AEROSPACE SAFETY

UNITED STATES AIR FORCE

ON THE EDGE OF SPACE By Major Robert M. White FEBRUARY 1962

EXTREMES ★ ★

Perry B. Griffith
Major General, USAF
Deputy Inspector General for Safety

If it were possible, I would like to place each of us in the position of monitoring the USAF accident prevention program. If this could be done, I'm sure you would find the assignment both as rewarding and, at times, discouraging as I do.

On the bright side is an incident which happened last September. A B-58 student crew, on its seventh flight in the airplane, had a serious gear malfunction on takeoff. The mishap left only three of the eight wheels on the left gear intact, while the axle and positioning springs were broken and two wheels were hanging from the scissor assembly. Pieces thrown during the breakup of the gear punctured the aft pod tank and escaping fuel was ignited by the afterburners. Not a pretty picture.

Because of the leak and high power settings with the gear extended, fuel was rapidly expended. A tanker was launched but inflight refueling could not be accomplished because of the nose-high attitude of the B-58 with its gear down. Finally a successful refueling technique was worked out, using maximum afterburners on the outboard engines to maintain speed, while the inboards were used to maintain directional control. The lieutenant who operated the aircraft's defensive systems had the continuing and exacting job of fuel management to maintain the center of gravity within limits. *Seven more times* during the night successful midair refuelings were accomplished with approximately a third of a million pounds of fuel transferred.

After daylight, following 12 hours in the air, the crew successfully landed on a foamed runway at Edwards AFB.

Such accomplishments as this make me very proud and my job rewarding, especially when I know that this crew had but 32 hours experience in the airplane prior to this flight. Their professional handling of the emergency and the assistance provided by so many others saved a costly first line aircraft and possibly some lives. Such examples prove that accidents can be prevented, even under the most trying circumstances, through discipline and intelligent analysis of the problem.

Harder to understand, and impossible to accept, are accidents such as the one in which the pilot unnecessarily attempted a short field takeoff with an aircraft several thousand pounds above gross weight and with no weight and balance data computed. The aircraft forms indicated several discrepancies in routine maintenance inspections; the pilot had never before flown the type of mission to which he had been assigned, and the copilot was unqualified in the aircraft. These discrepancies suggest a pattern that could lead only to trouble, and it is hoped proper disciplinary action was taken.

How, at approximately the same time, can we have performances as professional as that of the B-58 crew and as unprofessional as that in the accident I have related? One case demonstrates that serious emergencies can be overcome by proper procedures, intelligent analysis and bringing all available resources to bear. The other reiterates that men can create emergencies from which they cannot recover by simply failing to follow the rules that have been established to prevent such accidents.

My pride, on the one hand, and my disappointment, on the other, make me keenly aware that we have still a long way to go before we eliminate all preventable accidents. I'm sure that you and I can agree that we must discipline ourselves always to perform in the professional manner. This means we must rigidly adhere to the sound principles of operation that can prevent many emergencies from occurring and enable us better to handle those that are unavoidable. ★

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FALLOUT

T-Bird Tips

Here's an incident report that will illustrate and validate Major Kammerer's opinion of maintaining directional control with one brake locked and maximum braking action just short of locking the other brake. (T-Bird Tips, FALLOUT, November.)

In May 1955 I was flying a T-Bird in the traffic pattern with a student on board, and on the demonstration landing the left tire blew out on touchdown. Fortunately, I was on the right side of the runway when the tire blew out. I stopped the aircraft in 2200 feet and drifted approximately 90 feet to the left on a runway 150 feet wide. The aircraft was aligned with the runway after coming to a stop. I used maximum braking action on the right brake just short of locking the wheel and managed to stop the aircraft on the runway.

With this experience in mind, I agree with Major Kammerer that maximum braking action short of locking the opposite brake is the best method. Effective directional control can be maintained to keep the aircraft on the runway, provided you have adequate lateral runway surface on the blown-tire side.

Capt Donald D. Anderson
3553d Pilot Tng Sq
Moody AFB, Ga.

Winter Clothing

Each year, northern bases meet and live with an old problem. The cold, windy weather brings more changes than putting snow on the ground and taking leaves off the trees. It makes everyone on the bases look more alike, with their parkas and heavy shoes.

Local residents realize that even though it may be warm in the afternoon, as soon as the sun sets, down goes the mercury, and they dress accordingly.

During these cold months, transient aircraft arrive with crewmembers dressed in summer flight gear, and usually are from southern bases. Perhaps a word or two would be appropriate for crews flying to northern bases, reminding them to wear proper winter gear.

Being snug and warm in the cockpit of a properly functioning aircraft is a far cry from being out in the cold wind in light clothing with no more protection than your chute can give.

Capt William A. Van Dine
Safety Officer, 478th Ftr Wg
Grand Forks AFB, No. Dak.

We say amen about being prepared for temperature changes. Anyone with doubt should read the article "Horror in Hell's Canyon," (Feb '59 and Nov '60). Four crewmembers of a C-119 died from exposure; their light clothing was no match for the elements encountered in the remote snow-covered terrain where bailout took place. More recently, two T-Bird pilots ejected over an area having 32°F. temp. They were more fortunate, though unprepared, because rescue was not delayed.

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ON THE EDGE OF SPACE...

Major Robert M. White, USAF
Air Force Flight Test Center, Edwards AFB, Calif.

"What is it like to fly at over 4000 mph?" This is the question I was asked to answer for Aerospace Safety Magazine readers following the flight in which a speed record of 4093 mph was attained in the X-15.

Before attempting to describe the speed run and some other impressions of flying the X-15, however, I think it is important that I restate the purpose of the program. The objectives of this project, which is a joint Air Force, Navy and National Aeronautics and Space Administration effort, are to explore aerodynamic heating, control and re-entry problems, as well as man's psychological and physiological behavior in space.

The X-15 is the latest of the rocket powered vehicles to be used in probing supersonic flight and the first to go hypersonic in exploring the problems of operating a manned vehicle at the edge of space. The X-15, and the proposed Dyna-Soar, are steps in aerospace research that are expected to eventually lead to routine manned space flight.

Speed and altitude records are but a natural fallout of the program. *(Ed. note: Major White flew the X-15 to an altitude of 217,000 feet on his 10th flight and set the speed record on his 11th.)*

The flight of 9 November was set up to achieve the 4000 mph design speed of the aircraft and was programmed at about 4090 mph. The fact that maximum speed was within three mph of programmed speed is indicative of the exactness with which project scientists and engineers are able to predict expected performance.

Takeoff was scheduled for 0900. I was up at 0600, had breakfast, and reported to the van at 0730. The leads through which my heartbeat, breathing rate, temperature, etc., would be monitored were taped to my body and I put on the pressure suit. All connections and operation of the suit were checked.

Forty-five minutes before takeoff I climbed into the X-15 and started the before-takeoff checkout. Everything went as planned and exactly at 0900 we were airborne.

On the climb to launch point the checkout continues. In addition to mandatory reports from the pilot, much information is telemetered to ground stations. There is also an observer keeping an eye on the X-15 through a special window in the side of the B-52, as well as observation by the chase pilots. On this particular flight we came about as near to routine as is probable. The B-52 skipper, Major Jack Allavie, said, "Bob, this is not only going to be the fastest run, it's going to be the quietest one."

The tempo increases and by the time we are in position for launch I have checked out every possible system short of running the engine itself. Everything checks or we don't drop. I was on one abort at 30 seconds when an APU malfunctioned. In the last minute of the countdown I have the igniter on, note and report pressures up, and when I drop myself from the B-52, I'm ready to light up.

We get an explosive light with the XLR99 rocket engine that results in sudden acceleration. This is

difficult to describe on a comparative basis. There just isn't anything quite like it. G forces pin the pilot against the back of his seat until burnout. To give you some idea, full afterburner acceleration from Mach 1 to Mach 2 in an F-104 takes about three minutes. In the X-15 we accelerate from Mach 1 to Mach 2 in 23 seconds. At higher altitudes, as drag and weight decrease, we accelerate faster. On the maximum speed run I went from Mach 5 to Mach 6 in 10 seconds and at burnout hit maximum Mach of 6.04. The cause of it all is the 57,000 pound thrust engine that uses up the 20,000 pounds of propellants we have on board in 86 seconds.

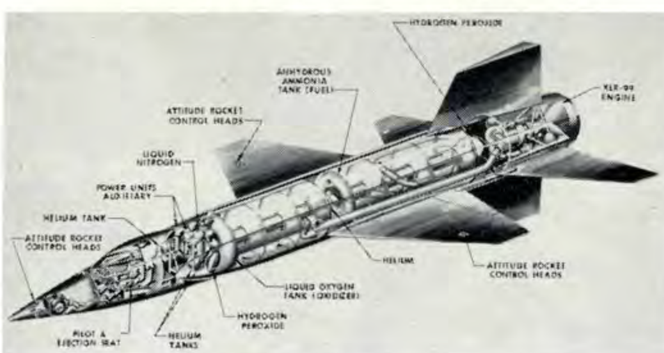
After burnout, weightlessness is experienced during the pitchover phase of the flight profile. Time of weightlessness depends upon the particular profile being flown, with two minutes not uncommon.

Zero G, or the weightless condition, is not really an unusual condition, at least for the short exposure time in the X-15 mission. The pilot is firmly strapped in the seat which eliminates the "floating" sensation in the cockpit. Most important is that zero G, in no way, has restricted the pilot from using any of his cockpit controls needed in performing that part of the mission.

From the time of launching until landing, about 10 minutes, the pilot is constantly busy. This is a hand flown vehicle all the way, and in addition to flying the exacting profile the particular mission calls for, there are test requirements designed to get every bit of information possible out of each flight. For example, on the speed run, after burnout, I had some maneuvers to perform with the stability-augmentation system's (SAS) roll and yaw channels off. We wanted information on handling qualities in the event of a SAS malfunction during the re-entry portion of a high altitude mission.

This might be a good point to mention the unique control system. In addition to the normal stick and rudder setup that is used for the subsonic approach and landing, the X-15 is equipped with a ballistic control system on the left panel and a side console stick on the right panel. The ballistic control is used to maintain aircraft attitude when above the atmosphere. Hydrogen peroxide, forced by helium gas through catalyst beds, decomposes

The Airplane and Its Systems



The X-15 is 50 feet long, has a 22 foot wingspan, and a skin of heat-treated Inconel X nickel alloy to resist 1200°F temperatures anticipated at high speeds. Launch weight is 33,000 pounds. The first glide flight was made on 8 June, 1959, and the first powered flight on 17 September, 1959. The main landing gear consists of two boat-shaped metal skids under the horizontal stabilizer and a conventional twin nose wheel. Liquid nitrogen, contained at –300°, cools the cockpit and electronic bay and maintains cabin pressure. Helium, contained at 4000 psi, is used to expel the nitrogen. An inertial system composed of a gyro-stabilized platform and computer provides the pilot with attitude information. The escape system consists of a rocket powered open ejection seat designed to be usable on the ground at a speed of 90 knots and to an altitude of 120,000 feet and a speed of Mach 4. The X-15 is mated to the B-52 in a manner to not interfere with the escape system. For a fraction of a second the thrust provided by the escape system rocket equals that of an F-86 in afterburner. Flight of the seat is stabilized by telescoping booms and two folding fins. Dual APUs provide power for the hydraulic and electrical systems. Automatic shutoff is provided in case of overspeed. Both electrical and hydraulic systems are dual and operate simultaneously, but one can perform all necessary functions in case of a malfunction. ★

into steam and oxygen and is forced through six rockets in each of two independent ballistic control systems which normally operate simultaneously. Nose rockets produce yaw and pitch and the wing rockets are used for roll control. Stick operation is basically conventional: up and down motion for pitch, left and right movement for yaw control and wrist rotation for roll. The side control stick on the right panel enables more exacting control during periods of high acceleration as the pilot's arm is kept on the armrest. Operation of this control is similar to conventional aerodynamic stick control. It is connected through linkage to the normal center stick. Aerodynamic controls have rate dampers and are fitted with bungees to provide normal feel for the pilot. All aerodynamic control surfaces are in the tail surfaces, the wings being equipped with flaps only.

We don't have much time to enjoy the scenery, other than what we can pick up on cross check type scanning. At over 100,000 feet the sky is a very deep blue; not dark, like at night, but deep blue with a band of light blue near the earth's surface. Actually, the horizon is interpreted as this light blue band. Curvature of the earth is easily identifiable. On the speed run, at 111,000 feet, 140 miles north of Edwards, I could see the dry lake easily.

This launch was made over Nevada and followed the normal straight profile down the High Range with arrival over Edwards with plenty of energy and altitude for a landing pattern. Leading edge heating exceeded 1100° F, with over 900° around the canopy. Heating to such temperatures causes discoloration of the metal, but this is not discernible to the pilot as he cannot see any part of the aircraft exterior from his position. The interior of the cockpit is maintained at a good comfort level, thanks to a liquid nitrogen cooling system.

As I was descending through 75,000 feet, at Mach 2.5, the outer pane of the right windshield shattered due to stresses imposed by thermal expansion and contraction of the frame. This incident allowed a slight deviation in my routine radio transmissions. I said, "Good Lord, I hope the other one holds." I didn't get around to explaining what had happened until a couple minutes later when I checked on the position of a chase pilot. Still, no one broke radio discipline. I'm a firm believer in using emergency frequencies for emergencies only. When a pilot has an emergency he wants the emergency channel clear for that purpose—not cluttered with unnecessary chatter.

When the right windshield shattered I was concerned about the landing as I could see through the left windshield only. Should the left windshield have shattered also I would have had to jettison the clamshell canopy at 35,000 feet, check out controllability with the canopy missing, and land. I verified position of the chase pilot assigned to monitor the landing. Should the other windshield shatter near touchdown I wanted him to be in position to provide talkdown assistance. Although I have had two windshields shatter, fortunately these were on separate flights.

Speed brakes in the vertical stabilizer assist in slowing the X-15 to pattern speed of 300 knots. A landing pattern is flown to enable the pilot to best adjust his approach to make the runway and the touchdown spot marked by smoke bombs. On final, at 300 knots, when the runway is made, landing gear is extended and the ventral fin jettisoned by firing the explosive bolts with which it is attached. This fin, which is necessary to provide directional stability at high altitudes and high speeds, would dig into the runway were it not jettisoned. An automatic opening parachute arrangement lowers this fin after it has been jettisoned. Flaps are lowered at flare and touchdown is made at 185 knots.

The X-15 handles well in the pattern, quite comparable to a Century Series fighter. Landing on skids poses no problem. Slide out averages five to six thousand feet. There is no provision for retracting the gear once it has been extended in flight.

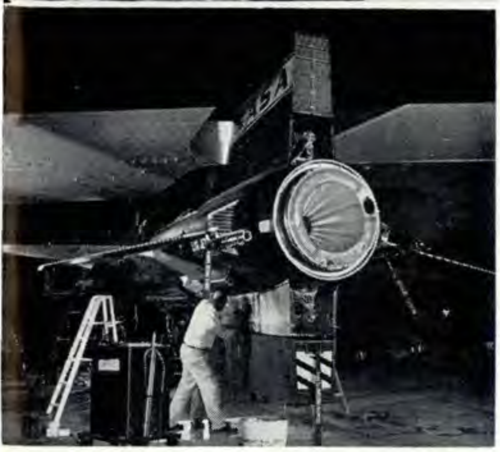
The many interesting facets of this project would require much more space than is available in this article. However, of the many safety-oriented considerations, I will mention a few that to me are particularly outstanding.

Support of the pilot is simply tremendous. Always, safety of the pilot and the machine is uppermost. No compromise is ever made that would be detrimental to the man or the machine. Propellants used are difficult to handle, corrosive and

hazardous if not properly separated and routed. No leakage can be tolerated and complete systems checkouts by ground crew personnel are extremely exacting. To give you some idea, liquid oxygen, ammonia, liquid nitrogen, nitrogen gas, hydrogen peroxide and helium constitute the primary fluids and gases used in the propellant systems and powerplant. Indicative of the success of the thorough checkout system is the fact that on every flight, once launched, there has been no malfunction serious enough to give us concern about recovery of the airplane.

A few words about the "flight suit." The AP-225 full pressure suit worn by all X-15 pilots has been described as a miniature pressurized cabin tailored to each individual's measurements. Attesting to the value of the suit, we have had cabin pressurization failures with cabin altitudes going to 70,000 feet but, thanks to the pressure suits, we have been able to continue and realize mission objectives.

Planning certainly deserves special mention. Nothing foreseeable is left to chance. The High Range is so located that it crosses several dry



lake beds that could be used for emergency landing. Fire and crash vehicles are stationed at these lake beds, helicopters are in the air, and the entire flight is closely monitored by radar. Azimuth and planned altitude information is passed to the pilot periodically.

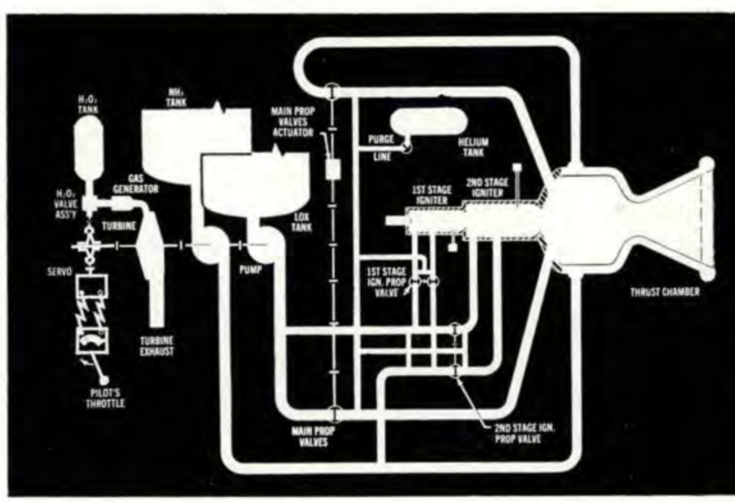
Significant too, is the redundant system arrangement used in the X-15. The maximum speed run was the 45th flight in the series with no loss of aircraft. The fact that the X-15 is a manned vehicle has bearing here. With the pilot in the loop, decisions can be made as to use of alternate systems. Had this been an unmanned craft, a number of in-flight failures would have resulted in loss of the machine.

Another point concerns use of simulators. Since being in the X-15 project, my feeling as to the value of simulators has changed tremendously. In the case of the X-15 we can't practice with the aircraft and must do our proficiency training in the simulator. This is our invaluable tool. Instrument failures, communications problems, engine malfunctions—every foreseeable emergency situation is practiced. Everything must be committed to memory—an X-15 pilot has no time to refer to a knee pad—and repeated work with the simulator helps here.

In conclusion I would like to reiterate a point which I attempted to make at the outset: the purpose of the project is not to go high and fast, but for space research. Information being obtained will help man broaden the flight envelope and transit from aircraft and flight regimes of today to the spacecraft and spaceflight of tomorrow. ★

The Powerplant

The 57,000 pound thrust XLR99 rocket engine is the most powerful powerplant ever constructed for aircraft use. A single lever throttle system provides complete control of the powerplant. Moving the throttle starts the cycle by allowing a controlled amount of concentrated hydrogen peroxide to flow to the gas generator. The gas generator decomposes and expands the peroxide into steam and free oxygen. These gases drive the turbopump. The turbopump pumps the liquid ammonia and liquid oxygen propellants to the main propellant valves. Ammonia is passed through the engine chamber walls to cool the chamber during operation. The ammonia-oxygen propellant combination enters the two stage igniter where an electric spark initiates combustion of the first stage. Combustion of the first stage igniter signals the opening of the second stage igniter valves. Operation of the second stage igniter signals the opening of the main propellant valves. With main propellant valves open, propellants are injected into the chamber at a controlled rate of over 12,000 pounds per minute, producing a thrust equivalent of one-half million horsepower. Closing the throttle shuts down the engine by closing the main propellant valves. Automatic purging with helium occurs immediately to clear residual propellants from the injector and combustion elements. Combustion of the igniters continues to burn off residual propellants being expelled from the lines. Next, the second and first stage igniters are cleared with helium, completing the purging of the entire engine system. Purging is accomplished automatically and instantaneously each time the engine is shut down. ★



DINNER FOR

The special awards dinner had been completed and the speaker rose at the head table. An expectant hush fell over the room as the seventy-three who had been invited waited for his words.

Surely, now, they would learn why they had been selected to attend. They had come from Air Force units in all parts of the world. None knew why. Each had received orders merely directing that he appear not later than 1800 hours on 1 January for temporary duty of one day to attend a special awards banquet. Queries at the individual's unit had netted nothing. Several had discreetly placed phone calls to friends in higher echelons, but found that no one could enlighten them. Some arrived early, anxious to learn the purpose, and had found all other attendees as much in the dark as themselves. Each had asked himself, many times, what he might have done, or might not have done, to warrant attendance. No amount of self-searching had been fruitful. Ideas were as widespread as the units from which the conferees came, and none were based on plausible grounds.

Dinner had been excellent, but pervaded by a strange subdued attention on the part of those attending. Curiosity had reached the highest pitch. There was a degree of apprehension, too, that could not be shaken. Any sudden sound or movement immediately caught the eyes and ears of all within range.

Probably no speaker ever had the attention of an audience to a greater degree than the one who stood now at the head table.

"Gentlemen," he began, "I can now tell you why you are here. You were purposely not informed in order to make this occasion one that you will never forget. You see, we want you to return to your units with a message, and the desire is that this message be carried back and passed on to all others in the most effective manner possible. You are attending the first of what we hope will be annual banquets. And, to be successful, attendance at each must increase."

"Initially, I ask you to take note of one important fact. There are exactly 73 of you present at this banquet. Remember this, please, I will explain the significance of this figure later.

"First, my specialty is safety, and I am here to discuss some of the salient points of the safety business. I ask that you continue to afford me the attention I have so far received because what I have to tell you is a matter of life and death, of dollars and cents, and vitally important to the 73 of you sitting here tonight.

"We do a lot of investigative work in this business and we know that most accidents are preventable. The obvious job then is to determine why they were not prevented, and apply this knowledge to prevent accidents in the future. For example, our records disclose that in 1960 there were 7402 on-duty Air Force accidents." The speaker paused, and when he continued, his words had a measured enunciation, almost as if they were being turned out in mechanical cadence from the files of a computer. "I said this is a matter of life and death and dollars. In these accidents there were 49 lives lost and direct costs to the Air Force exceeded five million dollars.

"Our analysis of these accidents disclosed that most of our on-duty, non-vehicular ground accidents occur in five Air Force activities: systems maintenance, civil engineering, supply, supervised recreation and food service. Knowing where the trouble existed made it possible for us to direct efforts toward these areas . . .

"For a moment, let's hold this picture firmly in mind, and consider some other problem areas determined by a review of accident experience. These are current problem areas; the ones that cost lives and dollars last year, and the ones we know need attention in the months ahead. I'll run through them briefly, and as I do, please note how many are old hazards that everyone knows about, but some still don't respect.

"We have burn injuries from improper use of protective devices during welding operations. Ever ask a blind man if protective devices are worth the trouble?

"People get hurt working with ejection seats because of unfamiliarity, failure to insert safety pins and in adequate identification of release mechanisms.

"How long have we known the dangers of carbon monoxide? Yet this continues to kill our people.

"Crane accidents continue, and will continue if we overload the booms, operate too close to high tension lines, fail to insure overhead clearance, use inexperienced operators and perform inadequate inspections.

"Drowning takes its toll because some of our people swim in unauthorized areas, some while intoxicated, and some in situations beyond their ability.

"Men handling drums get hurt because of improper storage and opening, and non-use of protective equipment.

SEVENTY THREE

"Fires, at night in barracks and outside makeshift fires for warming personnel cause injury and death. And just as deadly, but often faster, is the misuse of gasoline as a floor cleaner, as an engine cleaning solvent and a fire-starter. Paticularly tragic are hobby shop accidents when inexperienced people are permitted to operate power machinery, especially without adequate guards. Poor supervision and hurrying allows accidents when jacking or supporting aircraft during maintenance operations. Poor supervision gets the bulk of the credit in food service areas when people are burned lighting gas burners, on steam pipes, and when amputations occur while operating meat and vegetable slicers. We know too that amputations are likely with improper operation of power mowers. We even know that pulling the mower backward, raising the rear portion, operation with guards missing, operation over uneven terrain and making adjustments with blades turning account for the bulk of such accidents.

"Refueling accidents occur when vehicles are improperly located and not properly grounded. Ring finger accidents continue to occur, primarily when people are lowering themselves from an aircraft or other elevated location.

"Not only 'unloaded' guns, but guns being assembled, disassembled, loaded and unloaded cause accidents and deaths.

"One more area, most costly of all in both lives and dollars: motor vehicle accidents. They've occurred when drivers assumed emergency-run privileges when on non-emergency runs and ran red lights, stop signs, utilized flashers and sirens. They have also occurred when flares were not used to mark stalled vehicles."

The speaker paused to reassure himself that he continued to hold the undivided attention of everyone present, then said, "The one area that cost the most by far in lives and dollars is that of private motor vehicle accidents. Despite a concentrated effort in this area, Air Force personnel continue to kill themselves and others by speeding, driving under the influence of alcohol, driving while fatigued, passing on hills, running stop signs and assuming the right of way.

"Now," the speaker smiled, "to explain why exactly 73 of you are here. You 73 representatives attending this banquet are living, healthy proof that there is reason to continue efforts on behalf of ground safety. You represent the exact number by which losses of life were reduced last year. Neither you nor I will ever know whether it was your life, or the life of one of your buddies that was spared. Whose life doesn't matter. The fact that in each of 73 cases someone's was spared is what's important. We are confident that if you go back to your units and spread the word we have 73 safety disciples. I ask that you bear one thing in mind. If you fail, there will be no banquet next year because there will be no one to attend. If you are successful, there will be another banquet. The attendance will be a mark of your success. Thank you." ★

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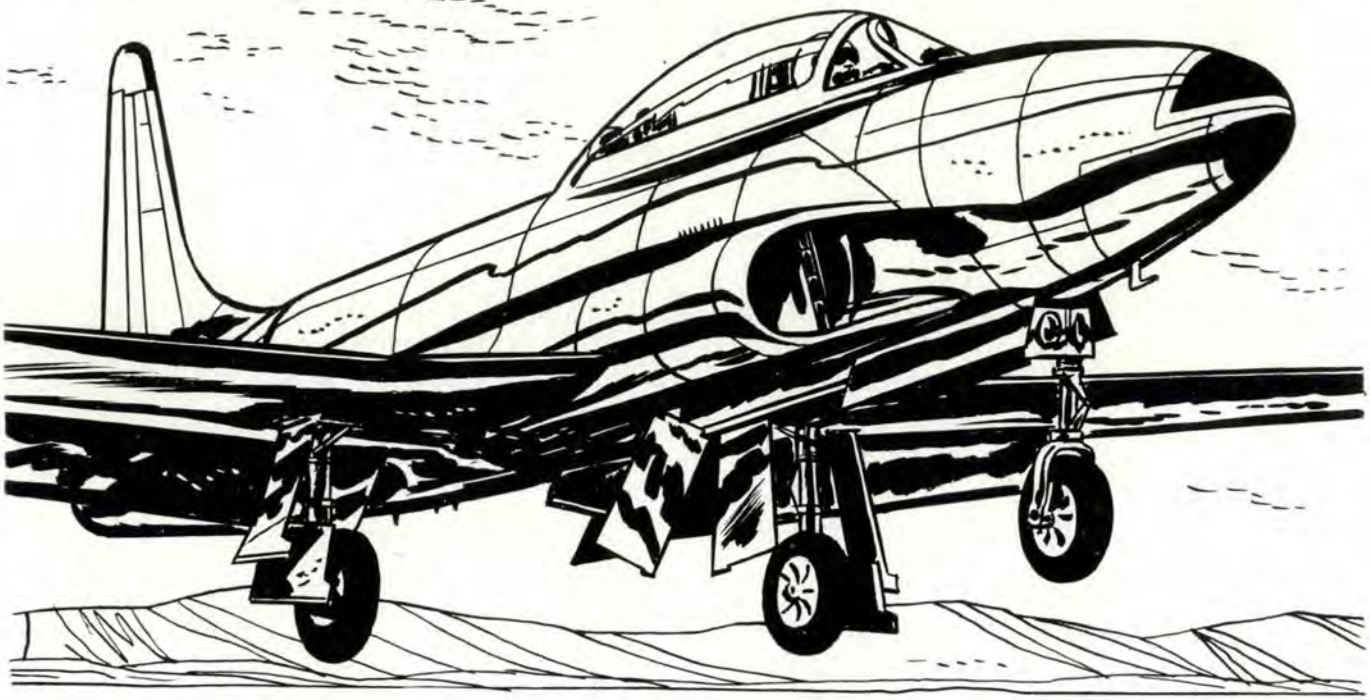
REMINDER

Effective 19 December 1961, CAR 60-27 restricted the speed of arriving aircraft within areas under FAA control. "A person shall not operate an arriving aircraft at an indicated airspeed in excess of 250 knots (288 mph) during flight below 10,000 feet msl within 30 nautical miles of an airport where a landing is intended or where a simulated approach will be conducted unless the operating limitations or military normal operating procedures require a greater airspeed, in which case aircraft shall not be flown in excess of such speed." All major commands were to have established operating procedures to comply with the rule.

Remember, this rule applies to arrivals and *not* to en route and departing aircraft.

(Ed. Note: More restrictive airspeed limitations for high density zones, as spelled out in the Flight Planning Document, still apply.)

PROFESSIONALISM?



"... as contrasted with amateurism ..." Webster

Fuel was leaking from the cap of one external fuel tank. The pilot used the mechanical release to drop the one tank. The other tank also dropped off because the auto drop circuit was alerted.

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A flight was conducted at FL 370 with the cabin altitude at 35,000 feet. The copilot suffered from dysbarism and at a refueling stop had difficulty walking. The flight was continued to home base, where the copilot was hospitalized in a serious condition.

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The front seat pilot was de-planing and the oxygen hose from his bailout bottle got caught and stretched taut. The hose broke loose and the metal end struck the copilot in one eye, causing major injury.

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The pilot failed to retain control during a crosswind landing. The aircraft ran from the side of the runway and the nose gear collapsed.

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On a low final turn, the aircraft struck a telephone pole. The nose gear collapsed during landing.

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While making touch and go landings the IP pulled the gear up prematurely.

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The pilot pressed the tiptank jettison button for an unknown reason.

The copilot blacked out during the start of a loop. He became confused, and ejected.

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While flying a low-level training flight, the aircraft struck telephone wires.

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In anticipation of taxiing, the throttle was advanced and the engine was accelerated to power setting more than sufficient. During the turn from the parking area, the jet blast overturned an APU.

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The pilot forgot the 5000-foot check during climb. The tiptanks did not feed, so internal fuel was used. The pilot dropped the external tanks, declared an emergency and, at landing, barely had enough fuel to taxi to the parking ramp.

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The throttle could not be retarded because a dust excluder plug had not been removed from the air intake. The plug had been blown and/or sucked into the plenum chamber and jammed the throttle linkage.

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On a VFR cross-country at low altitude, progressive deterioration of weather had forced the aircraft to 1000 feet. The pilot was circling an Air Force base awaiting an IFR clearance when the engine flamed out. The pilot had forgotten the descending 5000-foot check and ran the fuselage tank dry.

The fire warning light glowed dimly and the gear selsyn units cycled from safe to unsafe. The flight was continued until the external fuel tanks fell from the aircraft. The tanks fell within the limits of a large city, but fortunately did not cause injury or property damage.

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The safety pin streamer entangled the canopy jettison "T" handle. The pilot pulled the streamer rather forcefully in an attempt to free it. The ejection system was activated, and the canopy was blown off the aircraft.

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An attempt to stop on a wet runway ended off to the side of the runway because the pilot applied too much force to the brake pedals and caused the wheels to lock.

•

The landing gear collapsed during the landing roll because the pilot had only partially lowered the gear handle.

•

The downwind leg was very close to the runway. During the turn to base leg, the turn tightened; the nose dropped, then the aircraft snapped inverted and plunged into the ground.

•

The IP sat in the rear cockpit during an SFO while the airspeed decreased; the altitude became dangerously low, and the aircraft was too far out on final to make the runway. Corrective action by the IP was not timely and the aircraft crashed short of the runway.

•

The pilot landed short, struck the runway lip, then made a go-around. A touch and go was made, followed by an intended full-stop landing. Again the aircraft struck short, bounced into the air and touched down some 1200 to 1500 feet from initial point of touchdown. The nose gear tire was flat, the right main gear was sheared and the right external fuel tank exploded on contact.

•

The aircraft was descended into the ground during a night VFR GCA surveillance approach. The front seat pilot was concentrating his attention in the cockpit interior at ground contact.

•

As the penetration descent was started, the pilot looked to his right and rear. When he returned his attention to the gages, he determined the aircraft to be in an unusual attitude. He could not regain control and was forced to eject.

•

On a cross-country flight, the pilots became lost. They were finally positioned in close proximity to an air base. They attempted a penetration, using the wrong letdown plate and finally found an airfield in an adjoining state. During landing, the aircraft porpoised and the nose gear was sheared.

•

The copilot was making a VOR penetration. Entry into the undercast was made at 14,000 feet. The front seat pilot noted a decreasing airspeed and notified the copilot. Thereafter the aircraft went out of control and the pilots ejected.

•

The aircraft flamed out shortly after takeoff because of fuel mismanagement. The pilot attempted ejection but was forced to ride the aircraft in when the seat failed to fire.

•

The pilots erred and flew a heading which corresponded to the mileage on the high altitude chart. They were directed to a fix after being found many miles off course by GCI. When cleared to 8000 feet, they let down to 18,000. The aircraft's fuel supply was exhausted and the pilots ejected, one at approximately 400 feet without the zero lanyard hooked up.

•

A pilot requested an inflight visual check because of an unsafe nose gear. The pilot in the checking aircraft did not maintain proper separation and caused a midair collision.

•

After 18 minutes of ground operation, the pilot took off on a low-level, cross-country with internal fuel only. He passed directly over suitable landing areas but continued until fuel was exhausted and the aircraft crashed.

•

From an SFO the aircraft was landed gear up. A fuel tank ruptured, a spark ignited the fuel and the aircraft was destroyed.

•

An IP was practicing vertical recoveries. The aircraft entered an inverted spin. The pilots ejected.

•

Just at lift-off speed, a tiptank fell off. The aircraft ran from the side of the runway, caught fire and was destroyed. Although this accident was caused by a materiel condition, the pilot did not have the auto drop alerted and was vague concerning its operation.

•

At 31,000 feet the pilot selected gangstart ON and then OFF. The engine flamed out. He then tried several airstarts before reaching 25,000 feet. An air start could not be made, and the pilots ejected.

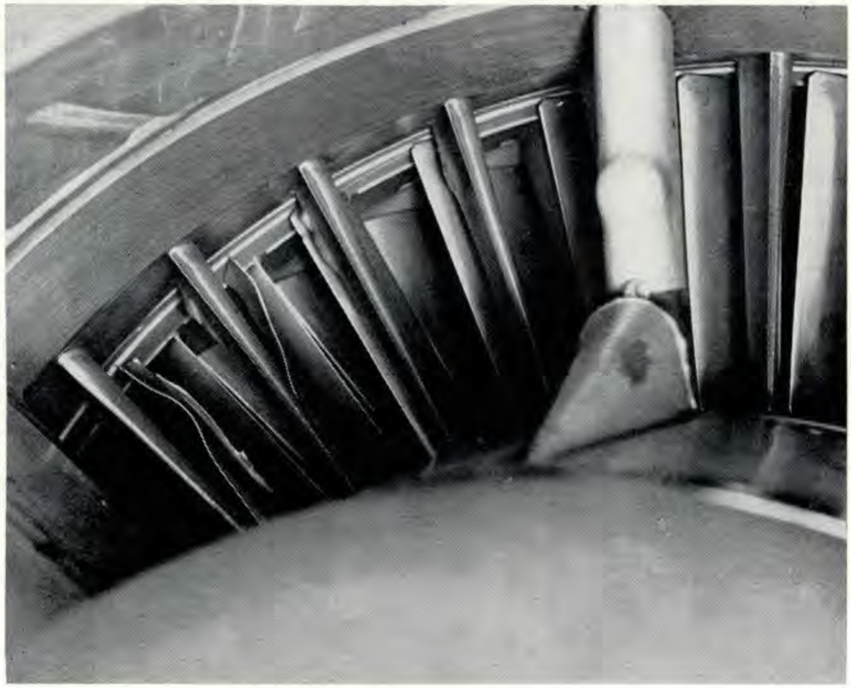
•

During an SFO, at low airspeed and altitude, the pilot determined that the landing surface could not be made. To increase the glide distance he raised the wing flaps. The aircraft crashed and was destroyed.

Lt Col K. I. Bass, USAF
Defense Branch, Fighter Div, D/FS

The above mishaps are representative of pilot factor incidents, minor accidents and major accidents which have occurred in T-33 aircraft during the first eleven months of 1961. ★

IN...AROUND...OVER...AND THRU



It's **winter** and again we're at war with the formation of ice and the vicious path it sometimes takes in and on our high performance aircraft. The ducks had just filed their '175s for points south when our first catastrophe struck. One of our B-47s iced up, swallowed large and small chunks, and crashed two miles short of the runway, taking three of its four crewmembers with it. Fortunately, the one survivor was able to fill in many of the details of what actually happened.

The sortie started out from a northeastern base as a routine combat crew training mission, with low level navigation and bombing as part of the mission requirements. At their weather briefing the crew was given a forecast of scattered clouds at 2500 feet, an overcast at about 3200 feet, light snow showers and mild to moderate icing for their low level portion of the mission. Everything appeared normal until climbout into the overcast following their low level delivery. Then ice formed very rapidly on the surfaces and in the engine inlets. Engines No. 1 and No. 4 exploded at around 12,000 feet; No. 1 hung down at a 45-degree angle, and No. 3 was shutdown after No. 4 exploded. Whether or not the anti-icing system was turned on is unknown. The pilot restarted No. 3 about twenty miles from the VOR station at his intended landing base while at 6500 feet.

With two engines out and power limited on the remaining engines, he was able to get the bird to the VOR and hold his own in a straight-in GCA until the final approach, when extension of the gear and flaps was called for. Then came the startling discovery that there was insufficient power available to make it to the runway. In a attempt to stay airborne, the gear and flaps were retracted.

A recent survey at two bases revealed that out of four B-47 aircraft that entered icing conditions, a total of sixteen engines were damaged due to ice ingestion. Investigation revealed that the minor engine damage occurred while operating at a reduced RPM in the vincinty of 85 per cent and below. and that anti-icing was turned on after structural ice was observed. Had the engines been operating at normal rated thrust or above, they would have been severely damaged or destroyed. It appears that in some cases the pilots are reluctant to use the anti-icing systems in the manner prescribed in the Flight Manual. If it is turned on *after* the ice has formed, it's too late. The digestive system of a jet engine cannot tolerate broken compressor blades and turbine buckets. We all should know that ice forms very quickly on aircraft flying in clouds when the temperature is anywhere from about plus 10 to a minus 20 degrees Centigrade, with a close dewpoint spread. We should also know that it can form in a jet engine under the same temperature spread without any clouds present. A certain amount of moisture is always present in the atmosphere as indicated by the relative humidity. Couple this with the right temperature and the venturi effect of a jet engine, and "Bang!" That's what you hear when the engine explodes after swallowing ice, that you never saw, formed on the inlet guides, nacelle struts

MAJ DAVID J. SCHMIDT, BOMBER BRANCH, D/FS

and cowling lips. Some people seem to accept as true the temperature gage. Not so; friction heat will bring the indicated above the true temperature.

Not too long ago one of our B-52s required five engine changes due to damage from ice ingestion during low level in clear skies. The crew confirmed that it was VFR throughout the entire low level portion of the sortie. However, the right set of weather conditions prevailed in order for the ice to form on the engine inlet guide vanes, nacelle struts and cowlings. Since no high power settings were used, except for the pop-up, apparently only small pieces of the undetected ice were ingested.

It is not uncommon to see a medium or heavy jet bomber land with one to two inches of ice on the leading edges and external tanks. When you consider the area involved and the weight that is represented, it is obvious that some additional speed is required on the final approach in order to make it to the runway. This is dictated by loss of lift due to disturbing the air foil, the drag induced by this effect, and the weight, which can be staggering. A B-52, for example, with two inches of ice on the surfaces, requires an additional 10 knots on the final approach.

Coupled with the surface icing is the danger of accumulating ice in the ram air scoops or ducts that provide for the use of ram air for elevator "Q" springs, alternators and cabin air in some cases. In the past three years there have been 16 cases of loss of artificial feel in the elevators, reportedly due to ice.

A recommendation has been made to separate the wing and empennage leading edges anti-icing from the engine anti-icing. This would enable thermal anti-icing to be used on the engines, independent from the structures. Regardless of the recommendation, let's play safe and operate in accord with the T.O. *Put on the anti-icing before entering known icing conditions. Don't wait until after structural ice is seen.* ★

SOME THOUGHTS ABOUT MINIMA

This is an attempt to eliminate some stories that have no plot—no plan--no thought, just a climax: CRASH.

Weather is a contributing factor in 12 per cent of all USAF major accidents.

Potentially then, elimination of the weather factor could reduce the accident rate 12 per cent.

Most weather factor accidents occur in the approach or landing phase of flight.

Approaches are *planned,* then made.

Pilots must condition their thinking to the weather they anticipate penetrating.

Approaches cover an area well beyond the confines of an airdrome.

We are not an all-weather Air Force; we have learned merely to operate in some conditions and around others.

Some weather degenerates the capability of approach control equipment.

Scattered clouds and partial obscurations do not constitute a ceiling.

Scattered clouds or partial obscurations may block your view of the runway.

Pilots will proceed to an alternate . . . ceiling or visibility is observed from the cockpit to be below authorized minimums (60-16).

Minimums are the lowest point at which we can operate in weather.

Weather can go below minimums—we can't.

Minimums are a calculated risk.

Minimums are not based on operational requirements.

Minimums are related to equipment, facilities and terrain.

Published minimums pertain to only two weather measurements; ceiling and visibility.

Accidents occur when other conditions become involved.

MINIMUMS MUST BE QUALIFIED BY SURFACE WIND, TURBULENCE, PRECIPITATION, RUNWAY SURFACE AND ICING.

You could write a book about almost any one of these thoughts. Think a do-it-yourself story. Make a Walter Mitty approach to minimums in a B-58 in a thunderstorm.

Then the next time you climb in a Blue Canoe, Goon or a T-Bird, plot, plan and QUALIFY those minimums. Leave yourself an out; use it, and cut down that 12 per cent weather factor. You'll get the primary blame if you don't—POSTHUMOUSLY.

MAJ CLARENCE F. HILGEFORD
HQ AIR WEATHER SERVICE

WINTER ACCIDENT BRIEFS

Following are briefs of accidents in which winter weather was a factor. All occurred after 1 January 1961. All had been duplicated previously, in somewhat similar form at least. They are presented here, along with an entreaty that those who are now accustomed to winter operations will not relax and be tripped by past accident-exposed hazards. It would be well to remember too, that these are representative rather than all-encompassing. Many other hazards are associated with the winter season. All bear watching.

F-102—Routine touchdown made after training mission. As wheels touched ground, pilot felt that the left main gear had struck some object. Left main gear collapsed and aircraft veered left, going off the runway, sliding across a field, through a wire fence and stopping under a tree. The left gear had struck a snowbank, two and a half feet high, that projected onto the runway. There was no NOTAM in effect concerning the airfield hazard.

Recommendation: Snow removal be performed in accordance with AFR 90-6. More emphasis be placed on airfield conditions and all hazards be promptly NOTAM'd.

C-47—Night GCA in rain. Pilot proficiency mission. Aircraft hit, bounced, then made second contact nose low. Right propeller and wheels made runway contact.

Recommendations: Review teaching techniques and landings under all conditions. Brief all pilots on dangers that may be encountered when visibility is impaired. Clarify status of IPs on aircraft and indicate specific IP duties on flight orders.

C-47—Navigational proficiency flight. Takeoff in snowstorm with field below landing minimums. Left engine failed shortly after takeoff and close in GCA pattern flown. Pilot unable to maintain a safe altitude during GCA landing pattern, requiring a one mile final for terrain clearance. Pilot delayed lowering gear until runway in sight. Insufficient time for gear to extend to a safe, down position. Right gear collapsed on landing. Pilot at controls had flown 50 minutes during preceding 48 days—this in copilot position. Copilot had flown four hours preceding month but was not qualified as first pilot. An IP was on board but did not occupy a pilot seat.

Recommendations: Instructions be given on Dash One technique, including flight demonstrations and gear extension times. Duties of all crewmembers be explicitly spelled out. Current checklists be used on a challenge and response basis. More restrictive weather minimums be established for CRT or navigational flights.

C-124—On night VOR approach aircraft commander noted altimeter discrepancy between his and pilot's instruments. Setting verified with approach control and pilot stated he had failed to set altimeter at transition altitude. Navigator set his altimeter at setting given and stated he heard both pilots state their altimeters were at same setting. Light to moderate turbulence and intermittent precip encountered. Runway sighted at indicated minimum altitude. Aircraft continued inbound 50 feet below minimums, struck trees, ground, right wing broke off, then tail section as aircraft completed 180 degrees of turn and burned.

Recommendation: Initiate study to determine amount of altimeter error possible in C-124 aircraft during icing, precipitation and turbulence. T.O. revision to require functional inspection of static port heaters no less frequently than each periodic. Determine advisability of revising flight checklist to require draining the static system as part of the descent checklist. Expand GCA facilities.

B-52—Cause undetermined. Most probable cause attributed to weather in that severe clear air turbulence caused the aircraft to be placed in a stalled maneuver from which the pilot was unable to recover before the aircraft structural limits were exceeded.

Recommendations: Insure all aircrews are fully cognizant of Dash One turbulent air penetration procedures. Design specifications be reviewed for stress adequacy in all flight regimes including high altitude clear air turbulence and mountain wave effect. Indoctrinate all aircrews concerning hazards of delay in initiating escape following loss of aircraft control.

H-43B—An instructor pilot in the left seat of an H-43B was making a 90-degree practice autorotation with a nine-knot quartering tailwind. The aircraft struck the runway in a right skid, left auxiliary gear first, with sufficient force to fail the gear. The aircraft rolled onto its left side.

Recommendation: Pilots should make certain to monitor wind direction during final autorotation to insure landing into the wind, thus avoiding increased settling inertia. ★

THE SAFETY SURVEY

Col Raymond K. Gallagher, then 5th AF Chief of Safety, briefs survey team before departing on a safety survey of a Fifth Air Force base.

In this article I am going to explain how to prevent accidents. There is little doubt that accidents are prevented by before-the-fact effort that makes use of all available tools: quality maintenance, supervised training, honest flight checks, realistic instrument training, emergency procedures training, examinations, safety surveys . . . you can think of more.

Safety surveys, you say? Now there's one, a real accident prevention tool. Let's talk about the safety survey—who does it, who gets surveyed, the objectives, and how it works?

• **Who does it?** Unit and base safety officers make surveys on a continuing basis. The Deputy Inspector General for Safety, major command and numbered Air Force headquarters make the large scale survey described in this article on a periodic basis.

• **Who gets surveyed?** Every group or work center associated with flying and missile and weapons handling, and those doing jobs where a ground accident could occur, get a thorough going over. Command, operations, maintenance, personal equipment, flight surgeon, AFCS, A&E weapons teams, and airfield facilities are checked and rechecked.

• **The objectives are:**

(1) To assist the commander being surveyed in uncovering hazardous procedures, conditions, equipment and facilities which would likely cause or contribute to an aircraft, weapon, or ground accident.

(2) To offer suggestions and recommendations for correcting deficiencies.

(3) To report to the unit's higher headquarters and the staff of the survey team's headquarters those items requiring corrective action which are beyond the unit's capability.

(4) To observe and pass to other units new and better ways of doing the job—safely.

(5) Through the above, the elimination of accidents.

• **How it's done.** Particulars of how we in the Fifth Air Force conduct a safety survey and the areas we cover are shown in the accompanying

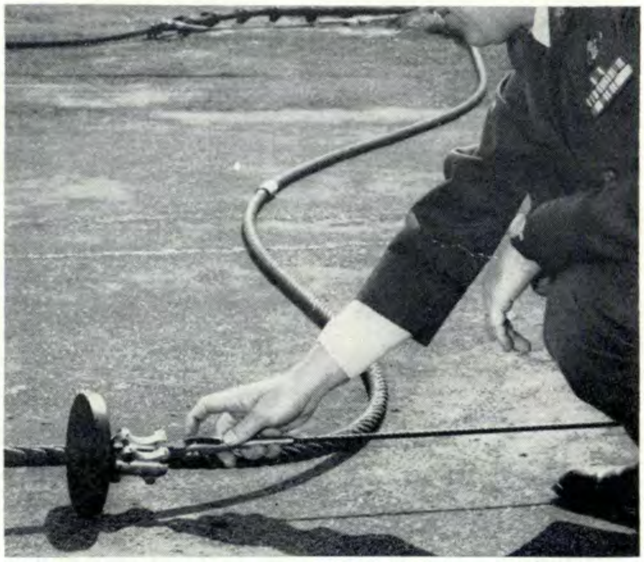
MAJ VINCENT J. CLARKE, CHIEF, FLIGHT & MISSILE SAFETY DIV., HQ FIFTH AIR FORCE

Survey team specialists study training records . . .

observe CRT pilots' flight planning . . .

participate in F-100 periodic . . .

look for airfield facility hazards . . .



observe missile loading under adverse conditions . . .

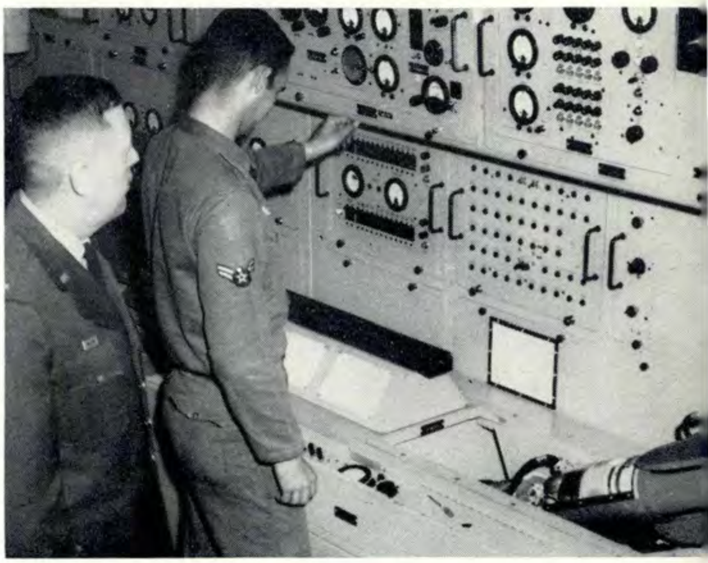
check ground safety practices basewide . . .

monitor a pilot's preflight inspection . . .

examine personal equipment . . .

point out critical danger areas . . .

verify adherence to missile checkout procedures . . .



examine unit armament equipment.

Informal critique concludes survey; formal report will arrive later. Here, F-100 squadrons see how they compare in a pilot quiz.

photos and captions. However, some additional discussion is appropriate here.

Let us start by saying that the safety survey team is not a group of long-haired technical experts who presume to know more about the unit being surveyed than its commander and his supervisors. Each member is, however, highly skilled in his particular field and well versed in the unit's mission; selected individuals are proficient in the unit's tactical aircraft. These are basic essentials if a survey team is to be recognized by the unit as being qualified to point out safety hazards during the survey and listened to when the suggestions and recommendations are passed out. Some other basic survey requirements are: objective observations, integrity, and personable and cooperative attitude.

Although there should be no attempt to force acceptance of suggestions or recommendations, we've probably wasted a lot of valuable time if they are not accepted, and do not result in actions that decrease accident potential. And speaking of time—it's without a doubt the most important single thing to offer the unit being surveyed. While in the field the team has nothing to do but survey! No VIP's to meet, no luncheons, conferences or meetings to attend, no speeches to make, no letters or reports to read and sign and so on and on with the zillion big and little things that make most commanders wish the day were 28 rather than 24 hours long. The survey team is restricted by none of these details. Further, we can devote full time to a critical area—an assist to the unit commander whose time must be spread across many more problem areas. We just look, check, listen and "feel" out potential problems that the commander just doesn't have time to look for. We have the time—it's his for a safer operation.

Not to be overlooked, of course, is the old cliché about not being able to "see the trees for the forest" or some such thing; it's for real. A good example was brought out during a recent survey when we found the links of the runway barrier chain were smaller on one side of the runway than the links on the other side of the runway. This obviously would cause an aircarft to swerve from the center line because of the uneven drag. Both the base operations officer and the civil engineer said, "Why, I've looked at that chain 50 times and never noticed the different size links." The outsiders (the survey team), who know the unit's mission and equipment, see both the trees and the forest. In addition, we can bring experience to bear from intimate knowledge of safety problems in other units.

Not many safety offices are manned to cover all the areas directly connected with the flying business, so it may be necessary to borrow qualified help. We get help from AFCS, the Flight Surgeon's Office, the Deputy for Material, Inspector General—whoever is needed to do the job at a particular base. They all give invaluable assistance to our safety program.

One final point: At one time or another during every survey someone asks at least one of the team members, "How did we do?" or, "Did we pass?" As we see it, a passing or failing grade, or for that matter, any kind of score, is not part of a safety survey; and, except in isolated instances, an answer to the report is not required. The team makes recommendations and offers suggestions which it believes will enhance a unit's safety program. The commander uses the suggestions as he sees fit.

Most commanders accept and use the survey team for what it is: a temporary increase in his staff with but one uninterrupted mission to perform. However, we occasionally find a commander who looks on the team as a group of people unfriendly toward him in particular and his unit in general, with the objective of finding discrepancies which will compare him unfavorably with other organizations. This is not the case, for we believe any qualified group, properly directed, could find operating procedures, facilities or equipment anywhere which could be improved. Therefore, the survey team is simply showing a commander where, not telling him how, hazards could be lessened or eliminated. ★

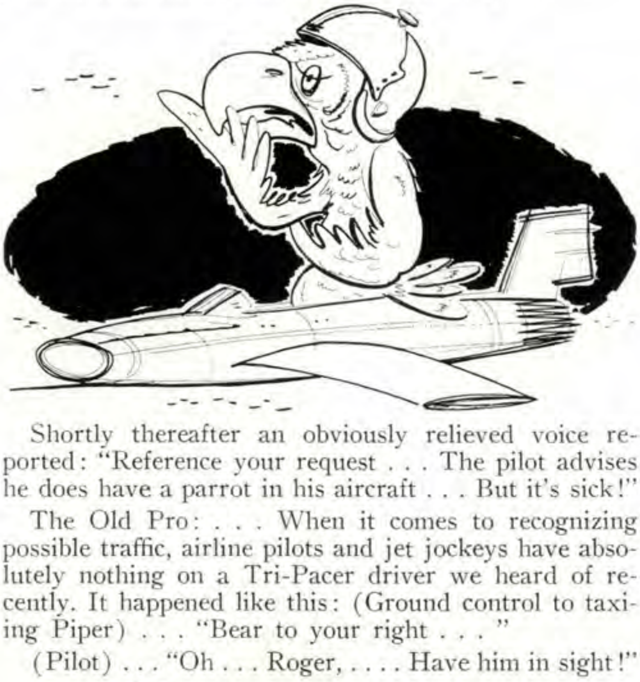
OFF THE RECORD

Squawk Two: . . . As long as the military and ex-military types keep on calling it a parrot instead of radar beacon transponder, we'll always have a certain amount of confusion . . . but a lot of laughs, too, judging from the number of controllers who send parrot stories to *Off The Record.*

Lou Boldt, over at March AFB, tells about the time that one of their controllers asked a civilian pilot if he had a parrot on board . . . "Negative." the pilot says helpfully, "but we have a bird colonel."

Paul McAfee, ATCA Region 4 Enroute Councilor, likes the one about the center radar controller who contacted a remote Flight Service Station via interphone . . .

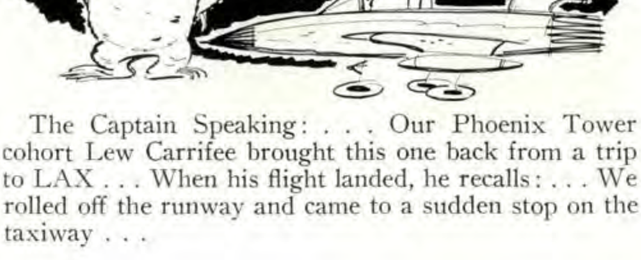
"Contact the aircraft and ask the pilot if he has a parrot . . . " "Does he have a what?" Queried the far-away voice incredulously . . . "A parrot, p-a-r-r-o-t, just see if he has one on board, I'll stand by . . . "



Shortly thereafter an obviously relieved voice reported: "Reference your request . . . The pilot advises he does have a parrot in his aircraft . . . But it's sick!"

The Old Pro: . . . When it comes to recognizing possible traffic, airline pilots and jet jockeys have absolutely nothing on a Tri-Pacer driver we heard of recently. It happened like this: (Ground control to taxiing Piper) . . . "Bear to your right . . . "

(Pilot) . . . "Oh . . . Roger, ... Have him in sight!"



The Captain Speaking: . . . Our Phoenix Tower cohort Lew Carrifee brought this one back from a trip to LAX . . . When his flight landed, he recalls: . . . We rolled off the runway and came to a sudden stop on the taxiway . . .

The voice of the pilot came floating over the intercom . . . "Ladies and gentlemen," he said, "we are pausing here momentarily to give you a look at our company's entry in pure jet flying. It is my pleasure to call to your attention the next aircraft to land on the runway to your left . . . "

Obediently, all on board craned their heads and uttered suitable ohs and ahs as they caught sight of the sleek jet carrier whistling over the boundary.

Crunching down in a cloud of burning rubber it leaped 40 feet into the air, came down again, and in a spectacular clutching, grabbing recovery disappeared down the runway with all the grace of a roller-skating water buffalo.

A voice on the intercom finally broke the long period of deafening silence that followed:

"Oh . . . when, . . . " it queried sadly, "will . . . I . . . ever . . . learn . . . to . . . keep . . . my . . . big . . . mouth . . . shut?"

Good Old Daze: . . . Those interested in the lore of the airways are indebted to Ray Roe, Co-ordinator at Seattle ARTCC, for the following:

Flight 6, approaching Portland, Oregon, advises he will be over the field in about 5 minutes . . . The dispatcher then takes his mike, assumes a position outside, plugs into a jack on the ramp, and proceeds to work the aircraft:

> PDX to Flight 6—"I hear you faintly north of the field!"
>
> Flight 6—"O.K., we are on top at 5000!"
>
> DISPATCHER—"The Portland weather, ceiling 1500, visibility 3 miles, wind SE 10, Kollsman 29.98!"
>
> Flight 6—"Got you O.K.!"
>
> DISPATCHER (listening)—"Northwest of field, a little louder . . . Due west now! . . . Over hills to Southwest! . . . Due South! Southeast fading! . . . East of field, very faint! . . . Northeast, coming in stronger! . . . North now, loud and clear! . . . Northwest fading again! West Northwest stronger!"
>
> Flight 6—"O.K. we are contact 2 miles North of St. John Bridge, field in sight!"
>
> DISPATCHER—"Wheels down, will you need gas?"
>
> Flight 6—"Yes, will need about 60 gallons!"

Thus another routine landing of a Boeing 247 was made at Portland Swan Island Airport, sometime in 1924. No control tower, no radar, no established instrument approach procedure, no other traffic . . . Only the dispatcher's good ear, his mike, and the drone of two engines in the distance. ★

COURTESY: AIR TRAFFIC CONTROL JOURNAL

Sea Survival • Part Two

• LEARN AND LIVE

It was cold and a light mist half obscured the bay area. The chill, wet wind and low overcast made the twilight of early morning seem dreary and forbidding, the start of a gloomy day. Sleepy and tired from long journeys from every part of the United States, TAC Personal Equipment and Survival Officers and NCO technicians began reporting to the Psychological Training Center, Langley AFB, for what was to be an adventure they would never forget.

As specialists in Personal Equipment and Survival, these man were the key figures in many TAC personal equipment shops throughout the land. They represented all units, including those in the Air National Guard and Air Force Reserve. Each had a mission and a personal determination to learn as much about deep sea water survival as possible in the six short days that lay ahead.

Now, the average TAC fighter jock is a captain with eight years' service. Since graduating from flying school, he has logged some 1275 hours, with 700 of these in the F-100. He started flying at the age of 21 and his average age now is 29. Since joining the Air Force, his training and salary have cost the taxpayers approximately $762,336.00. As you can see, this is a considerable investment in dollars and cents. This, of course, does not consider what this man means to his family and loved ones. To protect him in a survival situation we need more than the traditional yearly jump into the swimming pool.

A concentrated deep sea water survival program conducted in Japan from 1956 to 1960, and a similar program conducted at Headquarters TAC, confirmed this and clearly showed why the pool programs weren't hacking it. Having a trainee jump into a placid fresh water pool and flounder 40 or 50 feet while staying within easy grasping distance of the edge will not prepare him to survive in that seething, salty, ever-angry expanse of water that is the ocean, any more than an occasional jaunt to the local shopping center will prepare this same individual for racing a three liter Ferrari at Le Mans.

Of the students attending these water survival courses, 16 per cent could not swim, while an additional 10 per cent were poor swimmers. The main problem faced, particularly by this group, was fear and the resultant panic. Poor physical condition and insufficient will to survive ran a close second.

This, then, was why the personal equipment survival training officers and technicians found themselves at Langley looking apprehensively at the weather. They didn't know it, but the nasty weather was no accident. The course had been deliberately planned for that time of year when weather was generally nasty, with the water temperature cold enough to make an exposure suit appreciated. In short, the keynote to the whole program was REALISM with an attempt made to make the student feel he was actually bailing out into the sea to survive or else!

The Special Training Division at Headquarters TAC knew the need, and realized what kind of training was necessary. Unfortunately, only a small portion of tactical aircrews can be trained in each course, so the initial training was directed at the survival training officers and technicians. In this way, these individuals would have first-hand knowledge of survival and could use

Using ejection seat, students practice correct body position for entering water. Below, student learns to plane on surface by bending at waist, keeping arms in and legs spread for stability.

Capt Fred B. Ewing, USAF
Personal Equipment & Survival Training Br
Hq TAC, Langley Air Force Base, Va.

this to instruct others, and possibly adopt some of the techniques for their unit's survival training program.

The academic phase of the six day program lasted two full days. During this phase, each man learned in detail what to expect from ejection to rescue. Each student was given an ejection in the ejection seat trainer, then taken to the altitude chamber where a simulated descent by chute was made. Here students experienced decompression and learned how to cope with various descent emergencies. In addition, the bailout bottle, mask, helmet and automatic parachute timer were demonstrated or used. This was followed by lectures on flotation equipment, survival, and students actually fired assorted pyrotechnics. Rescue methods and procedures were also discussed in detail. Of course, what each man did not look forward to was the four day period at sea where the fruit of these lectures was demonstrated and put into practice.

Each morning prior to starting the water training, a briefing on the day's activities was conducted in the classroom. Problem areas of the previous day were discussed and outstanding performances by students during problems were pointed out—some humorous, others serious, but all with the same common interest, "sea survival."

The students, outfitted with the required equipment, took a bus to the dock, and boarded a Landing Craft Medium which took them some 15 miles out into Chesapeake Bay.

First came the non-swimmers' indoctrination and confidence-building event, to prove the trustworthiness of the underarm flotation equipment. Once the non-swimmer learned that he could not sink and could paddle about without the subconscious fear of choking or having water in his nose and face, he soon was ready to join the rest of the class in the 300-yard open water swim. This swim was made with all clothes and equipment on and accomplished many things. These things were *most* vivid in every man's mind:

- Wet clothes are heavy, and speed and endurance are impaired.
- With flotation equipment, you can stop and rest.
- The easiest way to propel one's self through the water is on your back, literally rowing with your arms and kicking your feet.
- Three hundred yards is a long way, much too far to leave your raft, buck currents and swim to shore or to a drifting boat or raft.
- Many crewmen are in poor physical condition and overweight.
- It takes grim determination to complete the 300 yards.
- It pays to keep yourself tied to the raft with a line so it will not drift away should you fall out.
- Poopy suits, the MD-1, CWU 3/P and R-1, always a bone of contention with all pilots and aircrewmen, are well worth the fuss when the water is cold. After wearing the Poopy in the relatively warm 60° water of the Chesapeake Bay, this was a unanimous decision by all concerned. In short, the Poopy suit is a welcomed necessity if it even assists in keeping the cold chill of the water and the wind to a minimum.

Instructors heard remarks from the students, such as, "to think I've been flying over 50° water without this jewel"; "I need my head examined for not wearing it before"; and, "I know now I'd have died from exposure if I'd gone in the drink without it."

The live helicopter pickup was an interesting feature of the program, with each student using the old horse collar and the new seat-type pickup. Pickups were made from the sea, incidentally.

Those Mark 13 flares are great and any simple stupe can tell the night side from the smoky day side. Strangely enough, the instructors were right—the molten particles will burn a hole in a raft!

The simulated parachute jump into the sea, one of the more dreaded events, turned out to be the high-

Entering a one-man raft is not only fatiguing but, without shoes, survivors' feet are lure for sharks and barracuda. Students often arrive with improper footgear. Instructors permit this since students often lose shoes, which serves as lesson to all. Helicopter pickups train both survival students and chopper crew.

light of the program. Some sadistic geniuses in the Survival School had constructed a 14-foot parachute jump tower on the stern of the LCM. This was manned by a jumpmaster and two assistants who monitored each jump. A personal equipment technician examined each student to see that equipment and parachute harness were worn correctly before he climbed the tower to jump. Discrepancies such as loose leg straps and incorrectly fitted harnesses and underarm life preservers were pointed out and corrected. When it was time to jump, it seemed a long way down to the water. This was further complicated since the LCM was moving at about six knots, or at about the same speed a 15 to 20-knot wind would pull an average individual through the water by his open chute. The student was to demonstrate the correct entry into the water from the moving tower and release his risers with the two quick releases. As the students had been warned, these had moved from the normal chest position to about even with the ears. The students soon learned that they had to keep the proper body position in the water or drown.

"Bend at the waist, keep your feet wide apart," the instructor said. "Keep those arms in close to the body or you will be flipped over. Don't flail or kick the water. You must plane like a surf board if you want to breathe and keep the water out of your nose and face." After the jump and release, the students were required to board the one-man raft and set up housekeeping for the rest of the day. For those students who flew with one release, MC-1 knives were used to cut the other riser strap.

While in the one-man raft, the students had to use all of the equipment available, mirrors, desalting kits, hand paddles, and various goodies supplied in the survial kit, not to mention having to repair and maintain the raft. A full afternoon in the raft, in fairly rough seas, quickly indoctrinated everyone on seasickness. Everyone also learned about exposure to sun, wind, and cold. All of this is further proof that true survival cannot be tal en lightly or learned in the classroom or swimming pool.

Every student received a well-rounded program in all flotation equipment. Even a fighter jock may, at some time, come in contact with a six-man or twenty-man raft. Rescue techniques call for air dropping the largest raft available, should the weather close in or the sea get too high to make a water landing. The larger raft provides a better target for visual pickup later and its size gives additional safety, weather protection and equipment.

The six-man raft was the delight of all students. It can be sailed and even navigated to a given point. These are possibilities not found in the one-man or twenty-man raft. A 15 mile navigation course was run with the six-man raft which provided the student with the opportunity to:

- Learn to handle the six-man raft.
- Construct and improvise sails.
- Troll and forage for food from the sea.
- Utilize the six-man raft kit components.
- Navigate.
- Learn to work with others as a team to survive.
- Learn first aid problems.
- Maintain and repair the raft.
- See how he could travel great distances with the equipment and survive.

The twenty-man raft, although harder to control and navigate, does provide excellent security with the double flotation tube and weather protection. It also has additional items in its large survival kit.

All students agreed that this raft did increase the trend towards seasickness, mostly because of being closed in under the large canopy. The canopy, incidentally, may be reversed from a deep blue to a fire engine red, depending on whether or not you want to be spotted. With this raft, one of the most disastrous things that could happen would be to lose the small adapter that screws on the end of the pump hose. This adapter connects the pump to the mattress valve of the raft tube. Without it, air can't be pumped into the raft, which could prove embarrassing in a real survival situation.

Repairing the twenty-man raft is not so easy either, especially in medium to heavy seas. It not only takes a lot of skill, but considerable determination and a placid temperament.

The water produced from the solar stills tasted like plastic, but all students agreed that at least it was water and did satisfy their thirst to a great extent. As usual, one of the personal equipment experts was so intent on foraging for food he let a fish hook tear a hole in the lower tube of the twenty-man raft and soon the raft became soft. In the medium seas that were running, the raft started to close up like a morning glory around the students. They had forgotten to tie off the interconnector tube after the raft had inflated. In the mad scramble that followed all students found themselves again in the sea, holding on to the outside of the raft while two of the crew tried to patch and pump up the tube. If you have never tried to pump up a twenty-man raft by hand, you have missed out on one of the most exasperating and fatiguing propositions in life. Despite this, all students agreed that the twenty-man raft was like a Cadillac compared to the one-man and six-man rafts, since it provided:

- Excellent stability.
- More room if less than 15 survivors.
- More rations.
- Better protection from exposure, wind, sun, and water.
- Better drinking water and also a greater supply from the solar stills.
- The boarding stations, which made it easier to get an injured man aboard.
- The large canopy, which made it easier to catch rain water in large quantities.
- A greater amount of survival equipment.

This, then, was TAC's immediate answer to the problem of lives lost due to ejections over the open sea. All students agreed that this type of training, with its realism and practical approach to the problems, is the only way to insure survival for 12 out of a dozen instead of seven. ★

A pilot of an F-102 started takeoff on a 10,000-foot runway. He heard an explosion of some type (at 125K with about 7000 feet of runway remaining), which he INTERPRETED to be in the glycol tank. He elected to continue the takeoff. WHY? Before he got to 500 feet he had heavy compressor stalls and a call from mobile that he was on fire. He elected to fly a rectangular pattern under a 600-foot ceiling rather than to eject. WHY? On the downwind he lost power, bled off his airspeed then was unable to maintain altitude. He elected to continue descending (below ejection altitude), trying to get an A/B light. WHY? God alone gave him a light on the eighth or ninth attempt, and he was able to check the sink rate at about 150 feet. He climbed up to 600 feet and, turning base, lost sight of the field in a rain squall. He elected with this sick bird to descend to 300 feet two miles out in an effort to get back in. WHY? Amidst more stalls and rain squalls the pilot eventually got it on the runway.

This is all Monday morning quarterbacking, of course, but doesn't it seem to you that this has a touch of "Don't confuse me with the facts, my mind is made up?" This pilot has lots of guts and was unquestionably a fine stick and rudder jock. The results of the incident attest to that. There is no avoiding the fact, however, that some pretty basic ideas have been cast aside during this incident. We can built more aircraft but the loss of a pilot is irreplaceable. Pilots must be familiar with their ejection equipment, its capabilities and limitations and, when conditions warrant, use it. It takes guts to go out too, and that go or stay decision must be based on facts, not intuition or superstition.

NOTE: The engine had actually suffered FOD on takeoff—probably ingesting a webbing strap of some kind.

AC Power Failure—It's a shame our Flight Safety Directorate isn't a larger organization. I believe that every fighter pilot we have would be a safer pilot and a better supervisor if we had an opportunity to work at a job in Flight Safety for a while to see the record of the tremendous number of accidents we have each year that could have been prevented. The most recent flight safety problem that contributes its share to this category is the loss of AC power in the F-106. It has the two "usual" characteristics of this type accident: First, it happens frequently; second, pilots quite often are able to violate the printed instructions and get away with it. With these two ingredients the seed of complacency is sown, the accident is on its way. It's merely a question of *where* and *when.*

Don't let this "no sweat" condition in the F-106 fool you. It's true we have a lot of them and very seldom does anything other than a routine landing occur, but there are also a certain number that are far from routine. So far we have had eight flame outs and three of them resulted in major accidents with two fatalities. At least one fatality was caused by the "no sweat" but when a pilot, after safely reaching traffic pattern altitude with AC power failure, attempted a 360 to let a civilian airliner land. On rolling out of the 360, the bellmouth of the No. 3 tank was uncovered momentarily, and the aircraft flamed out. The pilot ejected but had insufficient altitude for chute deployment. A "no sweat" condition all the way—yet a fatality and the loss of a $2.5 million aircraft resulted.

That's a tough one but there are tougher ones coming up. You know—the kind that involves YOU? Right now the average '106 pilot considers this AC power failure so routine he doesn't even bother to declare an emergency when approaching the base. He can handle it all by himself. Or, can he? There havebeen two of these flameouts when the nose was lowered on the landing roll—BOTH HAD OVER 3000 POUNDS OF FUEL ABOARD. Not supposed to happen? Right, but it did. Twice. This proves that we still don't know all the answers to this problem.

Give yourself a break. In the event of AC power failure, regardless of fuel on board, *declare that emergency* and let the tower and crash crew stand by to help you. *Get your gear down and don't let anyone make you deviate from that straight-in, nose high approach.*

Lt Col Frederick C. Blesse, Defense Br., Fighter Div.

A PROPER SAFETY BALANCE

Lt Col James W. Bradford, Chief, Flight Safety Div., D/S, Hq USAFE

How do you go about selecting a proper balance between safety and mission accomplishment? Our present approach in USAFE is to weigh the risk involved in executing a maneuver or following a certain procedure against the effect it would have on our assigned mission if the maneuver or procedure were eliminated.

Before I get into our balance selections however, I feel a brief description of our operating conditions is in order.

- The majority of our bases have NATO standard runways which are 8000 feet long and vary in width from 127 to 147 feet.
- Approaches at many bases are poor, and over-runs vary from inadequate to non-existent.
- Our best weather in Central Europe during the period November through May is equivalent to the worst weather in the States for the same period.
- Navaids are inadequate with many low frequency radio beacons of 25-watt power being used for terminal fixes.
- Often beacons 25-30 miles apart have frequency spreads of only one or two kcs.
- Central Europe is an area of frequent, if not heavy, rainfall, and runways are wet a great deal of the time.
- Air Traffic Control is inadequate and air traffic is controlled in Germany up to 25,000 feet only. Above that, quadrantal altitudes are flown.
- Under IFR conditions, which prevail most of the time, the entire area is saturated with air traffic.
- Real estate is at a premium and since we are the guest of the host nations, many political implications are involved and improvements in the airfield complex must be coordinated through NATO channnels.

Now, under the above conditions we are attempting to operate as safely as we can by using what we have to work with.

We have on occasion found ourselves using procedures which were holdovers from World War II, Korea, or the days of the F-80, '84, and '86. Just because it was a good procedure then does not necessarily mean that it is still good today. We think this is particularly true if we lose more aircraft practicing a maneuver or following a procedure than we do under actual operating conditions. I think a good example of this was the former practice of making hooded takeoffs in T-33 aircraft. Several years ago, the Air Force found more T-Birds were lost making hooded takeoffs than were lost on takeoff under actual low visibility weather conditions. This practice was stopped and, to the best of my knowledge, we haven't lost any T-Birds from this cause since.

Within USAFE, we have been examining many of our operating procedures to determine if we are still employing practices that have contributed to accidents or near-accidents and which, when analyzed, are not really necessary for mission accomplishment. Now, no one is going to place restrictions on operations which would hinder our ability to carry out our assigned mission. I want to emphasize that I am speaking only of procedures which we feel contribute *nothing* to mission accomplishment. For example:

- *Touch and Go Landings in Tactical Aircraft are Prohibited.* Considering the history of tire failures, loss of nosewheel steering and brakes, anti-skid failures, A/B plumbing failure and the like, we see no reason to risk touch and go landings. Once the aircraft is on the ground safely, we believe it is better that it stay there and have the advantage of a postflight and preflight inspection prior to becoming airborne again.
- *Formation Takeoffs in Tactical Fighters are restricted* to gross weights of 37,000 pounds for F-100 aircraft, and 46,000 pounds for '101s. This restriction is based on the assumption that it is safer to take off from our NATO standard runways as individual aircraft and then join up, than to make heavy-weight formation takeoffs. The wing commander has the authority to waive this restriction, if, in his opinion, other circumstances dictate that formation takeoffs must be made.
- *Formation Landings are Prohibited.* Until 1960, USAFE experienced a number of accidents wherein wingmen crashed during formation landings on an attempt by the flight leader to drop the wingman off. These occurred at night or under reduced visibility conditions. Apparently the wingmen experienced difficulty in transitioning to VFR and in each case crashed short of the runway. Our present policy is to recover air-

craft individually under GCA unless there are extenuating circumstances such as low fuel, malfunction of radio or flight instruments which necessitate a formation approach.

• *Simulated Air-to-Air Combat.* Unscheduled, unbriefed, simulated air-to-air combat is prohibited. Specifically, pilots cannot engage or intentionally pass within 500 feet of other aircraft unless *all* crews involved are briefed in detail *before* takeoff on the tactics, techniques, and safety measures to be employed.

• *All Night Landings of Tactical Aircraft are from GCA.* Regardless of weather conditions, all night flights within USAFE are IFR, point-to-point flights, with recovery by GCA. In other words, regardless of whether you have the airfield in sight and have determined that the base is reporting VFR conditions, you cannot cancel your IFR flight plan. Further, if GCA is in operation, you make a Ground Controlled Approach. Since this policy has been in effect, we have not experienced a night landing accident caused by the pilot undershooting the runway.

• *Requiring Takeoff Minimums to be Same as Landing Minimums for Navaid in Operation at Departure Base.* For our CRT and non-urgent administrative and support flights, we require takeoff minimums to be equal to or higher than landing minimums for the landing aid in operation. In addition, we require a takeoff alternate if flights must go when the point of departure is below landing minimums—the takeoff alternate being within 50 miles for single and twin-engine aircraft and 100 miles for four-engine aircraft. (In this case, the takeoff alternate weather must be at or above landing minimums for the landing aid in operation.)

• *Using Flight Manual as Bible.* USAFE Policy Letter 62-1 requires that all aircraft be operated in accordance with Dash One T.O. procedures. Flight maneuvers exceeding in any manner any of the operating limitations specified in Section V of the Flight Handbook are not required in our flying operations. Such maneuvers or practices are not permitted to be designed into training tactics or techniques, nor are they used in transition, training, evaluation or other flying operations. Further, the instructions in Section VI, "Flight Characteristics," are considered the same as operating limitations. No flight tactics, procedures, or techniques are permitted which conflict with the instructions, notes, cautions, or warnings of this section of the Flight Handbook. This is not unusual, but occasionally we find some unit wanting to produce its own handy-dandy charts. In one particular accident, it was determined that a locally produced "go-no-go" line speed chart contained erroneous information. This situation was corrected and today only the Dash One or reproductions of charts from the Dash One are used by USAFE pilots. I think it is interesting that after one year of operating under this policy there has not been a single request for a waiver or a comment to the effect that the mission could not be accomplished under the restrictions of this policy letter.

From what I have just said, you probably think that every time we experience an accident, we immediately put out a regulation with additional restrictions on the pilot or aircrew. This is not the case and some of the policies that I have mentioned had nothing to do with accidents, but were the result of evaluation of procedures in effect that were not necessary for mission accomplishment; in other words, each had a degree of risk involved which could not be justified.

We are presently reviewing two additional procedures which we think are not worthwhile. These are:

• The need for accomplishing an airborne LABS check.

• The need for checking gunsights en route to the range by sighting on each other when the guns are hot.

As most of us know, the history of F-100 aircraft in dropping objects is known Air Force wide. A great number of our F-100 incidents involve dropped tanks, practice bombs and the like. Many such items have been dropped when performing LABS checks. Although we have directed units to perform LABS checks over unpopulated areas, this is often impossible because of the cloud conditions prevailing much of the time in Europe. Our question now is, "Is it absolutely necessary to perform airborne LABS checks, or can we accomplish the same thing by ground checks without hampering the mission?" As of this time, this matter has not been resolved.

As for sighting on each other with hot guns to check the gun sights, apparently this practice has been going on for years and no one has been shot yet; but I think you can see the potential there: human error or mechanical malfunction and we could lose an airplane. Again the question: "Is this absolutely necessary?"

We in USAFE feel that we have made some headway in selecting a proper balance between safety and mission accomplishment, but we have barely scratched the surface. Our reason for this article is to:

• Let others know what we have done within USAFE to enhance safety, yet at the same time not interfere with mission accomplishment.

• Open a discussion on the subject so we might hear of actions of other commands that might be appropriate for use in USAFE.

• Determine if this approach to aircraft accident prevention should be pursued at USAF level. ★

• • •

20
YEARS
SERVICE TO THE NATION
Civil Air Patrol
1941 — 1961

The C-47 has been a fabulous airplane. Its many feats are legend and tales are often heard of its reliability and performance under the most trying conditions. Some of these tales, however, are of harrowing experiences. One such is brought about by overspeeding props.

In the Goon this can be a no-fun proposition; the old crate just wasn't built to do its best unless both fans are operating in something like normal fashion. Here are some examples of how malfunctioning propellers have accounted for their share of accidents in the C-47.

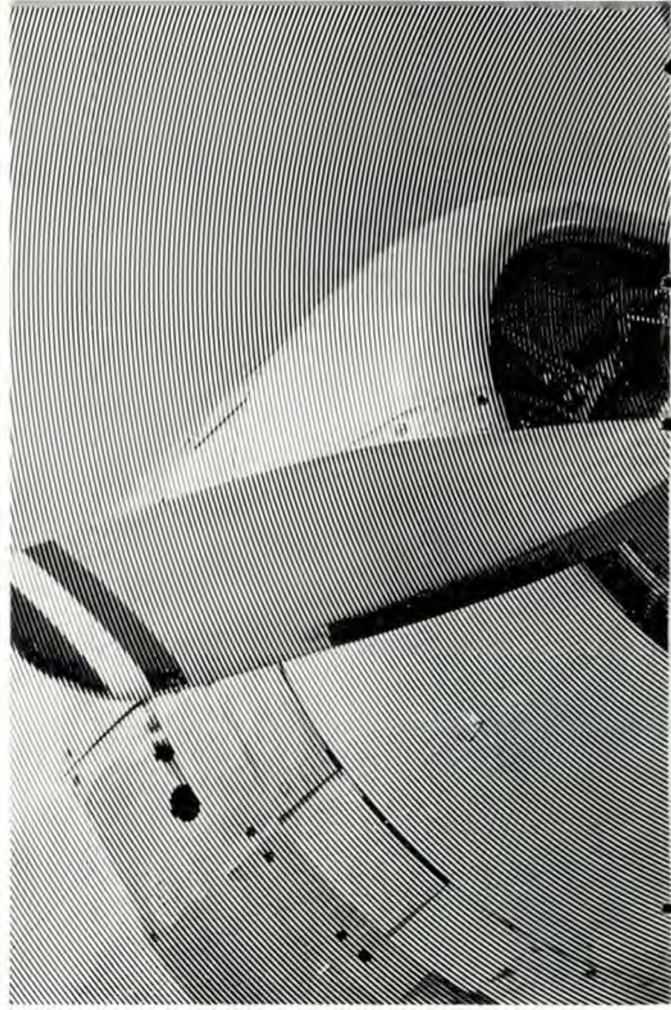
• A functional flight check was being performed for a prop governor change. The aircraft was cruising at 1200 feet, power setting 28 in. and 2000 rpm. When the No. 2 prop control was actuated, the RPM increased to 2300, then, with a slight increase in manifold pressure, to 2900. This was the result of oil restriction to the governor. As feathering was attempted, an increase in electrical load indicated power was going to the feathering motor. A leak in the oil feathering line was the problem. Power was increased on the good engine to 41 in. and 2550 rpm which gave 100 mph and 500-700 feet per minute descent; directional control of the aircraft at this power setting and air speed was very difficult. Due to the low altitude, the landing gear was not lowered until landing could be assured. The right gear folded on touchdown since insufficient hydraulic pressure and time were available to insure the gear locking in the down position.

• During takeoff the oil pressure decreased to 22 psi and the cylinder head temperature rose to 280° on the right engine. Two minutes after takeoff the oil pressure dropped to zero. No other engine malfunctions were evident except a five degree rise in oil temperature. Feathering was attempted several times without results. The left engine was operating at maximum power and the cylinder head temperature increased to 400°. With a loss of power, low airspeed and descending, the aircraft made a left turn back toward the field, but crashed, fatally injuring three of the four crew members. The No. 2 prop governor, feathering motor and pump were recovered and checked satisfactorily. Inadequate oil supply caused the feathering system to malfunction.

• During a night takeoff, No. 1 prop oversped. Feathering was attempted without results. Severe vibration was experienced and directional control was hard to maintain. Due to the drag created from the left prop windmilling the aircraft continued in a left turn and crashed. Investigation revealed that the right prop was at decreased RPM and the hydraulic selector was on the left engine.

• The aircraft was climbing through 4000 feet when No. 2 prop ran away. Feathering was not effective. Other emergency procedures were initiated without results. Maximum power was applied to the left engine. The aircraft, which weighed about 28,000 lbs., started a slight right turn, descending 300 feet-a-minute at 95 knots. The passengers bailed out at 2000 feet. The pilot reduced the airspeed to 85 knots and the right wing was raised slightly, which slowed the rate of descent. The aircraft made a gear up landing on an airfield after flying 15 miles over wooded terrain.

As a result of these experiences, operating procedures have been tested and changed many times. However, there is still no cut and dried solution to correcting this propeller deficiency and getting the aircraft home safely.



· 47 PROP

The various conditions in which we could have a prop malfunction or loss of propeller control and its results are:

• Loss of the prop control cable. When this happens above 2100 RPM the RPM will automatically stabilize at approximately 2000-2100. The effects of this condition would be most critical at takeoff RPM.

• The prop will not come out of the feather position. This results from insufficient oil pressure on the outboard side of the propeller piston.

• Overspeed condition due to broken speeder spring. This is a prop governor malfunction. If the pulley stop pin is sheared, the RPM may be controlled by manual operation of the prop control lever.

• The prop continues to windmill after being feathered. Actuate the feathering switch intermittently to stop the rotation.

• The prop will not feather. There may be an opening in the electrical feathering circuit, a faulty feathering switch, a leak in the oil feathering line or a sheared drive shaft in the feathering pump.

• Restriction of oil pressure to the prop governor. The prop will go to the low blade angle or increased

PROBLEMS

RPM. By operating the prop control no noticeable change in the blade angle will be realized. Therefore the prop feathering motor must be utilized and the airspeed reduced, which further puts a load on the prop, thereby decreasing the RPM. If the RPM cannot be controlled and the prop feathering motor is inoperative, a landing is imperative.

There are many factors which make a safe landing possible although a windmilling propeller will not feather, the first being weight and altitude of the aircraft. Other factors which will reduce or increase the time in which flight can be maintained are airspeed, power setting and the pilot's smoothness on the controls.

The Flight Manual says to take the following action for a prop that fails to feather:

"In a clean configuration the aircraft will not maintain altitude with a windmilling propeller, even at weights below normal landing gross weights. If a propeller fails to completely feather and is still windmilling, open the firewall shutoff valve to supply oil to the engine, after making sure no fire hazard exists.

1. Maintain directional control and airspeed.
   a. Slow aircraft to nearly minimum control speed.
   b. Mixture control—IDLE CUT-OFF.
   c. Propeller control—Full DECREASE RPM.
   d. Throttle—Full OPEN.
   e. If appreciable reduction in RPM is realized, make further attempt to feather the propeller.

2. If still unable to completely feather propeller, the pilot must evaluate all circumstances involved and make the decision to:
   a. Land at the nearest installation.
   b. Bail out passengers and crew.
   c. Crash land or ditch aircraft.
   d. Attempt any combination of the above."

The Dash One procedure above is predicated upon failure of the power plant. It should be adhered to.

But there have been propeller malfunctions when the power plant was still capable of normal operation. When this is the case the situation is considerably different. Here are suggestions should prop control be lost, but the engine still be capable of normal operation:

1. Slow to minimum control true airspeed (drag of an uncontrollable propeller increases approximately as the square of the velocity).
2. Feather if possible. If not possible,
3. Check RPM. If RPM is within limits,
4. Increase power to not exceed maximum continuous allowable RPM. (Drag will be decreased and, possibly, some positive thrust realized . . . Again, the lower the true airspeed the greater the benefits.)
5 Land at the nearest suitable field.

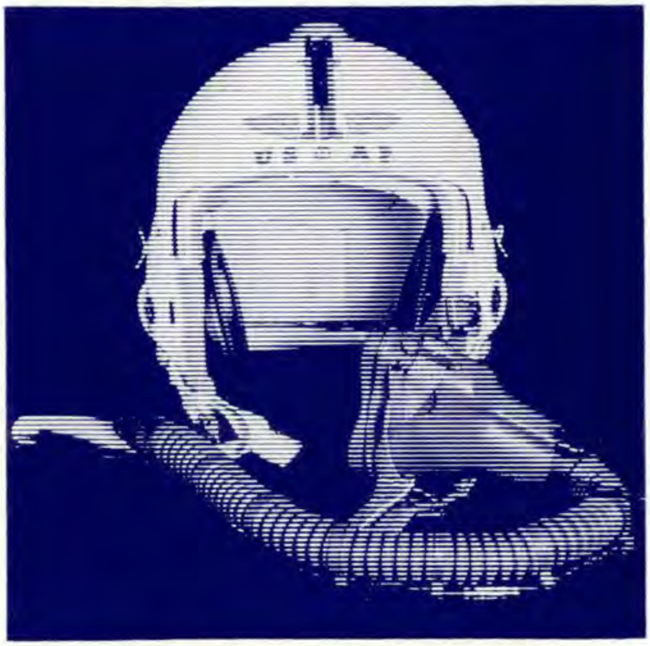
In conclusion, we cite a case in which this procedure was used and the seriousness of the emergency alleviated considerably:

During a routine engineering test hop, normal feathering of No. 2 was accomplished at 6000 feet. When unfeathering was initiated the propeller came out of the feather position, but the governor failed to take effect and the prop control lever had a "loose" feeling. Refeathering attempts had no effect. An emergency was declared and the aircraft spiraled down to get beneath a cloud deck between it and the base. During this descent slight changes in airspeed were noted to have a proportionate effect on RPM. At 3000 feet 43 in. MP and 2550 rpm were set on the left engine. Airspeed was held at 100-105 mph, mixtures emergency rich, cowl flaps cracked. Power was slowly added to the right engine until RPM reached 2600 (13 to 14 inches MP). Here, in the words of one of the pilots, was the result, "Hoping this would get us safely home, you can imagine our surprise when the old girl started climbing! In fact, we had to reduce power on the left engine to 35-36 inches (still holding 2550 rpm) to keep from climbing into the clouds. We maintained level flight with this power setting a good five minutes before making a 'normal' straight-in approach from 3000 feet."

The best suggestion is to know the operational capability of the aircraft, aerodynamic considerations and systems operations; then analyze the situation intelligently and take action accordingly. Pre-planning for emergencies, i.e., knowing weights, minimum control speeds, suitable landing areas, etc., can be valuable also. These are the things that can well make the difference between incident and accident. ★

MAJ GARN H. HARWARD, TRANSPORT BRANCH, D/FS

YOUR PLASTIC



SAFETY SHELL

"Sometime after ejection I lost my helmet and oxygen mask." In reviewing reports of recent accidents involving ejection, we find this statement is becoming an increasingly familiar quote. This is occurring in spite of improved protective helments and retention devices currently in use. The reasons for the frequent loss of helmets and masks during ejection become readily apparent when you begin to analyze the evidence submitted in the accident reports. One crewmember may fasten the chinstrap but fail to lower the visor; another may lower the visor but leave the chinstrap unfastened and many *do neither*.

Here is a typical example: "I had approximately two minutes from the time I decided to eject until I left the aircraft. During this time I secured the cockpit and checked to make sure I was properly hooked up—seat belt, automatic chute opening device and lanyard. Just prior to jettisoning the canopy I pulled the visor down and tightened the retention buckles on my mask one notch on each side. As soon as the seat rotated approximately 90 degrees after ejection, my helmet and mask came off."

This pilot was one of the more fortunate ones. He had time to plan a course of action and prepare himself for the ejection. Nevertheless, he omitted one vital step that would probably have insured retention of the helmet. **HE DID NOT FASTEN THE HELMET CHIN STRAP.**

The effectiveness of the proper use of the chinstrap and visor is clearly demonstrated by the following data compiled from 402 successful ejections reported during the period 1 January 1959 to 31 December 1960.

ROBERT H. SHANNON, SAFETY OFFICER, LIFE SCIENCES

	Total	*Lost*		*Retained*	
		Nr	%	Nr	%
Chinstrap Fastened	255	39	15	216	85
Visor Down	134	10	7	124	93
Visor Up	121	29	24	92	76
Chinstrap Not Fastened	61	50	82	11	18
Visor Down	21	14	67	7	33
Visor Up	40	36	90	4	10
Total	316*	89	28	227	72

*Does not include commercial helmets and cases in which information regarding chinstrap and/or visor was not reported.

As shown by these data, the overall retainability of 72 per cent is quite high. However, the significant contrast between chinstrap fastened/visor down and chinstrap not fastened/visor up definitely indicates that this percentage could be greatly improved.

Several disturbing rumors concerning the use of the helmet still persist. These are just rumors and cannot be substantiated by operational experience.

The story has been circulated for quite some time that ejection with the chinstrap fastened, particularly at high speed, could result in a broken neck. This definitely is not true; in over 2000 ejections reported to date, there has not been a single instance of serious neck injury attributed to the helmet chinstrap. The chinstrap is designed to break or give way prior to a force being exerted that would cause neck injury. On the other hand, minor injuries occurring as a result of the helmet being torn off when worn improperly are not uncommon.

There is another popular misunderstanding concerning the visor. Reports indicate that many crewmembers believe the visor snaps in the down position automatically upon ejection. Were ejection forces great enough to accomplish this, there would be some pretty sore backs. The visor must be lowered *manually* prior to initiating ejection.

You might ask at this point why retention of the helmet is so important once you have cleared the aircraft and started the parachute descent. The answer should be pretty obvious; however, we shall be-emphasize some of the more important aspects.

First, and most important, is the protection you might need during landing. There is an alarming lack of knowledge of bailout techniques among USAF crewmembers. The most critical factor is probably parachute landing. The records contain a substantial number of cases in which the ejectee falls after touchdown and strikes his head on the ground, and others who are dragged by the chute canopy. That old plastic shell is mighty comforting at a time like this. During 1960 alone, the helmet was credited with preventing head injury or more serious head injury in 15 instances on landing.

The possibility of the seat bouncing off your head during descent is also another consideration; it has happened.

The next most important factor is the need for supplemental oxygen during ejection at high altitude. The record does not show this to be a real problem; but with the aircraft we are flying today a potential hazard does exist.

Finally, there are many ways in which the helmet can be put to good use as a survival aid after landing. To cite a few: it affords some degree of protection from the elements, e.g., keeping the head and ears warm during cold weather; serves as sunshade when it is hot, and makes a handy little container for carrying water or bailing out your dinghy.

Here are some pertinent quotes from the September 1961 issue of "Safety Tips from the Air Force Logistics Command." First, the *Do's:*

- Do fasten the chin strap and carry your helmet like a basket or carry it under your arm.
- Do protect your lens when not in use. A scratched lens will impair your vision.
- Do hang your helmet by the throat straps, or set it upright on the shelf of your locker, or store it in a bag or helmet protector.
- Do spread your helmet only far enough to allow ease of donning.
- Do be sure your helmet is properly fitted and adjusted for comfort.
- Do thread the communication cord behind the shell lacing to prevent excessive flexing.
- Do mark your helmet in accordance with T.O. 14-1-4 and as authorized in AFM 35-10.

NOTE: The white finish or coating on the helmet was originally designed to reflect solar radiation. The white coating acts as a cooling agent to the wearer.

And now for the *Don'ts:*

- Don't carry your helmet by the communication cord.
- Don't throw it in your locker.
- Don't spread your helmet excessively.
- Don't lay your helmet down on the visor lens.
- Don't wear a sloppy fitting helmet.
- Don't let the communication cord dangle and flop about.
- Don't paint your organizational insignia on your helmet.*

In summary, take good care of this equipment; maintain it well; wear it properly. Some day it may save your life ★

**If you must paint your organizational insignia on your helmet, the visor cover is considered a likely spot or area for it. Ed. Note.*

CROSS COUNTRY NOTES FROM REX RILEY

• *IT MUST BE TOLD*

This will re-embarrass a couple of T-33 pilots but it deserves to be hit again as it's not a joking matter. Anyway these two T-Bird troops were circling around a base at 1000 feet, maintaining VFR, while they got some kind of a clearance to a nearby base. They became so occupied with this that they ran the fuselage tank dry and flamed out. Fortunately the pilot's proficiency at dead sticking a T-33 was better than the ability to watch the fuel. A successful landing was made. Seems as if the pilot hadn't gang-loaded and had the fuselage low level warning in the dim position. Because this type of occurrence keeps happening now and then, there's some talk about re-locating the warning light, additional lights, etc. Rex will keep you advised.

• *PRACTICE STEERS*

Rex made a little joke about a pilot who asked for a practice DF steer. The tower came back with "No practice steers allowed—only emergency steers given." To which the pilot meekly replied, "O.K. let's have one of those."

Rex was advised that some of the troops took this seriously. Let me correct it then—practice DF steers have not been forbidden but are encouraged for training the DF troops, and pilots, too. The Enroute Supplement even gives the procedure.

• *T-33 ENGINE OPERATION*

The other day Rex flew with a troop who evidently hadn't read his Dash One since 1960. The particular T-33 was a real dog and we were trying to get it to 42,000 feet. After 30 minutes of climb he came in with, "We've pulled 100 per cent for 30 minutes; don't you think you'd better back off to 96 per cent for awhile? That's what the book says." Rex explained that that is what the book *used to say*. It doesn't anymore. The engine experts found that it was less detrimental to the engine to operate at 100 per cent continuously than to run at 100 per cent, retard throttle (which cools the engine) and then go back to 100 per cent. They do advise, however, that engine life is prolonged when operated at reduced RPM. So the word is—use 100 per cent when you need it, but when you don't need it, reduce RPM.

• *ALBUQUERQUE/KIRTLAND AREA*

Another area enters the "Hi-Density Traffic Zone" family. This means you've got to keep looking around or end up eyeball to eyeball with another jock. Also means you should check the Planning Data, Section I, of the FLIP for VFR entry and exit into the area.

Kirtland has another "catcher" you should watch out for. In jet aircraft you can't make a straight-in approach and landing from any of the NAVAIDS (this includes VOR, ILS, GCA, etc.). Runway 17-35 is closed to jet traffic which means you make a circling approach to runday 08-26. One other thing about Kirtland: they get some fierce winds straight out of the north and south. This makes for some hairy crosswind approaches and landings on the east-west runway (08-26).

• *HARD TO BELIEVE*

A B-47 crew was on an "Oil Burner" mission at 5000 feet and was scheduled for a "short look" release on an unnamed radar bomb scoring site. Forecast weather was 1800-2000 feet, broken to overcast with stratus tops to 4000 feet. The airborne radar indicated no severe weather. As a climb was started the crew hit heavy rain and light turbulence and leveled off at 5000 feet. Ten to 20 seconds before release an area of extreme turbulence was entered. The RBS site was asked for assistance as to the best heading to get out of the weather and replied "southwest." (Airborne radar malfunctioned during first penetration of turbulence.) They finally broke out VFR at 10,000. Another B-47, inbound to make a run, heard the conversations going on about turbulence and requested the target area weather from the RBS pilot. The reply was, "We're not authorized to give that information prior to release." The AC of the first B-47 gave the ungarbled word to the second B-47 and he aborted his run. From here it looks like these RBS troops would have let the second B-47 drive on into severe turbulence knowing well that a dangerous flight condition existed. Can this be SOP? Undoubtedly Rex will get a few dozen howls from some conscientious RBS folks. We'll give their answers in a later issue.

• NEW WRINKLE IN ACCIDENT INVESTIGATION

Jarrin' JAWN LANDRY (LtCol type) and formerly of Norton Flight Safety is now trying to teach the British subjects how to speak his brand of English. Anyway he sent along the 10th Tac Recon Wing's investigation guide and it's a good one. The new twist is this: it's divided into sections such as powerplant, hydraulic, structural, electrical and the other groups normally found in a well set up accident investigation board. Then each section has pictures, diagrams, schematics, etc. that are pertinent to their part of the investigation. If an accident happens each member of the board can grab his guide and use it right on the scene to plot wreckage parts, instrument readings, position of controls and so on. If you'd like to see one (and Rex repeats—it's a goody), write the 10th Tac Recon Wing, APO 238, New York, N.Y.

• A CONTRIBUTING CAUSE

It reads: Pilot exerting pressure on maintenance personnel to expedite repair of starter.

How does that grab you?

It happened. The first paragraph is a verbatim quote picked up from a report involving improper starter installation, but the pilot got what looks like a well deserved assist on this one. After the engine was started and stabilized at idle RPM, the starter disintegrated, discharging metal through the cowling and left side of the fuselage. Metal particles were ingested by the engine.

Quit leaning on the repair troops. They are just as anxious to get you on your way as you are.

• ISN'T IT QUIET

A T-37 student and instructor pilot leaped off on a local student training mission about 0900 and were in serious trouble a little later. During the climb to VFR on top some light rime icing was encountered but nothing to get shook up about. After practicing instruments, they received clearance to 21,000, then to 20,000 in a holding pattern where the '37 picked up a quarter inch of wing ice. During penetration the student pilot had difficulty establishing a descent so the IP took over control. He immediately noticed a restriction to forward elevator control. In the clear, at 14,000 feet, ice began to separate and No. 1 engine flamed out. As No. 1 was stopcocked for a restart, No. 2 engine flamed out! Passing through 8000 feet both engines were restarted and a normal approach and landing were completed.

The base investigators feel that ice ingestion caused the double flameout. This is probably right 'cause the Dash One states that "flying in known icing conditions should be avoided." There's also a warning, "Leave the area of icing as soon as possible" and "Altitude should be changed immediately upon the first signs of ice accumulation."

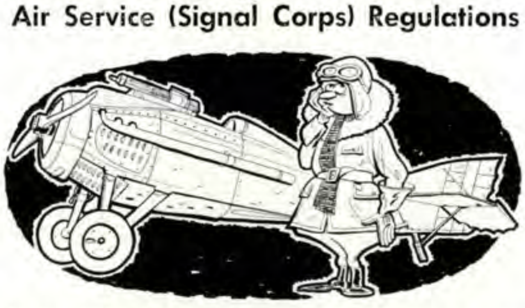
Remember, you T-37 troops, this airplane was not engineered or designed as an all weather trainer. It would be nice to modify the T-37 air intake system but this would cost a lot of money and take a long time. Although modification has been discussed, it's not likely to happen. Best you dust off the Dash One and have a good review. Could learn a few other things at the same time.

• F-84 AND F-86 DRIVERS

Here are a couple of mishaps of interest to all F-84 and F-86 pilots. All was serene with an F-84F and an Air National Guard pilot until, at 40,000 feet and 97 per cent, he hit the emergency fuel switch with his elbow and flamed out. (He also could have caught the switch on a portion of the anti-exposure suit.) It was a real hairy ride down to 11,000 feet when finally after six attempts he got an airstart. This last attempt was just before preparing to go up and out via the next of kin button.

The F-86L pilot was in a greater bind. On downwind he noticed the nose gear light was out. He made a low go, and mobile reported gear appeared to be okay. The pilot then changed the bulb but the light was still out. Then the aircraft flamed out and could not be restarted. After steering the machine way from a farm house, the pilot successfully ejected—at 350-400 feet. It was determined that he inadvertently turned off the master switch with the side of his hand while changing the light bulb. The switch protrudes 1/8 in. beyond the guard. The base where this occurred has now shortened the switches to 1/8 in. below the guard. ★

First Set of Flying Rules—Circa 1920
Air Service (Signal Corps) Regulations



Don't take the machine into the air unless you are satisfied it will fly.

WELL DONE

• Captain •

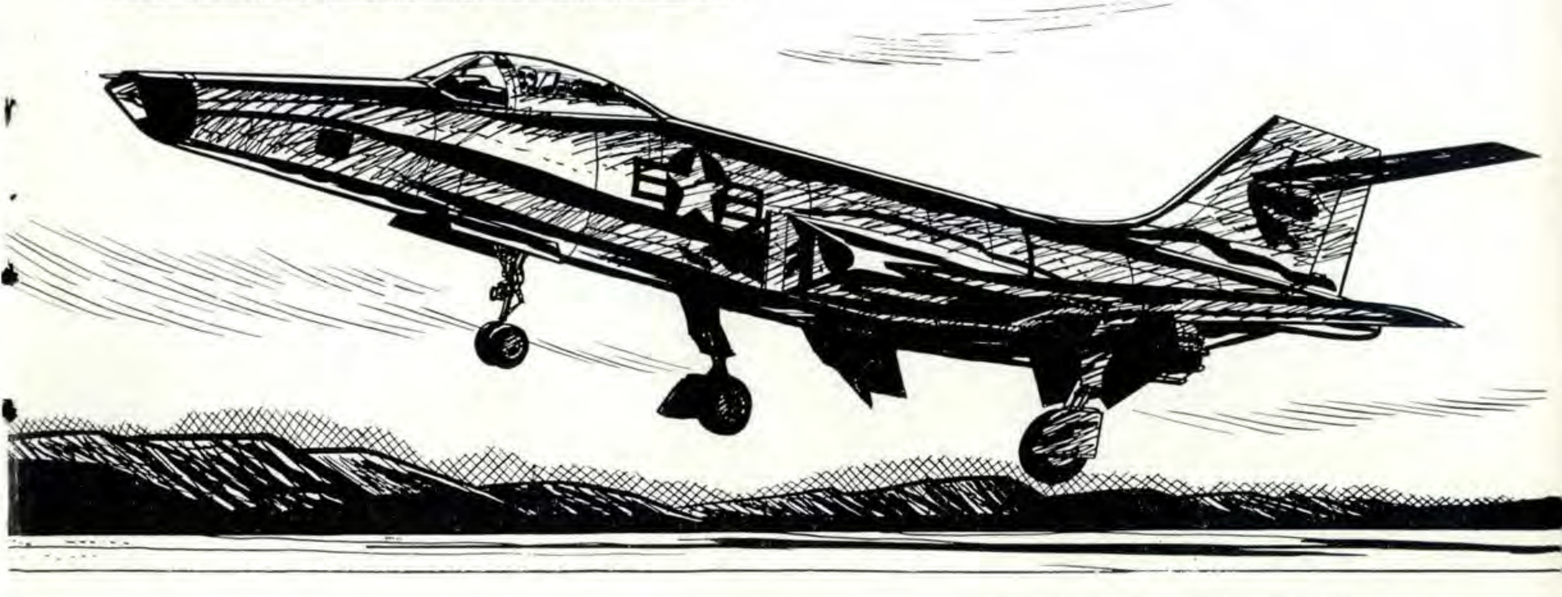
Dale Connolly

38TH TAC RECON SQ, USAFE

Captain Dale L. Connolly, an RF-101 pilot assigned to the 38th Tactical Reconnaissance Squadron, took off from Toul Air Base on a recon mission during a Wing Tactical Evaluation. While his aircraft was climbing through 15,000 feet, the left engine compartment fire warning light came on. He retarded the throttle to idle and checked all engine instruments; they appeared normal. A check in the rear mirror, however, revealed smoke coming from the left engine so he closed the left throttle. Another RF-101 joined him to give his aircraft a visual check. The smoke had now ceased.

Captain Connolly elected to divert to Laon for landing since the weather there was much better. Enroute he found that the throttle of the right engine was jammed in the full OPEN position. The chase pilot informed him that fuel was streaming intermittently from the underside of the fuselage. He set up a straight-in, single engine approach—intending to use the master switch to shut down the engine on touchdown. However, one mile out on final the wing flaps failed to come down when they were selected. This left him in a precarious situation inasmuch as flaps are normally used to lessen excessive airspeed held on a single engine appoach. He immediately shut down the right engine with the master switch and touched down at approximately 180 knots. Emergency braking was used and the '101 stopped on the runway. Investigation revealed that the 16th stage air bleed pressure duct had ruptured, and the force was great enough to drive the pressure line through the engine bay and into the No. 3 fuselage cell, causing the leak. Also, it kinked the teleflex conduit so as to lock the right engine throttle in the full military position. Captain Connolly's problem actually involved two emergencies; however, his quick thinking and proficiency brought about a routine conclusion to a serious combination of circumstances. And, finally, that dead-stick touchdown was perfectly executed, particularly since the aircraft grossed more than normal landing weight and flaps were inoperative.

Well Done! Captain Connolly. ★



"Red 4, you're cleared for a closed pattern."

"But sir, I thought he said 'close pattern!' "

TWO POINTS OF VIEW

"This is beginning to look like pilot error, Lieutenant!"

"But sir, I believe the cause of the accident was administrative . . . I should never have graduated from flying school."

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