to 180 knots and returned it to level flight. In level flight the aircraft continued to vibrate as though the speed brakes were extended, and the F-4 was vectored to the T-33 for a visual check.

The right half of the plenum chamber access door had come off in flight and had struck the vertical stabilizer, damaging the fillet, bending the elevator pushrod assembly and breaking out the rotating beacon and fuselage light. The pilot of the T-Bird made a controllability check at altitude, determined the airplane to be safe to land, and accomplished the landing without further difficulty.

The crew chief stated that he had fastened the door after his preflight, and the pilot stated that he had checked the door by pulling on it. However, only three of the fasteners on the right side showed evidence of being pulled out. Further investigation of other T-33 aircraft disclosed that these fasteners were not all aligned with the edge of the door and did not give a good visual reference for checking security of the door. The investigators also learned that two secured fasteners are sufficient to hold the door for a "pull check."

This unit has repaired all its aircraft so that fasteners are aligned properly, and alignment stripes have been painted on all the T-33 plenum chamber doors. Other units might take note.

This problem is older than many of your maintenance troops. How good is your safety education program down on the flight line?— Ro*

*B/G Robin Olds

topics

FLIP CHANGES

High Density Traffic Airports:

FAA is extending for one year the special air traffic rule for High Density Traffic Airports which was scheduled to expire on 25 Oct 71. (See Section II Planning for OPERATIONS RESERVATIONS FOR HIGH DENSITY TRAFFIC AIRPORTS.) Reservation requirements for operation into and out of Kennedy International Airport, and O'Hare International Airport have been modified and are now required between the hours of 3:00 p.m. to 8:00 p.m. (local time). La Guardia Airport, and Washington National Airport require reservations between the hours of 6:00 a.m. to midnight (local time).

FOG DISPERSAL

The FAA has awarded a large chemical company a two-phase contract to study the effectiveness of certain ecologically safe chemicals, known as polyhydrics, to disperse warm fog. The first phase of the contract will be part of the U.S. Naval Weapons Center "Project Foggy Cloud IV." It will involve spraying small quantities of the chemicals from a manned balloon and measuring the fog dispersal. If the Phase I tests are successful, the second phase will be conducted from April 1972 through January 1973. A final report should be available by summer of 1973.

RUNWAY DEBRIS

The National Transportation Safety Board recently released its final report on the fatal crash of a commercial airliner last year. According to the Safety Board, the probable cause was ". . . a loss of pitch control caused by the entrapment of a pointed asphalt-covered object between the leading edge of the right elevator and the right horizontal spar web access door in the aft part of the stabilizer."

The Safety Board pointed out that the introduction of jumbo jets, with more than twice the thrust of previous models, has caused considerable erosion along taxiways and runways used by the jumbo jets. At the airport in question, such pieces of asphaltic material were continuously being blown onto taxiways, ramps and runways, even though these areas were conscientiously being swept.

The message seems very clear. Those bases which are now accommodating the C-5 should intensify their runway debris control efforts. It's a lot cheaper and easier to pick it up *before* the accident.

LOOK, SEE AND AVOID

"We were flying a Buzzard One departure out of Last Chance AFB. Published instructions are to maintain runway heading to the five mile DME, right turn to 060 to intercept the 038 degree radial. At the five mile DME and climbing through about 5500 feet, we began our right turn. Last Chance Departure Control cleared us to Center, followed immediately with '381, if you're still on frequency, be advised there is traffic at twelve o'clock.' We looked up in time to see a light aircraft passing by us less than 500 feet away. Weather at the time was VFR."

—extracted from aircraft commander's statement.

What can we say? The quote is from a routine message, a USAF hazard report on a near miss by a C-141. Two phrases leaped out and hit us in the eye: "We looked up . . ." and "Weather . . . was VFR." It may be heresy to suggest, but it seems clear that the precision, the cross-check and the attention to flight instruments required for safe flight in weather, are our worst enemies in visual conditions. When the weather is "VFR" the little airplanes are out flying in it. It is imperative that we *look, see* and *avoid!*

THROW A NICKEL ON THE DRUM—

An hour or so after takeoff, the pilot of the F-4 started a right turn and found the control stick wouldn't move to the right. Using aileron trim and rudder, the pilot completed his right turn, declared an emergency and diverted from flight plan to a nearby airfield. Enroute, the problem cleared up and he made an uneventful emergency landing.

Investigators turned up a nickel in the front cockpit between the torque tube stop bolt and the torque tube mount bolt. The nickel showed signs of being jammed between the bolts. They removed the nickel, checked the flight control system, found the system to be satisfactory and released the bird for flight.

Now, a nickel's not worth much—when it's a nickel. But when it's a piece of FOD it's worth a bunch—in terms of the damage it can cause. Everybody—pilots and maintenance types alike—should be aware of the necessity of accounting for tools and personal property while in the vicinity of aircraft.

Commanders: This is the very reason that cockpit FOD is a Red Cross item. Are you positive your maintenance and aircrew people are fully aware of the potential hazard?— RO

—AND NO ACM ORDERS

As the T-41 student was recovering from a power-on stall, a green, 18-inch snake slithered from the upper right air conditioning vent to avoid the cold and took up residence in the warmth of the IP's lap. A complete survey of type and size of snake was accomplished in approximately .01 second. The IP and student formed a committee of two to apprehend and confine the snake as it was in violation of current directives (not on flying status, not manifested, not medically cleared, no dog tags, and not enrolled in a formal training course). Subject snake was captured and confined to a sick sack for the remainder of the flight. Upon return to the flight room, subject snake was chastised for his willful violation of flying regulations and utter disregard for safety of flight. Damage to the aircraft was confined to minor seat cushion deformity.

Ingenuity has changed many would-be accidents into good war stories. Looks like that ingenuity is still with us, when the opportunity arises.

—ATC Safety Kit

TESTING AND LEARNING

. . . from VEHICLES OF THE AIR by Victor Lougheed (published November 1909).

"In testing new flying machines, and even in learning to operate ones of established qualities, there are a number of things to be considered that are a little different from the conditions surrounding the tests of other mechanisms and the operation of other vehicles.

"Thus failure of an experiment with a mechanism of this type is likely to be not a mere mechanical failure, but also may readily result in injury to or the death of its operator unless ingenious and well-considered precautions are taken to assure a maximum prospect of safety.

"Likewise, for a beginner to attempt to drive a machine even of a type known to be well capable of flying, the attempt can easily become most dangerous business if gone at in a reckless manner."

(How terribly, terribly prophetic, Mr. Lougheed!)

SOUR PICKLE

The OV-10 pilot had expended all his Willy-Pete rockets from station two, and thought he positioned the number two switch to OFF after his last marking pass. Then, intending to select number four station for additional passes, he inadvertently selected number three instead. He realized his error and, after returning number three to what he thought was the OFF position, he switched number four to the FIRE position. On his next pass, when he pressed the trigger button, a rocket fired from station four, just as he wanted it to. Unfortunately, he also jettisoned the centerline tank (connected to station three) and the LAU-68 rocket pod from station two. At this time the pilot realized he had positioned switches two and three to DROP, rather than OFF.

As a result, the unit has decreed that all pilots will arm or safe the weapons control panel using only one finger. Since a positive lifting movement is required to move the switch past the OFF detent into the DROP position, it sounds like a good idea. This unit has implemented the procedure into its phase one checkout program and instructed its Stan Eval pilots to monitor compliance. Units of other aircraft with similar panels (and similar problems) might give some consideration to the idea. ★

Toots

is interested in your problems. She spends her time researching questions about Tech Orders and directives. Write her c/o Editor (IGDSEA), Dep IG for Insp & Safety, Norton AFB CA 92409

Dear Toots

I have a question regarding TO 00-20-5, dated 1 September 1971, and the proper signature to use in signing off the "In-Process Inspection" entry in the Corrective Action block of the 781A.

TO 00-20-1, para 6-61, says in part that the minimum signature to be used on the maintenance forms will be "the written first name initial, last name and grade/rank, although a full signature should not be considered in error." However, the current 00-20-5, para 2-94, says that a statement such as "In-Process Insp Accomplished" will be entered in the Corrective Action block of the 781A, if required, followed by "first name, initial, last name and grade/rank."

I believe that a typographical error was made and that the comma between name and initial should not have been inserted. However, our QC people have interpreted the statement to mean first name, middle initial, last name and grade/rank.

While an AFTO Form 22 is being submitted, all entries made after 1 November 1971, not having the full signature will be considered in error. Can you clarify?

MSgt Richard K. Bailey
89 CAMRON
Andrews AFB, Maryland

Dear Richard

I talked with the OPR for 00-20-5 and you are correct. There is a typographical error. The intention was to require the same old minimum signature—first name initial and last name. The OPR is expecting your AFTO Form 22 and will give it immediate attention.

Keep up the good work.

Toots

Dear Toots

I am at odds with my brother Quality Control inspectors about the intent and applicability of paragraph 4-36, TO 00-25-172 (page 4-9, Change 10). The paragraph states: "Adequate eye protection (safety glasses or face shield) will be worn by persons servicing aircraft or equipment with nitrogen gas." I feel that this sentence pertains to servicing of systems and equipment with *high* pressure N_2. My counterparts maintain that eye protection must be worn regardless of the pressure.

It seems very senseless to require a face shield or safety glasses to perform the following tasks:

a. Purging and pressurizing a battery case to 10 psi.

b. Servicing and pressurizing a hydraulic reservoir to 50 psi.

c. Checking and pressurizing a tire to 100 psi.

d. Purging a liquid nitrogen system with gaseous N_2 at 35 psi.

My question is in two parts: One—is my contention valid? Two—if you do agree with me, at what servicing pressure should eye protection be required; 500—1000—1500—2000—3000 psi, etc?

Please do not get the impression that I do not have respect for high pressure gas—I do! But I feel that compliance with this paragraph is too restrictive and that it should be applied with common sense.

MSgt James L. Watts
9 SRWg
Beale AFB, Calif.

Dear Jim

I must agree with your brother Quality Control inspectors. My interpretation of 00-25-172, para 4-36, requires the use of eye protection during all nitrogen servicing. This paragraph does not define a specific pressure.

I think a bit of additional information for you is in order. Take a look at AFM 127-101, para 7-4, which defines pressure systems, and para 8-2.0 which describes the dangers of handling pressurized gases. Pressures as low as 10 to 15 psi have been known to cause serious injuries.

Toots

FOR MAINTENANCE SUPERVISORS

MAJ RICHARD E. HAMILTON, Directorate of Aerospace Safety

Many of the problems that plague the F-4 today have been identified for years . . . yes, I said years. Corrective actions, for the most part, have been to further refine the technical data in order to identify the problem before it happens. We then call for a one-time inspection of the fleet, find a considerable number of failures, chaffing, etc., and then turn the whole problem over to the crew chief again.

Just because we publish more explicit inspection criteria, we seem to expect a young troop just out of tech school to solve everything. Let's face it, a man just can't be taught all of the tricks of the trade at tech school. Is it necessary to have years of experience in order to spot a peculiar bend in a wire bundle, or to know that this particular fuel line needs to flex more than an inch when the engine is running? Just what does "adequate clearance" mean in the real world of field maintenance? OJT is a lot more than "reading the cards."

The key is supervision, or maybe I should say instruction. Experience comes from both sides, and the new man needs to know the results of his efforts, both good and bad . . . "Spotting a chaffed line here can prevent an inflight fire;" "If this wire bundle shorts out, the engine can flame out;" "Check this cable clear through both bulkheads or binding can occur and the pilot will lose control of the throttles."

A top notch supervisor will insure that his guys are qualified in both inspection and prevention.

Tech TOPICS

BRIEFS FOR MAINTENANCE TECHS

LOST AND NOT FOUND

During through-flight inspection of a C-141, a 4' X 1' inspection panel just forward of the rudder was found missing. A search at both the departure and recovery bases failed to turn up the missing panel. The panel is normally secured by 52 screws, three of which were still attached. The remainder of the nut plates were intact, indicating that the panel had not been properly installed during maintenance.

Aircraft panels were designed to enable maintenance personnel to inspect and service something beneath the aircraft skin. It makes sense for the supervisor to inspect the security of panel as well as the work performed below it.

AIRBORNE ALLIGATOR (CLAMP)

After takeoff the T-39 gear indications failed to show up-and-locked. The pilot recycled the gear four times but this failed to correct the problem. The gear was returned to the down position with three in the green, and a safe landing made.

An alligator clamp minus the wire was found attached to the nose gear door forward arm. The clamp had wedged between the nose gear door and forward fuselage, preventing the door from fully closing. Apparently the clamp was not removed after refueling.

POL and maintenance troops note: TOs 00-25-212 SS-1 and 1T-39A-2-1, para 4-7A spell out the type static ground required during refueling.

Wonder how the pilots missed this on preflight?—Ed.

THE TO, SARGE

Two sergeants were dispatched to perform a flow check on the F-4's emergency canopy system. Even though the TO was on hand, the sergeants goofed and blew the sequence actuator.

While performing step E of TO 1F-4C-3-2 (which states: "disconnect line 7 from T fitting 9"), the sergeants inadvertently disconnected line 7 from T fitting 6. Not realizing their error, they continued with steps F through L, which require that dry air be applied. At this time the sequence actuator blew.

The primary cause was personnel error, in that the sergeant disconnected the wrong line. A contributing cause was that the crew chief didn't use the TO as a checklist while his team member performed the work.

TO utilization is a must during all maintenance.

M & M

That M & M stands for Maintenance and Murphy. Here's why we chose that title.

After the utility hydraulic system in a T-38 failed in flight, the utility pressure and return lines to the left horizontal tail actuator were found to be connected in reverse. High pressure through the utility return line into the servo valve caused failure of the seals separating the flight control and utility system. This allowed utility fluid to pass into the flight control system where the excess fluid was vented overboard leading to utility system fluid depletion and system failure.

Maintenance bought the blame, but it looks like Murphy also had a hand in this one. Your TO was designed to eliminate Murphy—Use it!

T-38 TORQUE TALE

During takeoff roll for an FCF after Nr 1 engine change, there was an explosion and the left engine fire warning light came on. The takeoff was aborted, but there were two more explosions and the right engine fire warning illuminated. Both engines were shut down and the crew smartly exited the burning aircraft. The fire, in the engine bay and tail section, was quickly extinguished.

There were several things wrong with this bird:

- The two top nuts that mount the fuel control to the pump had not been torqued during installation, and the washers were missing.
- There was a small gap between the fuel control and pump and about a one-eighth inch gap between the nuts and flange. At approximately 25 psi test cell boost pressure, leakage would occur between the pump and main fuel control.
- The O ring seal had been crimped during installation and ruptured because of the loose connection.

In this particular case, three people failed to do their jobs: the mechanic who did the work, the dock (station) supervisor and the QC inspector who finally cleared the work performed.

COMMANDERS TAKE NOTE: Are there problems being documented by your QC that aren't getting to you? Are you following up on the problems you and your staff have corrected? Could an instance like this one happen in YOUR shop??— Ro

IT COULD BE ONE OF YOURS

SAAMA has received reports from the field which reveal a serious problem concerning ejection seat ballistic hoses. In an inspection of 40 F-102 aircraft and five T-33s, 92 hoses were found with tolerances that failed to meet TO (42E1-1-1) requirements.

These hoses are a field-level manufacture item, and it's obvious that quality control procedures for their manufacture have not been adequate. If the couplings do not match properly, it is likely that over torquing will result from attempting to tighten the couplings. The hazard is obvious: improper mating of the couplings can cause a loss of gas pressure and render the escape system useless!

A Dash-2 handbook operational supplement has been issued on these two aircraft to assure close inspections at time of maintenance. Even though reports have only been received on the T-33 and F-102, it does not mean this problem is unique to these aircraft. It is highly probable that escape systems in other aircraft are also involved, since many use the same type of locally manufactured hose.

Good quality control procedures are absolutely essential during the manufacture, installation and maintenance of these hoses. This potential hazard warrants the immediate attention of ALL personnel involved in egress system maintenance.

PAPER TIGER

The pilot of the TH-1F brought the aircraft to a four-foot hover, then hover-taxied approximately 50 feet forward. At this time the pilot heard two loud bangs but before he could react, the aircraft yawed left and struck the ground on both skids. The engine was shut down and the crew evacuated.

Engine teardown revealed particles of brown paper towel in the inlet guide vanes and compressor section. The engine was cleaned and reassembled, after which it operated normally.

A specific source for the towel was not found; however, it was determined that these towels were being used at the mobile snack trucks and in the latrines adjacent to the flightline.

Regardless of the nature of foreign material, pick it up and properly dispose of it, or it may turn up in a critical area, as the paper towel did in this incident.

Tech TOPICS

A REASON FOR THOSE FORMS

This F-4 was on an FCF for a Nr 1 engine change. After the crew entered the supersonic corridor and accelerated to 1.8 mach, they heard a loud thump and the aircraft felt as if the speed brakes had been extended.

A visual inspection by a chase aircraft confirmed that door 82L (a left hand engine access door) was missing. After a controllability check, landing was accomplished without further incident. The door loss was traced back to the night before when an engine crew had dropped the door to make final linkage adjustments on the trim pad. Upon completion of the adjustments and trim run, only the camlock fasteners were secured. The mount bolts were not installed, nor was the appropriate red X entry made in the aircraft forms.

The following morning the crew chief failed to detect the missing mount bolts during the preflight inspection.

The Aircraft Record (AF Form 781) has definite purposes, one of which is to record uncompleted maintenance. Had the appropriate form entries been made this incident would have been avoided.

WIRE FOR SAFETY

Proper securing of aircraft hardware during maintenance is essential. That little 15 cent nut can turn into a million dollar accident if it's not properly installed.

Insufficient torque can lead to that little item not staying where it was intended to stay. Too much torque can lead to a premature failure from stress.

The same applies to safety wire: The correct size wire for a specific item is a must. Here is an example of what can occur when the wrong size safety wire is used.

A T-37 was on downwind. The pilot placed the gear handle down, but only the nose wheel indicated down and locked, and the hydraulic pressure went to zero.

The pilot initiated a go around and activated the emergency extension system. The right main showed down and locked but the left main stayed up. After all attempts failed to lower the gear, the runway was foamed. The pilot touched down on the right main and nose and held the left wing up as long as possible. The aircraft came to rest 6000 feet down the runway with approximately $1600 worth of damage.

The wrong size wire had been used to safety the gear actuator gland nut. The wire broke allowing the nut to back off causing subsequent system failure.

MAKESHIFT MAKES TROUBLE

The T-37 was taxied to the pad for Nr 1 engine trim. The NCOIC of the trim pad installed the communication, Jet Cal, and EGT cables.

The primary electrical cable group was inoperative, so a secondary cable grouping was used. These cables did not have the required securing device attached, so the NCOIC routed the cable from the electrical box around the front of the aircraft, across the right canopy rail and into the cockpit.

The Nr 1 engine trim was accomplished, and the NCOIC and his assistant went into the trim shack to complete the forms.

At this time the crew chief, who was in the cockpit, requested permission to start Nr 2 engine. Permission was granted and Nr 2 was started. Just after it reached idle RPM the crew chief saw the electrical cables pull toward Nr 2 intake. The fire warning light came on followed by smoke in the cockpit. The engine was immediately shut down.

You guessed it—engine FOD. The cause: (1) The electrical cables had not been properly secured; (2) the crew chief did not clear the Nr 2 area prior to start. To add to the above, the crew chief started the engine without the required fire guard posted.

Tech TOPICS

QC, WHERE ARE YOU?

Following a TACAN penetration and GCA pickup, power on the F-4 was advanced to 94 percent to maintain 250 kts. When the student retarded the throttles to obtain final approach speed, the number one engine RPM remained at 94 percent. The instructor pilot attempted to control the engine RPM from the rear cockpit without success, so he shut the engine down by placing the throttle to idle cutoff, declared an emergency, and made a full stop landing.

The problem with engine control was evident once the engine bay was opened. The throttle torque shaft was disconnected. The bolt that secures the torque shaft to the fuel control crossover shaft had been improperly installed. The bolt shank had not engaged the spline shaft undercut of the fuel control crossover shaft during installation.

Review of the aircraft records indicated that the maintenance was last performed in this area during engine installation at the IRAN facility.

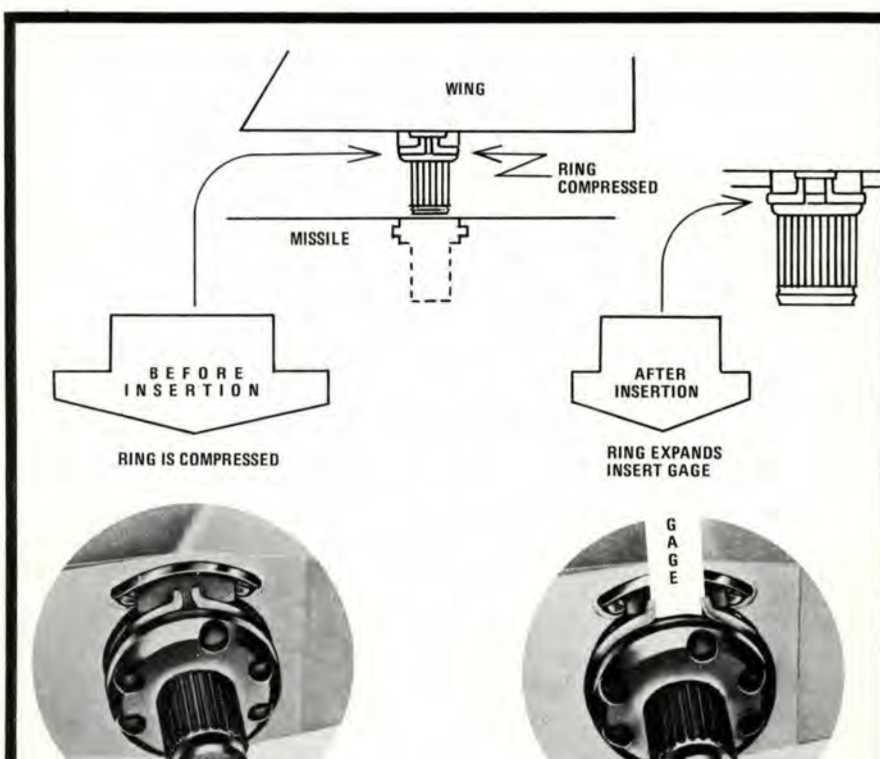
This kind of maintenance error can cause a disaster and is a good example of why we have inspectors. Where was the one who should have caught this goof?

AIM-7 WING LOSSES

CAPT JOHN C. VETEIKIS
Directorate of Aerospace Safety

In a tale from Norse mythology, it seems that one Wayland, a smith, whose trade was manufacturing weapons, also constructed wings to be attached to the body. According to the saga, Wayland, after finishing his first set of wings, planned with his brother Egil, to try them out, i.e., Egil was to make a test flight. The flight went well until a landing was attempted whereupon Egil discovered that the wings which worked on takeoff did not work on landing. Unfortunately, the tale doesn't relate whether Wayland, the designer, or Egil, the user, was at fault.

History repeats itself, and once again we have wing problems—this time AIM-7 missile wing losses. Supposedly, we have come a long way from those days of mythological tales, but a look at the facts makes one wonder. In mid-1970, a GO-NO-GO gage was devised that, if used properly, would prevent AIM-7 wing losses. However, the number of wing



losses has remained constant, and most of these incidents have been attributed to personnel error on the part of the user. Some bases have been three and four time repeat offenders.

The loss of missile wings is not a myth. The descendants of Egil are loading our missiles, and steps must be taken to insure that they have this gage and are using it properly. ★

EXPLOSIVES SAFETY

PEOPLE PROBLEMS WITH EGRESS SYSTEMS

An accident occurred when three men were removing an ejection seat. The system functioned as designed, and three men were injured. The suspected cause was failure to install maintenance safety pins!

The use of specially trained personnel (AFSC 422X2), specific instructions in each aircraft TO series, and checklists for the specific task performed will prevent an accident like this one. And if a task is peculiar to one system or base, include applicable MOI/SOPs on the list.

Each item requires specific safety precautions. However, two safety precautions that apply to all EGRESS CAD/PAD items are:

• All items not installed in aircraft must have the shipping safety pin and/or shipping plug or cap installed.

• Do not roll, tumble, or drop during handling.

Accident reports continue to show EGRESS near the top of the list of accidents, and personnel error as the main cause. The solution lies partially in training and education. How are your people trained? By whom? Have ALL of the personnel that might come in contact with the explosives components been included? Is a short safety briefing conducted prior to starting the job? These are some of the questions that must be answered to insure a complete safety program. AFM 66-1 states, "The chief of maintenance must provide (through training control) the means for determining training needs and the program for filling these needs." (This can be normal flight line training, including specialized training where problem areas exist.) "Maximum use must be made of FTD and MTD. ETS (Engineering and Technical Services, AFM 66-18) must be exploited in the overall training program."

TO 11-1-34 is one of the best publications for ready reference on the different types of explosives items used on aircraft. The Table of Contents lists about any explosive/egress device you can name, and includes identification data, concisely-worded descriptions and many illustrations. All egress personnel should have this and other appropriate TOs available for use.

(HQ 13th Air Force)

EXPLO 71! NEED TO IMPROVE

HY BOSCH, Directorate of Aerospace Safety

Virtually every technical order involving explosives contains the same canned statement, *"All personnel engaged directly or indirectly in operations which involve explosive items and/or other hazardous material shall be thoroughly trained in explosives safety . . ."* With this requirement, mustn't all egress system personnel be conscious of explosives safety?

Egress personnel know that technology has provided explosives devices that are safe to handle; technical orders provide them with tested procedures; and training has made them intimately familiar with their tasks.

But complacency can set in! Satisfied by their prowess, supervisors and workers tend to take shortcuts. The TO referred to less often and eventually abandoned. Some procedural steps are omitted and soon forgotten. Result—complacency terminates in an accident. Then it's back to fundamentals again.

Far fetched? Let the record speak for itself!

Of 35 egress mishaps in 1971, 34 were a result of personnel error. The 35th was due to supervisory omission. In 21 instances egress personnel were involved.

Safety pins were a recurring factor in these events. Twenty-two mishaps resulted from not installing pins, using unserviceable pins, improperly installing pins or inadvertently pulling the pins during maintenance or seat removal/installation.

Other mishaps occurred when connections were not made or were done incorrectly, while stowing equipment in the cockpit, or when too much force was used in conjunction with seat removal. One happened when a crew chief's clothing caught on the linkage assembly, firing the initiator.

Most disturbing were two mishaps where explosives devices had been activated—*but had not been reported or restored to operational condition!*

The only time to be complacent in egress maintenance is when the seat you maintained saves someone's life. That's satisfaction! ★

SOAP

LT COL JOHN M. FLAHERTY
Idaho ANG, Boise, Idaho

The first positive save has been credited to the 305 Spectrophotometer (SOAP Lab) since being placed into operation by the Idaho ANG at Boise in July 1971. Thanks to the "on base" oil analysis lab and the expertise of MSgt Bruce Carpender, an emergency landing was averted recently and possibly an F-102 saved. The story goes like this: In the 18 hours F-102 S/N 426 had flown since the last oil change, the wearmetal reading had not varied more than .5 parts per million. On the last sample, however, the iron jumped from 3.2 to 7.4 PPM, the copper from .6 to 2.6 PPM, and the magnesium from .8 to 4.5 PPM. Based on the last sample, Sergeant Carpender advised Maintenance Control that the aircraft should be grounded until further evaluation could be made. A decision was made to ground-run the engine for 30 minutes, after which another sample would be taken and evaluated. The engine had been ground-run for 10 minutes when oil started leaking from around the engine mounted gear box and it appeared to be extremely hot. Further investigation showed that the gear box had failed internally. At least two F-102 aircraft are known to have been lost in the past, due to inflight failure of the gear box. This incident points out several important facets of the SOAP program.

- The on-base SOAP Lab is a must for an effective program.
- If at all possible, samples should be taken after each flight and read before the aircraft flies again.
- The SOAP technician must be aware that the key to the program is not how high the reading is, but rather how abrupt the increase is. He must react quickly to ground an aircraft that shows a potential problem.
- No one system should be depended on to be the tell all. In this case, the magnetic plug should have provided the warning but it did not. In many other cases, the magnetic plug has provided the warning, while the SOAP reading was not significant. If accidents are to be avoided, all systems must be diligently used. The fact that occasionally one system might not tell us what we think it should, is not a valid reason for lack of confidence in that system.

ED. NOTE: The DOD proposal is to have analysis capability within 24 hour range of all installations. ★

MAIL CALL

HOOKS VS BUTTONS

Safety requirements do not appear as a result of the acts of irresponsible people, nor because of subjective evaluations of once-in-a-lifetime incidents. Rather, requirements come into being when definite trends toward unsafe situations are observed. This is the reason for the adoption of coded shapes for critical controls throughout the cockpit. These shapes are instantly recognizable through feel, even while one is wearing gloves.

A good example is the wheel-shaped knob of the landing gear handle. In the dark, who could mistake it for anything but what it actually is? I mean what pilot, indoctrinated in the Air Force system, could feel it and mistakenly assume it to be anything else?

Other knobs and handles in the aircraft are shape coded for easy identification in low light—or no light conditions.

The reason for this article is the arresting hook control—shaped (of all things) like a hook. Just why it is shaped like a hook has been lost in antiquity, but at least it can't be mistaken for any other control in the cockpit (by a trained pilot, I must hasten to add or I lose this point). The broad end of the hook also lends itself to diagonal yellow and black striping to identify it as a "critical" control.

Can you imagine suddenly discovering on landing roll, that your brakes are out, the drag chute is missing, you've landed long, and must engage the barrier? Has the arresting hook control become a more important item to you? How much time can you spend feeling for it? And how can you identify it if the lights are out and it's DARK? Some pilots, particularly the ones who have experienced an emergency arrestment, will agree—the arresting hook does become a critical control under the above set of conditions. However, any one of the conditions above would be bad enough to make the hook control a critical control.

In view of the foregoing, it is somewhat unnerving to observe that several of our newer aircraft are equipped with arresting hooks which have a button for a control. Some of these aircraft have buttons which are only a few inches from the buttons of other critical controls. Can you imagine punching for an arresting hook, in the dark, with a condition like that staring you in the face?

Some people evaluating such a condition say—"what's wrong with that? The buttons are marked, who could mistake one for the other?"

Even some pilots who must fly these aircraft excuse the situation with, "I've never had any trouble activating the arresting hook on this aircraft." Gee, that's great—all our worries are over! I must mention that an F-100 (with a button type arresting hook control) caused an incident when the pilot couldn't find the button in the dark. How was this situation remedied? A post-light to illuminate the button. The perfect solution—until the bulb burns out or a power failure causes a forced and arrested landing.

At least one of our modern aircraft has the arresting hook control on the right side. This is a normal control for the Navy shipboard operation where the hook is lowered as a matter of course while the aircraft is still airborne. However, can you imagine changing hands on a control stick and grabbing for a handle at a critical time? But how many gripes do we hear? Just because an airplane is the best thing in the inventory doesn't automatically excuse it from having faults.

The point I'm trying to make is —"SAFETY MUST NOT BE COMPROMISED." A subjective evaluation of a safety hazard should not negate the experience and studies which have established safety procedures and safety items. When cockpit geometry becomes so messed up that the standard shapes for critical controls cannot be used or located correctly, it's time for some objection from you pilots in the field. Your comments, suggestions, and URs do create some waves which bring changes to undesirable conditions.

THEODORE C. STEWART
Crew Station Branch
ASD, WPAFB, Ohio

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UNITED STATES AIR FORCE WELL DONE AWARD

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

Major JAY M. STRAYER

**40 Aerospace Rescue & Recovery Sqdn
Udorn, RTAFB, Thailand**

During a night training flight on 5 May 1971, Major Strayer and his crew were conducting simulated night aircraft recoveries. In order to simulate the most realistic conditions for training, the HH-53C helicopter had to be hovered above 30 to 100 foot trees in a blacked out configuration. During one such approach to a 200 foot hover, with the other pilot at the controls, a loud explosive-type sound was heard in the number two engine. The engine lost power immediately and the aircraft began to settle toward the trees.

Major Strayer took control of the aircraft and called off the bold face items on the engine failure checklist. The throttle on the remaining engine was already set at maximum for the approach, but fuel had to be dumped to prevent further settling. Major Strayer called for the external auxiliary fuel tanks to be jettisoned, but only one of the fuel tanks jettisoned, leaving the gross weight at 33,500 pounds. In this configuration, aircraft settling was finally stopped on the tops of 30 foot trees; however, the problem of the surrounding 100 foot trees still had to be surmounted. Using his professional skill and all the power available from the remaining engine, Major Strayer obtained translational lift and guided the helicopter around the 100 foot trees in his flight path. During the one minute the aircraft spent in this hazardous environment, rotor RPM dropped to 84 percent and the number one engine exceeded temperature limitations. Major Strayer subsequently declared an emergency and a successful single engine approach and landing were accomplished at home station. WELL DONE! ★

10 to 1

Those figures aren't odds at Las Vegas.

The 10 is the number of people

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