AEROSPACE
SAFETY
UNITED STATES AIR FORCE

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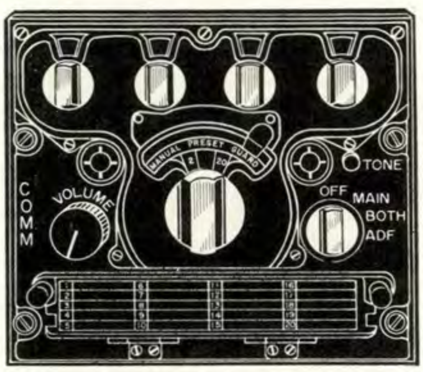
LOST COMMUNICATIONS PROCEDURE

Lt Col Robert P. Rothrock,
Directorate of Aerospace Safety



THE jet bomber was being given radar vectors for positioning on GCA final. Approach was over water to a coastal base. Weather 1200 overcast, visibility two miles. Three F-101s were also under GCA control at the time and the bomber was given a 270-degree spacing turn to the base leg in order to give the '101s landing priority. During the turn the bomber was descended to 1700 feet.

Lost communications procedure was given as: "If you lose communication with GCA for any one-minute period in the radar pattern or five seconds on final, continue with a TACAN approach to runway —, contact tower for landing instructions."

As the bomber approached the extended centerline of the runway, the pilot was given a frequency change because the three F-101s were on the same frequency. The frequency change request was not acknowledged. Attempts by GCA to establish contact, both on the old and new frequencies, were unsuccessful.

A GCA transmission was made in the blind on Guard channel, advising the bomber pilot to make an immediate right turn. There was neither acknowledgment nor course change. Approximately two minutes later GCA lost radar contact in the ground clutter northwest of the centerline of the runway.

The aircraft crashed 10 miles north of the runway centerline on the last heading and altitude assigned by GCA.

FINDINGS

The primary cause of this accident was pilot factor in that the pilot failed to execute lost communications procedures.

A contributing cause was failure of the pilot to maintain a listening watch on Guard channel in accordance with paragraph 19a(1) of AFR 60-16. (The accident board determined the UHF radio was tuned to the initial GCA frequency and the ON-OFF switch was on "Main." Therefore, the pilot was not monitoring Guard.)

Possible contributing causes were:

Materiel failure of the UHF radio.

Personnel factor in that the GCA operator used the wrong aircraft call sign when requesting a channel change. This could have caused the pilot to disregard the frequency change.

LESSONS

Be sure you understand the lost communication procedure as given by GCA. If no transmission is received for one minute in the radar pattern or for five seconds on final approach do not delay execution while trying to establish contact.

Familiarize yourself with all approved approaches for your destination prior to initiating any type approach so as to be able to cross-check location and determine if a safe position, altitude and heading are being maintained. All available radio aids should be on and tuned to the proper frequency. Brief fellow crewmembers of your intentions, ascertain that they are familiar with the approach and have them monitor.

Keep a listening watch on Guard channel. To use an old cliché, the life you save may be your own. ★

The cover photo was made from directly above the eye of Hurricane ESTHER on 17 September 1961. The pilot reported the eye of the storm to be 25 miles in diameter with cloud height of 50,000 feet. The vertical strips in the photo reveal that it is a mosaic made by fitting together individually sequenced photos taken by the camera. (Photo credit: AF Cambridge Research Lab.)

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IN THIS ISSUE

EDITORIAL

FIRE WARNINGS

Somewhere back in aviation history it was determined that an inflight fire was one of the worst possible hazards a pilot could face. Because of this, we suppose, someone said we need two things — a fire detection system and a fire extinguishing system that we can use in flight.

Good theory. Everybody's for it. Install some sensors in the most critical fire hazard areas, run some wires to the cockpit, hook them to warning devices, lights for example, and we have our fire warning system. Install fire extinguishers with manifolds to critical areas, put controls for these in the cockpit, and flying will be safer.

In theory this system works fine. In practice, something else again.

We've had such systems for years, and in all types of airplanes. We have found that, basically, there are but two things wrong.

1. We get fire warnings with no fire.
2. We get fires with no warnings.

In fact, the situation got so bad in B-47s that the engine fire warning system was disconnected. Someone got wise to the fact that we were having more panic and unnecessary engine shutdowns trying to cope with false fire warnings than we were from inflight fires.

Some, flying the Pacific a few years back, were faced, literally, with flickering red fire warning bulbs when flying in heavy rain. Particularly at night, the flashing red lights (no fire, of course) made it a bit more difficult to fly instruments through heavy turbulence.

Some emergencies are most critical. Fires, *real* fires, are in this category. Every Dash One spells out the procedure. But when a light comes on, as someone already has pointed out, all we really know is that the bulb works.

The commercial carriers have been plagued with the same problem for years. Here's a direct quote:

"Nr 3 engine was shut down when fire warning indication was experienced during stage three. No visual signs of overheat were evident. Aircraft landed without incident (he had three other engines). Ground inspection of the engine revealed left burner section sensing element malfunctioning. Changed element and system operation was then normal."

It seems just a little incongruous when we realize that we have the technological skill that permits us to safely orbit astronauts, but cannot reliably detect a fire in an airplane. ★ TJS

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THE BACKSIDE OF THE CURVE

Val E. Prahl, Manager of Flight, General Dynamics, Fort Worth, Tex.

Though the pilot's handbook properly describes the best landing techniques of the B-58, all B-58 pilots should be familiar with, and understand the slow-speed-flight characteristics of the airplane as a means of optimizing their landing habits. Since the basic landing pattern is relatively straightforward, no additional explanation is required; however, the final approach and landing techniques, having evolved as a direct result of certain flight characteristics of the B-58, are worthy of discussion and comment.

In landing any airplane the basic problem is to touch down at the approach end of the runway at the slowest speed practicable. However, to provide adequate control, the flare speed must include some margin above stall, and on most airplanes, is usually ten to 20 per cent above the stall speed. On delta-wing airplanes, such as the B-58, wherein no classic stall exists and good control of the airplane is retained well below normal landing speeds, the flare speed is not related to a stall condition or loss of control. The recommended flare speed for the B-58 is, instead, a function of the power required to fly the airplane.

Consider Curve A in the chart, which depicts the power required to fly the B-58, gear down, at various angles of attack out of ground effect. Notice how the power required increases rapidly as angle of attack is increased above 12 degrees. At the 14-degree angle of attack the airplane is well on the back side of the power-required curve which is an unstable power-required condition. In this region, if airspeed is allowed to decrease very slightly and power not readjusted for the new flight speed, airspeed will continue to decrease or the airplane will descend at a continuously increasing rate. Though flight at angles of attack greater than 12 degrees is not particularly difficult, especially since the B-58 has sufficient power available to sustain flight well above 17 degrees, it does require considerable pilot attention to maintain positive control of both airspeed and the airplane's flight path. If flight is conducted in this region the technique that provides the most positive control is to maintain airspeed by varying the airplane's attitude and controlling the flight path with power. This procedure prevents the development of high sink rates which in the landing situation are very dangerous unless recognized and properly controlled. Since during the landing approach the most desirable flight condition is one that requires minimum pilot attention, the recommended flare speed falls along the relatively flat portion of the power-required curve and avoids the susceptibility to high sink rates. If during the landing approach airspeed is allowed to decrease below the recommended flare speed it is important to realize that, although airplane response to control-surface command remains good, the key to positive control is power.

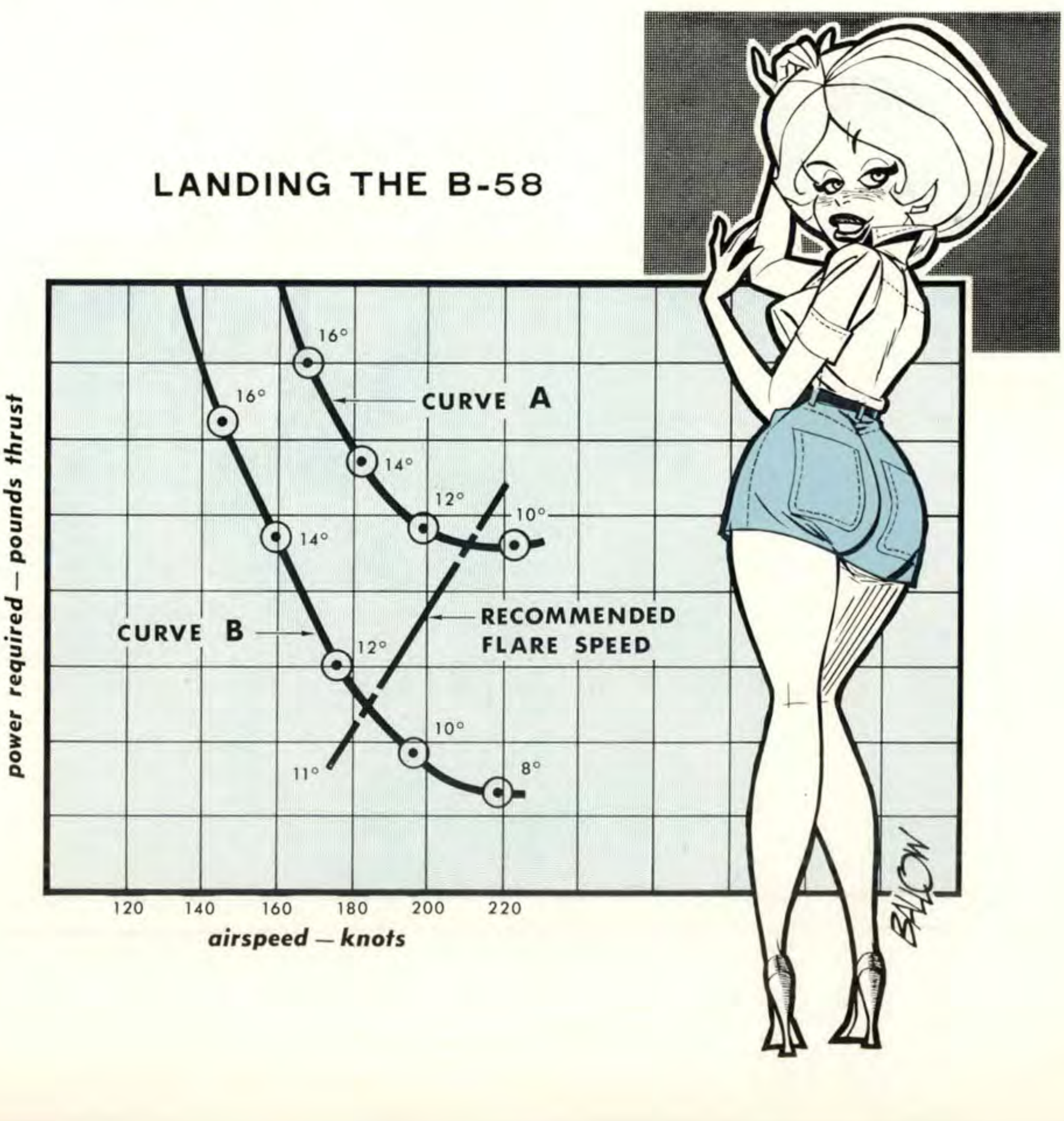
Once the significance of the recommended flare speed is understood the pilot has no difficulty in establishing a technique for the landing flare and touchdown. It is simply this: "If you get too slow on final, use power to flare." Nevertheless, power technique in the flare is quite important for all approach speeds. Consider Curve B in the chart. This is the power-required curve for the B-58 when flying in ground effect. Notice that it requires less power to fly in ground effect than it does out of ground effect, but also notice how much sooner the airplane reaches the back side of the power curve. If recommended flare speed is maintained in the landing flare, the airplane changes from a relatively stable power-required condition to an unstable condition and is now on the back side of the power-required curve. The point to understand is that, just as power is the best control in flight at high-angle-of-attack, so also is power the best control in the landing flare.

Obviously there are variations of this condition. If airspeed is 15 to 20 knots above recommended flare speed, the flare may be accomplished with power at idle. But when the recommended flare speed is maintained to the point of flare, power should not be reduced to idle until touchdown attitude is established. When this technique is performed properly, runway contact and reduction of power to idle will occur simultaneously. Though the power-required curve is one of the primary reasons for this technique, the so-called "reverse-flap" effect that is unique to tailless aircraft is also a predominant factor. This effect is caused by the effective change in camber of the wing as the elevator is deflected to rotate the airplane. From any given stabilized flight condition, if the elevator is deflected up, the lift generated by the wing is decreased until the airplane rotates to the new-angle-of-attack command by the elevator. In high-speed flight this condition is seldom apparent because the airplane is very responsive to elevator movement. But at landing and approach speeds this characteristic is quite evident. As the airplane is rotated in the landing flare, the elevator is deflected upward and acts like a flap in reverse on the lifting capability of the wing. Since at landing speeds elevator effectiveness is much lower than in normal flight, large deflections are required to rotate the airplane in pitch. In the landing flare this characteristic gives added importance to the use of power and further emphasizes the admonition, "Do not retard power to idle until the airplane is rotated to touchdown attitude." The combination of being on the backside of the power-required curve and the reverse-flap effect results in only one positive method of controlling rate of descent. That method is power. But when the airplane is flown at the proper speed and the rate of descent is controlled to maintain the normal approach path, the B-58 is pleasantly responsive in the landing flare.

In summary the mechanics of landing the B-58 are as follows:

- Fly the entry, downwind, and base leg at the speeds and altitudes prescribed by the pilot's handbook.
- After roll-out on the final approach, start reducing airspeed gradually until the airplane has decelerated to flare speed. Ideally this should occur as the airplane reaches a position to start the landing flare for touchdown.
- On the final approach use power as primary control for rate of descent.
- At the point of flare for touchdown if the airplane is on flare speed and rate of descent is not above 1000 feet per minute, reduce the remaining engine power above idle by approximately 50 per cent.
- Smoothly rotate the airplane to kill rate of descent and accomplish the touchdown.
- At touchdown immediately lower the nose slightly and reduce any remaining power to idle engine speed.
- Deploy the drag chute and raise the airplane nose to approximately 17 per cent until airspeed has decreased to 100-120 knots.
- Lower the nose gently until the nose gear has made runway contact, engage nosewheel steering and brake to taxi speed.
- Taxi from the runway, and park. ★

LANDING THE B-58



Too many Air Force accidents result from a progressive chain of events any one of which might have been only a minor inconvenience, but when added up produce the inevitable: catastrophe.

The files contain many examples: A flight of fighters, low on fuel, overflying one or more possible landing fields to get to home base. A T-33 flying into a rapidly increasing headwind undetected by the pilots. A turning point over a large base but a decision to press on. These examples led to flameout and punchout.

Others are more insidious. The loss of an engine on a four engine aircraft may not be a great cause for alarm. It is, however, the first indicator of a potential accident. Investigators contemplating the debris of what was an airplane, have laboriously traced back through a chain of events to a point where the flight could have ended safely, although not, perhaps, at its intended destination.

The selections to follow may seem unnecessary but they are presented because accidents, preventable and resulting from a series of deteriorating events, continue to occur.

An empty C-124 was en route from the northwest on a night IFR flight to the southeast. Assigned flight altitude was 11,000 feet, later lowered to 9,000. The pilot had been briefed that weather south of the Montana area would improve.

Approximately three hours after takeoff, Nr 2 lost power and the manifold pressure dropped to 18 in. Except for the low MP the engine continued to operate normally so it was decided to run it at reduced setting to take advantage of the power available.

At this time the aircraft was southeast of Billings, Montana, and the pilot called Denver Center to get the latest weather along the flight route. He was advised that all suitable airfields within the area were at or below minimums. Meanwhile a fast moving front was approaching Denver. With this information, the pilot advised the center that he would try to out-distance the front and land in Oklahoma where C-124 maintenance was available.

Two hours later Nr 3 began to backfire violently with an immediate loss of oil and was quickly feathered. Since the power output of Nr 2 was negligible, two-engine cruise was established and a course set up direct to the nearest suitable airfield.

Since the aircraft was moving in the same direction as the fast-traveling front, the pilot knew he could expect a rapid decline in weather conditions in advance of the front. He was right. Weather at the first field recommended by the Center dropped below landing minimums thirty minutes prior to ETA. Another airfield 200 miles east was selected with weather reported 200 to 300 feet above minimums. When contact was made with area radar at the second field the pilot was advised that the weather had gone below minimums with gusty winds.

Destination was now changed to a third field farther south where the WX was reported clear with 15 miles visibility, but with high, gusty surface winds.

One hour from the new destination Nr 4 began to backfire. Power was reduced. Now the situation stacked up something like this: Nr 3 inoperative, Nrs 2 and 4 at reduced power. The pilot had one thing going for him — he had maintained 8000 feet with a safe indicated airspeed. From this point it was possible to maintain a 100 fpm descent at 150K. The center radar immediately cleared all lower altitudes. As the aircraft approached 4000 feet, power was restored to Nr 4 with no difficulty and destination GCA was contacted for vectoring to a successful two-engine approach and landing. After touchdown, Nr 2 engine had to be shut down.

After some five hours of hectic flight, the aircraft was safely on the ground. No one thought to measure the depth of the sweat in the cockpit.

1.......2.......3.......

A four-engine aircraft was flying at 11,000 feet on the coastal route to Alaska when an engine began malfunctioning and had to be shut down. Terrain elevation was approximately 5000 feet. About 45 minutes later, at an altitude of 7000 feet, another engine had to be feathered.

Now the aircraft was descending at 100 fpm and an intercept was made by the Coast Guard. When the intercepting aircraft lost the transport in clouds, the pilot was advised to divert to another base 30 minutes farther, but over water.

The pilot was now faced with the alternative of an additional 30 minutes of flight over water, or a flight over mountainous terrain but 30 minutes shorter. His decision was to continue over the mountains. A few minutes later the aircraft crashed at the 5000-foot level and nine lives were lost.

Another sad-ending story started with loss of engine oil just eight minutes from a suitable Air Force base where a landing could be made. The flight plan was changed to a new destination some 400 miles away, which had adequate maintenance. Approximately 30 minutes later the oil leak increased and the affected engine was stopped. The aircraft at this point was one hour and 30 minutes from revised destination. The pilot proceeded to the destination without any other difficulty, arriving over the station at 7000 feet. During the instrument approach the second engine backfired, followed by heavy white smoke. The prop was feathered to reduce the fire potential. Since the aircraft was near the airport with sufficient airspeed and altitude for maneuvering, a successful landing was possible. Yet after entering the traffic pattern, the aircraft was diverted to another nearby airport which had a longer runway. While proceeding to final destination five miles away the third engine lost power and caught fire. There was no question as to the final destination at this point.

A pile of molten metal was the result of what started to be a common occurrence of one engine malfunction. Not necessarily skill or know-how but luck saved the personnel aboard.

Pilots are rightly concerned with mission accomplishment and landing an aircraft at the location where equipment malfunction can be corrected. The prime consideration, however, should be to get the aircraft on the ground safely regardless of location. There is no assurance that after one emergency another will not occur. Too many crews have learned this the hard way. ★

AND OUT

Lt Col Garn H. Harward,
Directorate of
Aerospace Safety

Snow Job

Lt Col Joseph P. Tracy, USAFR (Ret.)

Last winter more snow fell on Dow AFB, Maine, than had ever been recorded in the area during any one of the 105 years that official records had been maintained. To be exact, 182.7 inches fell during the winter of 1962-63. That's a pretty big snow job, about 15 feet, and when it drifts . . .

Take New Year's Day, for instance. The weather people had forecast snow flurries, but got a blinding blizzard instead. Seems that a big low was hanging to the north, with no weather stations in between, and moved in during the night to dump bucketfuls on Dow. It wasn't long before snow plow operators had to abandon their ma-

chines on the runway simply because they got stalled in the 20-foot drifts.

That was the beginning. Next, the electricity went off and personnel on duty were stuck wherever they might be. Pipes began to freeze in most buildings. Wives were becoming perturbed, and there wasn't anything anybody could do about it.

Base Ops fared much better than the average. They had emergency power for lights, radio and television PLUS the in-flight kitchen. Besides that, they had *no* aircraft traffic.

All roads were impassable, cars were completely buried and some houses nearly so. The 42d Rescue Detachment went into an around-the-clock operation with their Huskies. The choppers were the only answer to mercy mission requests.

And the temperature kept going down, finally leveling at 20 below.

Once the snow stopped the immediate requirement was to get a runway open. Actually, this was the second requirement; the first was to find the snowplows. It took 52 hours to get one runway operational and to open the primary roads. It could have taken longer, and would have were it not for the fact that experienced crews were available as well as a first-rate snow removal plan that had been refined year after year.

Another factor that made recovery rapid was the fact that one of the most experienced men available, the Base Ops officer with eight winters' experience at Dow, was given the overall responsibility for coordinating the entire snow removal operation. This is a vital principle of management. One job, one boss. If a deviation is made, it must be with his approval.

Another reason for Dow's surviving the worst weather in 105 years has got to be planning. Each season planning begins in the middle of the summer. That's the time to have the plows overhauled, review last year's program for any required changes, order sufficient protective clothing and parkas, establish educational programs for newly as-

Aerospace Safety magazine is indebted to Lt Col Tracy, formerly of the Education and Training Group, Directorate of Aerospace Safety, for this article. Following his retirement last spring, Joe took off on that long self-promised vacation to New England. While there, he visited Dow AFB for a discussion of winter problems. Much of the material in his article is based upon interviews with Capt James R. McCarthy, Director of Safety at Dow, and Capt Frank Bostrom, Director of Safety for the Maine Air National Guard.

signed personnel on the dangers of frostbite and allied ills of cold weather work. An important part of this advance planning is identification of the people who will have the key responsibilities during the following season.

Many of the people counted on last winter have been transferred. Shortly before the first snowfall Dow conducts classes on winter hazards and operational problems. A useful tool here is the base newspaper; editors always need good copy and are most happy to publicize safety hazards that are a local problem during winter months.

To get down to specifics for flight safety, here are some recommendations from Dow:

Check the calibration of the James brake meter. If this equipment is out of calibration it can multiply the hazard imposed by slippery runways. This is also a good time to brief operations personnel on just how to use the brake meter.

Review past accident and incident information, winter manuals and discuss the situation with the old timers. This will help in preparing for problems that can be expected. At Dow the biggest headache has

been frozen landing gear microswitches. The gear is usually down and locked, but because the switch hangs up the pilot gets an unsafe indication. A local solution that has worked quite well has been to get down to warmer air, then fly at maximum speed. Increased airspeed, accompanied usually by an increase in vibration, normally loosens the ice, it blows off and a safe gear indication is the result.

New crewmembers must be thoroughly briefed on the dangers of winter flying. They shouldn't be scared; they should be taught. Specialists such as flight surgeons and winter survival instructors should be called on.

Pilots and maintenance personnel should be briefed on the importance of checking drain holes in flaps, ailerons and elevators. There have been several cases where pilots almost lost control at lift-off because a flap or aileron was full of water or deicer fluid. The impression, held by many pilots, that deicer fluid will melt any ice covering such holes is wrong.

Check to make sure covers are tight on those flush mounted taxiway lights. These lights must be checked during plowing operations as well. A plow blade can clip the top off a light with no trouble at all. In fact, on occasion the blades have taken the lights out completely. This leaves a hole that can tear off a gear.

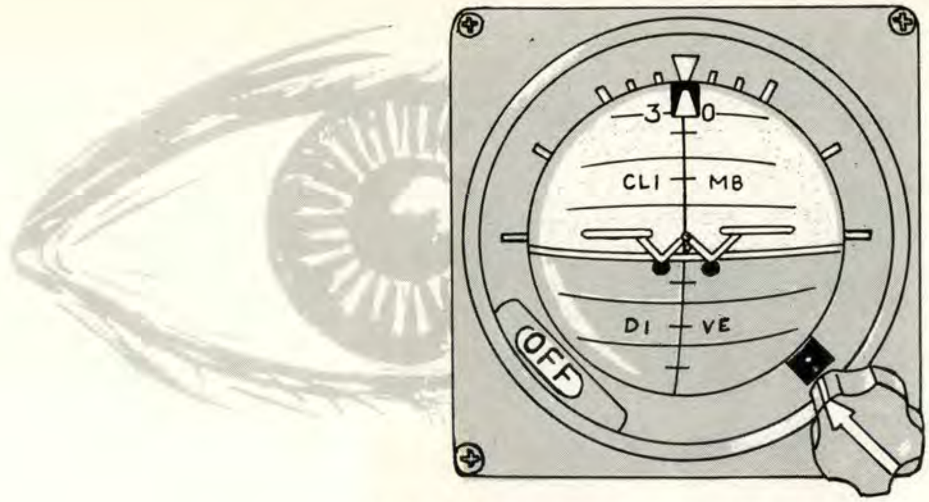
Barriers need special attention during winter weather. Frequent inspections are required to ascertain that they are operational. Sliding on through because the barrier is frozen down gives about the same effect as no barrier at all.

NOTAMS must be checked and any hazards promptly listed. Navaids have a characteristic of giving more trouble during inclement weather. At Dow a recurring problem is that an accumulation of snow can trip the ILS off.

Be prepared for an even greater problem after a thaw. When the temperature goes below freezing again it can make glare ice lakes on the ramps, runways and taxiways. Trying to maneuver an airplane on glare ice in a 40-knot cross wind is a risk beyond calculations. One of the few things that can be counted upon under such conditions is ineffective nosewheel steering. Running a D-8 Cat back and forth over the ice, as is done at Dow, breaks up the ice and scuffs it to the extent that the blade plows can then tear it out.

Move all equipment slowly. Remember, in winter especially, what you can't see can readily hurt you. Because of the visibility hazard from drifts at intersections many of the vehicles have red flags attached to their radio antennas.

These are some of the highlights of the Dow AFB winter operations plan. As can be seen from the accompanying photos, they need a plan, and the people with the know-how to execute it.



WATCH YOUR ATTITUDE

**Robert D. Nagle, Electronics Engineer,
Directorate of
Aerospace Safety**

The following is a direct quote from TO 1T-39A-1 in reference to the MM-3 attitude indicator:

> WARNING — A slight reduction in electrical power, or failure of certain electrical components within the system will not cause "OFF" to appear even though the system is not functioning properly. Therefore, periodically in flight the attitude indications given should be checked against the other flight instruments, such as the stand-by magnetic compass or the turn-and-slip and vertical velocity indicators.

This warning is applicable to any existing attitude indicating systems. The primary function of the "OFF" flag display on remote attitude indicators is to show that the gyro has not come up to speed after energizing the system, or indicates the loss of any phase of the three-phase AC power system. *This warning feature does not function to indicate other failures within the system.*

Major accidents have resulted from erroneous interpretations of the attitude indicating system because the airplanes were flown with reference to attitude indicators that were not telling the truth, even though the "OFF" warning was not displayed. Undoubtedly some accidents that come under the category of "undetermined causes" could be attributable to untruthful attitude indicating systems, if the facts were known. Without survivors or reliable witnesses, one can only theorize in such cases.

Don't get enthusiastic about a miraculous new type of failure warning system that could be added to the present and past generations of attitude indicating systems. This route was thoroughly investigated by the proper agencies and their conclusions regarding added complexity and decreased system reliability are concurred with. As a matter of fact, the first Phase Two systems that were produced (MM-3A and MM-4A indicators) met with unpredictable difficulties. The result was that the components were returned to the manufacturers and the indicators were changed back to the MM-3 and MM-4 configuration with the standard warning system. The rest of the story is that even if we had a warning system that warned of any and all types of failures within the system, if the system did show a truthful "OFF" warning when he was under instrument conditions, the pilot still might not get to his destination. Most likely he would have to eject.

The above applies only to single-place fighter aircraft and those trainers and older bombers that have either just one attitude indicating system or two indicators driven by one gyro control unit such as the K-4A or K-4B. Later bombers and cargo aircraft have independent systems for each pilot with alternate means of powering each system. This enables still better cross-checking of the systems and constitutes 100 per cent backup.

The commands who control the tactical and defensive fighters have all agreed to install stand-by attitude indicator systems as a backup for the primary attitude indicating system. This was a wise choice. Actually the ideal installation would be two independent systems with a sophisticated warning system in each. We can't have everything, however, and a considerable amount of development work is still necessary before we have a reliable, universal type of warning device for attitude indicating systems. The stand-by attitude indicating system, we're happy to announce, is already installed in quite a few aircraft. But be aware of both your own limitations and those of the attitude indicating system.

The other instrument system that can tax one's limitations is the air-

WATCH YOUR ATTITUDE

continued

speed/mach indicating system (the pitot/static system) under icing conditions. Recently, a flight of F-100's encountered visible moisture after breaking off from their tankers. During the ensuing climb, the leader noted an airspeed of 1.1 mach. This was obviously wrong and appropriate action was taken by requesting tanker escort. Operations at their destination launched other aircraft to intercept and lead the flight to safe landings. The leader and his men recognized the discrepancy for what it was: pitot/static icing. This may appear routine, but there are major accidents on record where this condition was not recognized; the incorrect procedures led to stalls and/or attitudes from which recovery was impossible. Here also, if the facts were known, quite a few accidents under the label of "undetermined cause" could be attributable to weaknesses of the system and the man.

In some of the later aircraft we see more sophisticated types of airspeed and mach indicating systems, the indicators being repeater type instruments driven by signals from an air data computer. In most of these aircraft, redundancy is exercised by providing a conventional type of airspeed indicator which is directly driven by a secondary pitot/static system. A conventional altimeter may also be provided in some installations. This secondary system may not be as accurate as the primary system but it is put there for cross-checking purposes during the entire flight — not only for when an emergency arises. The best secondary pitot/static system is one that is completely disassociated from the primary system mechanically, except for switch-over purposes.

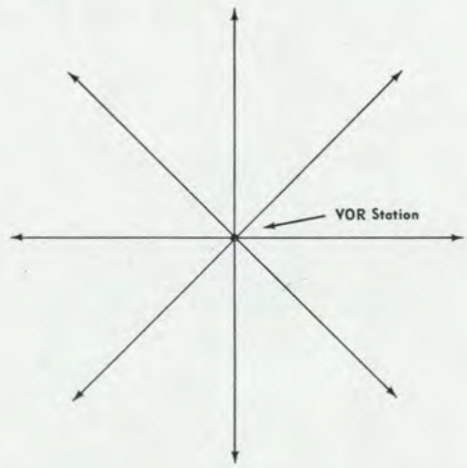
One might ask why this article was written. The answer is that under certain circumstances, accidents have resulted because the pilot failed to cross check and perhaps forgot what he learned in his earlier phases of flight training. Airspeed does not increase when the aircraft is climbing except under conditions of increased power. Likewise, airspeed does not decrease during a dive. These are symptoms of pitot/static icing. It can only be reiterated — be aware of the limitations of your instruments and yourself. ★

VOR-TEST

Sharp on VOR? You probably think you are and you probably are. However, there is an occasional gripe from the instrument school that there seems to be some confusion even among troops that have been around for a goodly number of years. With this in mind, the little test here will give you some idea of how sharp you REALLY ARE. It's not very hard if you know your business and if you get 100 per cent you're entitled to buy yourself a cool one at the club. So, have at it.

1. Locate the aircraft.
2. Indicate aircraft direction.

You can find the answers on page 13, but don't peek. ★



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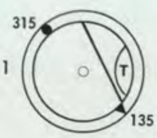

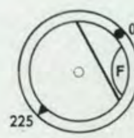

Fig. 2

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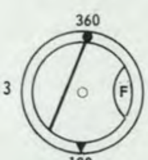

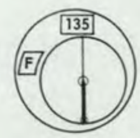

Fig. 4

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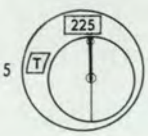


Fig. 6

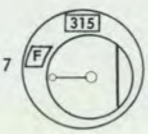
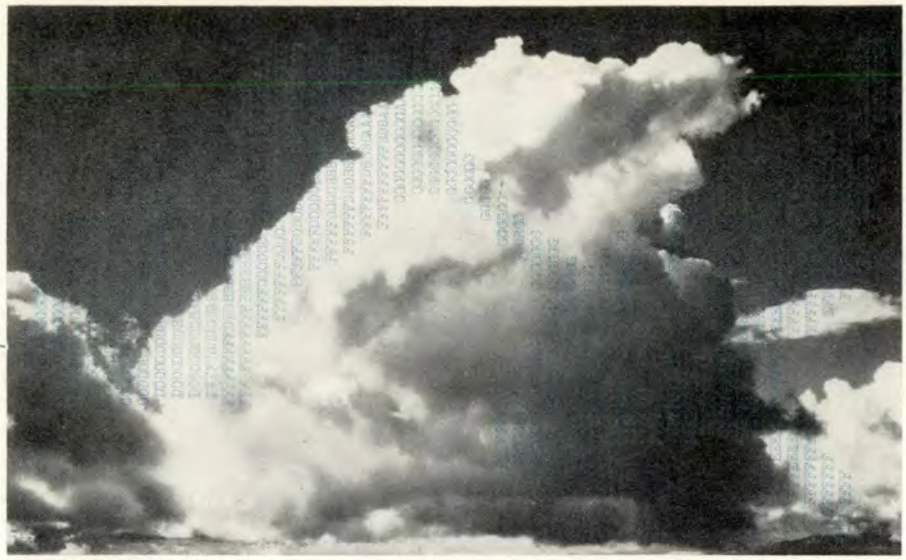
Fig. 7


Fig. 8

MILITARY WEATHER WARNING



AWS procedures for providing Weather Warnings to military locations have been evaluated since September 1962. As a result several changes were made for these reasons:

Numerous agencies which were not authorized service were receiving warnings.

Agencies that had a valid requirement were not receiving warnings.

Some agencies were receiving warnings from two or more AWS units.

Detachments' operations were hampered by having to call warnings to recipients. Some detachments had to place 25 to 32 calls for issuing warnings.

Previously centrally produced warnings were not adequate since:

- The areas warned were too large.
- The valid periods were too long.
- Insufficient lead time of warning.
- Not all criteria for which warnings were required were included.
- Periods of forecasting services had been curtailed at many USAF bases.

In the past there have been non-standard criteria for warnings. A survey of all USAF and US Army installations resulted in a requirement for the following criteria for specific warnings:

- Tornadoes
- Thunderstorms
- Hail
- Winds (exceeding 30 knots)
- Rainfall (more than two inches in 12 hours)
- Freezing precipitation
- Snowfall (more than two inches initial or additional accumulation)
- Severe dust storms

To alleviate these difficulties and to provide standard warning criteria to all USAF, US Army, National Guard and Air Force Reserve units as well as USAF contractors authorized this type support, a central warning center was

Figure One

Figure Two

Tool for briefing pilots

continued

established 15 September at Kansas City, Missouri. It has been established that 500 of the approximate 3000 facilities authorized this service actually require and desire warning service. Each facility or group of facilities has been designated by state number, for example: North Carolina, Ft Bragg is NC6 and in California, McClellan AFB and North Highlands is CALIF21. These warnings will be issued by the center and disseminated to all authorized agencies via AWS teletype circuit COMET 2.

At AWS detachments which have forecasters on duty, these warnings become advisories which serve as aids to the duty forecasters. At locations where there is no AWS forecast service, this warning is directly disseminated on base as a warning.

In order that all AWS detachments know what areas may require warnings, the center issues four weather warning outlooks on COMET 2 daily. These outlooks are not only valuable for warning purposes, but are valuable tools used by duty forecasters in briefing aircrews. They will be included as a part of weather briefings to pilots. Figure 1 shows the outlook as it is received over teletype in a special grid format. When the US overlay is matched to the printout, Figure 2, the different areas of weather activity are readily identified. By referring to the code at the beginning of the message, forecasters and pilots can easily see the specific areas for which caution is advised. During the summer season, most of the warning areas pertain to thunderstorms. Later in the winter, snowfall and freezing precipitation areas will also be depicted.

The new warning program will provide more thorough and timely warnings for installations as well as an additional briefing tool for forecasters. ★

Hq Air Weather Service, Scott AFB, Ill

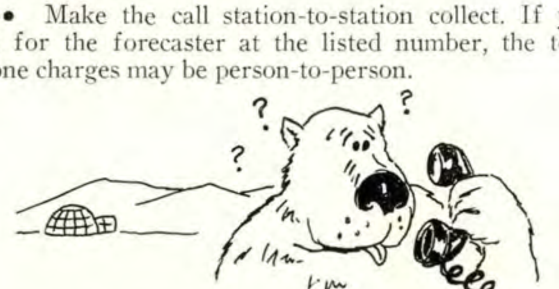
Weather Briefing Facilities

You who make a habit of carefully scrutinizing each issue of the FLIP Enroute Supplement, United States, have already noted the additions to the USAF Weather Briefing Facility list. The present list of weather detachments has been tripled. Twenty-four AWS detachments (eventually 26) can now provide weather briefings for pilots departing fields without Air Force forecasters.

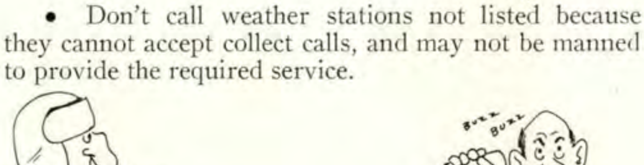
The briefing facilities were expanded to spread the workload carried previously by eight detachments and provide a quicker, more efficient service to pilots. To most effectively use the briefing facilities the following suggestions are offered:

- Always call the nearest facility from your departure point. In doing so, we save on long distance toll charges.

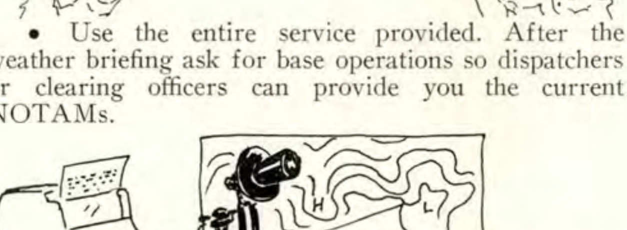
- Make the call station-to-station collect. If you ask for the forecaster at the listed number, the telephone charges may be person-to-person.



- Don't call weather stations not listed because they cannot accept collect calls, and may not be manned to provide the required service.



- Use the entire service provided. After the weather briefing ask for base operations so dispatchers or clearing officers can provide you the current NOTAMs.



- Please be patient. You will be talking to forecasters at some of the busiest weather stations. When supporting tactical operations, a pilot-to-forecaster contact, or issuing a weather warning, they may have to ask you to wait a few minutes. (While waiting — get those NOTAMs.) ★

Hq Air Weather Service

SAINTS OR DEMONS

Frank G. Henderson,
Safety Officer,
Ground Safety Division

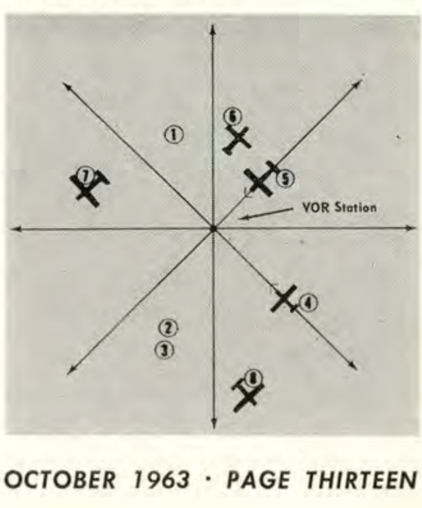
There are many propellant actuated devices (PADS) in most egress systems, but the only items that cause the system to function are the mechanically fired initiators! If these initiators are properly safetied, there is no sweat on the rest of the system — the thrusters, removers, catapults, gas-operated initiators, etc., that may be installed down-stream from the initiators. They are *Saints,* when they initiate the egress system in an emergency to save an aircrewman's life, and *Demons* when they are accidentally fired.

Mechanically fired initiators are always connected, either by linkage or by cable, to an activating lever or handle. Examples of these levers are the arm rests or the tripping lever of the lap belt initiator. Cables are often used to connect "T" handles to these initiators. It is imperative that air and ground crews know where these initiators are located in the aircraft and insure that they are properly safetied at all times, except during air operations.

A large per cent of all explosives accidents reported result from the accidental firing of aircraft egress systems. Lap belt initiators are fired, canopies are jettisoned, and seats are ejected. These accidents continue to occur with alarming frequency year after year. During calendar 1962, there were 94 USAF accidents involving inadvertent firing of initiators. Review of the causes indicates that failure to follow appropriate checklists and SOPs predominate. Often overlooked is the fact that improper supervision indirectly contributes to accidents. Supervisors do not always accept their accident prevention responsibility to insure and enforce the application of explosive safety requirements in every activity as an integral part of mission performance as prescribed in AFR 32-20.

Accident prevention depends upon the leadership and example of the supervisor. He must periodically brief his personnel on hazards and safety precautions associated with explosive materials. He must insure that SOPs, checklists and regulations are developed for all explosives operations, and insure that these standards and regulations are observed. He must then give each person sufficient training and supervision to insure that safe methods are used. Safety habits learned, as an essential part of the job, will prevent accidents and increase efficiency. When violations of SOPs, checklists and regulations occur, whether or not an accident results, the supervisor must take corrective measures if future accidents are to be prevented. ★

VOR *ANSWERS*



Radar En Route Descents

A long time back, in the early days of commercial aviation, pilots hauling passengers and cargo as a money making proposition had a habit of demonstrating that the shortest distance between two points is a straight line. Except when the wind was extremely strong, they'd wheel around in the direction of destination, give 'er the gun and light out across the pasture. Same thing at the other end. Destination in sight, or a familiar landmark just short of destination, down with the nose, back with the throttle, and straight in. They'd even angle toward the barn, where possible.

No wasted motion, no wasted money, and they were doing their bit to minimize the near-the-airport midair collision hazard by getting the heck out of such areas as fast as a straight line would take them.

And as airpatch conditions were modernized they continued this trait. A slight crosswind or downwind wouldn't deter them from their set-in-straight-line ways. And they became past masters at the technique of turnoffs in the first third or middle of the runway if thus they could follow a shorter route to the barn.

So what can you expect when they get their commercial jets. Right, same thing. Climbouts on course and descents on course. The fact that landmarks don't show up so good at 35,000 was solved by such tools as VOR and DME. But just where all the other planes are, and where they're going to be a short time from now hasn't been so easy. The best bet here, at the moment, seems to be radar, and the FAA controllers on the ground.

The military jet procedure of making a loop at the end of the flight path by hitting a fix at an altitude above most conventional aircraft altitudes then making a JAL was simply a waste of time. True, it can still be done, and is in many cases, but the consensus is that many military pilots are missing a good bet by not getting out of the busiest part of the sky by requesting a radar en route descent. Some reticence against radar en route descents may stem from the fact that if there is a miscalculation, adjustment of the flight path above 20,000 feet is not nearly as penalizing, fuel wise, as tooling around close to the deck. Another reason is that to make the straight-in-to-touch down descent usually requires another batch of paperwork — low altitude approach plates. These are particularly vital should communications be lost. Another thing, the average century series jock has zilch in the way of copilot help.

However, jet en route penetrations are authorized, and are gradually becoming more accepted by military pilots. It stands to reason that, to make this an even smoother operation, more practice by both pilots and controllers provides the best answer.

Section II of the FLIP Planning Document provides essential guidance. For detailed information the reader is referred to this document; the following information was gleaned from this source, an article that appeared in *Interceptor* magazine and from the FAA.

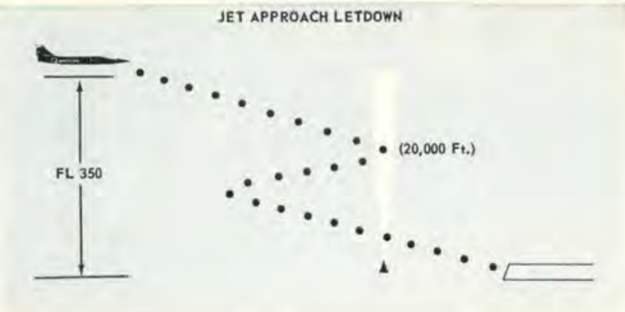
Pilots who desire radar en route penetrations must request this service from the ARTCC serving the destination airport.

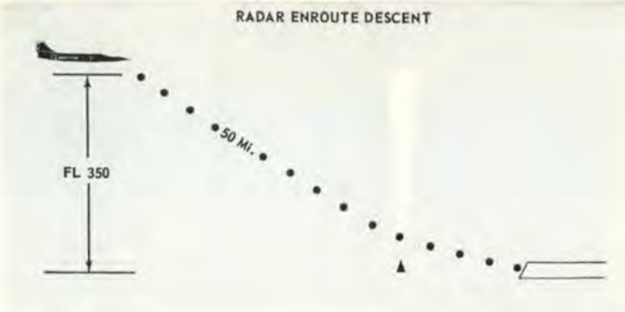
Effective 15 September it was no longer necessary for a pilot to request a "JAL" En route Penetration. The procedure now is "request en route penetration to .... airport." Also, the controller can now ask the pilot if he will accept an en route penetration. Concurrent with this change was the stipulation that the clearance limit assignment shall be a navigational aid/fix depicted on the JAL chart from which a jet penetration can be conducted in the event two way communications failure is experienced.

This procedure may be conducted in a non-radar environment; however, radar capability should exist to permit the controller to vector the aircraft to the final approach course.

Radar en route descents are a service that may or may not be available in any specific instance, depending upon the controller's workload. He will provide this service if he can. Once he authorizes an en route penetration it may not be terminated without consent of the pilot, unless radar goes out or an emergency situation arises.

The rough estimate of distance/rate-of-descent relationship for en route radar descents is arrived at as follows: For subsonic jet aircraft, 10 is added to the first two digits of flight level (for 350 add 10 and get 45) as the distance from the fix at which descent should be started. For supersonic aircraft the same system is used, however 15 is the constant added to the first two





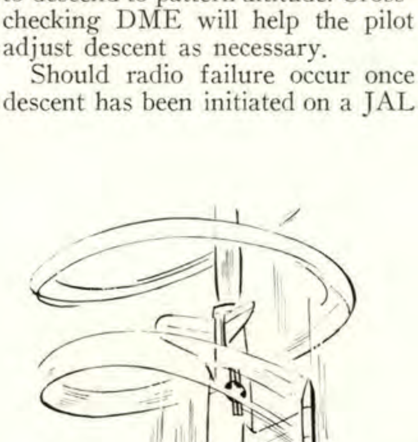
digits of flight level (350 plus 15 or 50.) In both instances rate of descent is predicated on 240 plus or minus 20 knots at 4000 to 6000 feet. Should this formula not be within the flight envelope capability of the aircraft you are flying, the controller should be so advised before descent is started. In any case, the pilot can assist by advising the distance from the fix at which he would prefer to start descent. The pilot must make his request known as far in advance as possible. The more time he has available, the better chance the controller has of fitting the inbound jet into the desired descent environment.

At about this point we get into some higher mathematics. The ultimate objective of the en route descent, a-la early airline days, is to end up at start of the final approach path at the exact heading and altitude. When aligned with runway heading this is fairly easy to work out. If final approach path starts at 3000 feet and you're at 33,000 in a T-Bird, start descent at 40 miles. If the active is the opposite direction the same procedure applies, but positioning would be on downwind rather than final. Normally, some vectoring will be required to position the aircraft in the most advantageous pattern position for landing or over the final approach fix. The pilot will be advised of his position in relation to the clearance limit when descent clearance is issued. During descent, should radar vectors be given that take the aircraft off the previously assigned non-radar route, advisories will be issued giving the position of the aircraft with relation to the clearance limit or destination airport, as appropriate.

Normally, three radio frequencies will be used for descent: First is the ARTCC en route frequency on which initial descent will be begun from high altitude; second is the change to the approach control facility as descent is made into the intermediate or low altitude structure. Eventually it is hoped that this will be the last change required, however, as yet, most destination airports require a change from approach control to GCA.

Cooperation will go a long way in providing the maximum in customer satisfaction. Controllers should always use the rule of thumb previously explained, the pilots should always average out the 4000- to 6000-foot per minute rate of descent. With both cooperating in this regard the aircraft will be positioned for landing at the proper altitude and not be forced to tunnel along gulping fuel close to the deck or performing a holding maneuver to descend to pattern altitude. Cross-checking DME will help the pilot adjust descent as necessary.

Should radio failure occur once descent has been initiated on a JAL approach, the pilot is to proceed to the radio facility to be used for the approach at the destination airport at the last assigned altitude or the minimum safe altitude, whichever is higher, and from that altitude execute the published penetration in lieu of climbing to the initial penetration altitude. No change here. For radar en route penetrations the procedure, as stated before, is to proceed to the clearance limit aid/fix and penetrate. To expedite the approach, particularly in the case of the JAL type approach, a gate such as has been established on the Bunker Hill en route radar/TACAN approach plate is one solution. If your station does not have such approach gates, talk to the Base Ops people about establishing them.



I'm beginning to wonder if I'll ever master these holding patterns.

As was pointed out earlier in relating this system to early commercial techniques, there are many advantages. One of the surest ways of minimizing the midair collision potential is to get the principals on the ground more expeditiously. Safety is further enhanced by the fact that the aircraft remains in the radar environment for a longer period of time. Also, the controller is doing the navigating, leaving the pilot to fly his aircraft and cross check. When performed ideally, there are no holding stacks and maneuvering is kept to a minimum. Time at the low altitude, high fuel consumption environment is less.

Exercise the system. ADC has been using a similar technique for scramble recoveries with their SAGE/RAPCON equipment. Practice should help to make the system more perfect. If there are discrepancies, discuss them with the Base Ops officer or the FSO so that they can take them up with the approach controllers. ★

IF

you can keep your head when those about you are losing theirs and blaming it on you . . .

Major William R. Detrick,
Directorate of Aerospace Safety

Two jet fighters were commencing a penetration from over a low frequency beacon. The lead aircraft was experiencing UHF receiver difficulty, but due to the inexperience of his wingman, decided to retain the lead, making a low visibility approach, GCA monitored, with the wingman relaying any necessary information. The flight broke out of the overcast too high and too close to the end of the runway for a safe landing.

Lead then decided to make a GCA and, because of his poor radio reception, instructed his wingman to assume the lead. A standard right climbing turn was started to accomplish a closed pattern GCA. Shortly after entering the overcast the new lead aircraft started an abrupt climb. This was noticed by his wingman and he instructed lead to "get your nose down and get on the gages — you're going straight up." Lead pilot was heard to say, "You'd better take it, I have vertigo." At 6000 feet indicated, the wingman partially stalled his aircraft in an attempt to stay with the lead and recovered at 2500 feet indicated (field elevation 1228 feet). The lead aircraft crashed immediately thereafter in a near vertical dive.

The pilot of a jet trainer took off alone on a cross country flight at dusk with a 300-foot ceiling and one-half mile visibility. Pilot was cleared for left turn for 360 degrees after takeoff but made a right turn and was given a radar vector to turn left to 270 degrees. The pilot acknowledged and began a left turn. At four and one-half miles the radar return disappeared. The aircraft crashed out of a shallow diving right turn in an inverted position. The pilot was killed.

The investigating board felt that the pilot's total time of 217 hours in the aircraft and his instrument time of 45 minutes in the last 90 days did not adequately prepare him for instrument flight in the weather existing at takeoff. Most probable cause — disorientation.

Here are two separate examples of accidents which are attributed to the problem of vertigo and spatial disorientation — the number one human factors problem in flying today You *must* have some sort of reference point or horizon in flying to control your aircraft — either the visual horizon, the instrument horizon or other aircraft in flight, as in a formation. The biggest stumbling block is that of changing from one set of flying conditions (or horizons) to another; for example: changing from formation flight to weather flight, transition to the gages as you would if you lost your flight leader in weather, transition from instrument to VFR flight as you might on a final approach in an instrument landing, and changing from contact or VFR flight to instruments as you might on a dark night takeoff.

There are three things we use to maintain our orientation in space: vision, vestibular apparatus or our sense of balance, the muscle sense or sense of body feel.

We learned at a very young age to incorporate all of these into a central computer and came out with the end product which is our orientation in space. As a typical example, most of us have watched our young sons or nephews when they learn to walk. We found that they went through various stages, falling on their heads or getting smart and falling on the other end. They learn to walk automatically and this is where part of the danger lies. Someplace during the first two or three years of life we learn to do this orientation business completely without conscious thought. Sensing impulses are sent continuously to our computers. If, while flying, we had a switch and could cut at least one or two of them out of the circuit, at the right time, we would be much better off. They often give us erroneous impressions.

Now let's discuss each one of these separately.

Muscle sense amounts to this: The push and pull on tendon and bone which exerts pressure and gives us an indication of shifting weight. It is very useful on the ground, particularly in a fast game of basket ball. However, when we place a man in an aircraft and have him rely on this sense as a means of returning to his position in space, we find it most unreliable. Let's take a for instance. Place a man in an aircraft cockpit, under the hood, and have some individual fly him in a coordinated phase so that he receives no lateral forces such as he would receive in a yaw or skid and about the only thing this man will be able to determine in terms of his position will be what positive and negative Gs are exerted upon him. If this man, under these conditions, is subjected to maneuvers such as a roll, chandelle, wingover or split S, the effects from these maneuvers are such that he will be unable to differentiate as to which he is actually doing. As a result, we can very readily see that the message that muscle sense relates to the individual, tells him very little. We are absolutely unable to fly by the seat of our pants which is what this sense is trying to do for us.

Next let us discuss the vestibular apparatus or sense of balance. We have a pretzel-shaped object inside each ear which is our vestibular apparatus or semicircular canal about the size of a fingernail. This is a three dimensional device which reacts to three motions: tipping, turning or swirling, rising and falling. A close up look at one of these canals would disclose small cilia or hairlike objects which are displaced one way or the other by the liquid in the canal. Fortunately, this liquid is quite viscous and keeps us from having an over-stimulation of this sense.

Now, let's climb into an aircraft flying straight and level. A turn is initiated to the right and the fluid in the ear, in its attempt to maintain its position in space, acquires an apparent flow in a left direction. This, of course, will bend the small nerve endings to the left and give us the indication of a right turn. As the turn is maintained, these come back to normal and there is no longer a definite indication of a turn. When we roll out or discontinue the turn the fluid will attempt to continue and again move in the canal, moving the nerve endings, in this instance, to the right. This now gives us an indication of a left turn. The threshold below which this sense will not be affected is approximately two degrees per second acceleration. Anything less than this will not register because it is below the threshold of operations for the vestibular apparatus.

A practical application of this may be seen in a formation flight where the flight leader initiates a gentle bank below the two degrees per second threshold and after maintaining it for any period of time suddenly rolls out. The wingman will have a faulty impression of a turn in the opposite direction even though he is now flying straight and level. One pilot reported an incident during a penetration in which the rolling into the penetration turn gave him the illusion of rolling inverted and he immediately called the flight leader and advised him of this condition. The leader in turn advised him that they were not inverted, that they were descending in a wing-level attitude. This did not cure the wingman's problem but he did maintain his position and flew the entire penetration with an impression that it was being done inverted. You can imagine the sweat he was in by the time he got the aircraft on the ground.

Faulty impressions from the vestibular apparatus are made even worse by the head being out of the normal vertical plane during a turn, climb or descent. In this case, when the head is returned to the normal position, a rather violent impression may be experienced of turning or spinning. I am sure you can see from this brief discussion that the vestibular apparatus is of very little use to the individual in flying and very often gives an erroneous reading tending to cause trouble rather than correct it.

Now let's discuss the third of the three, which is vision. Vision obviously is the most reliable of the three and the only one we can trust or rely on. However, there are certain visual illusions or disturbances that we should be aware of. The size-weight illusion is a good example. I remember years ago, seeing an "Our Gang" comedy in which one of the chaps pushed a boulder off the top of a cliff to fall on the other fellow. The small chap at the bottom proceeded to catch this boulder and throw it back up. To the point where the lad at the bottom caught it, we were all under the impression that the rock was big and heavy because of its size and its likeness to a weighty thing. From the point at which he caught it and threw it back, it was obvious that it was made of paper mache or something very light.

Relative motion is another illusion of the eye. Many people have sat in a train station in one train and got the impression that they were moving when the train on the next track started to move gradually. Or

IF *continued*

you have been in an automobile at a stop light when the car next to yours started moving and you had the feeling you were moving instead.

One of the limitations to the eyes apparent in flying is called auto-kinetic phenomena. In a blackout condition with just one light or reference, if you stare at the light long enough it will invariably move, sometimes in different directions, even though both of you are on a stationary platform. From this very obvious example one cannot fly formation with only one light for reference. Another word of caution: the extreme in illumination should be avoided, both extremely dim and extremely bright. In the first case, the eye is operating close to its lower threshold and in the latter, accommodation to the dim lighting requires a certain period of time.

The use of oxygen is very important to sight both in daytime and at night. At 8000 feet at night your vision is impaired by about 25 per cent without oxygen. At 12,000 feet by about 50 per cent. There is also the problem of smoking. Three cigarettes in a row can impair your vision at night by as much as 50 per cent. You should beware of self-medication as certain drugs affect your eyes. Among these are the antihistaminic drugs and, of course, alcohol. Alcohol causes an hypoxic condition, as does altitude, and one of the first senses affected is vision, particularly at night.

In closing, several recommendations are in order:

• For instrument flying, nothing will ever sufficiently replace good old-fashioned experience or practice. Many of our disorientation accidents occur to the very young, low experience level pilots, therefore the more experience you have, the more it is going to help prevent accidents.

• Air discipline — again the man who is affected more is he who is inexperienced in flying formation. He has no choice but to follow the flight leader. He cannot fly half instrument and half formation, particularly in the learning stage. The flight leader also has an obligation to his wingmen to keep them informed of what's going on, to avoid abrupt maneuvers, particularly close to the ground and in dangerous situations. The flight leader must remember his responsibility to get his wingmen through the mission and back on the ground safely — particularly when the wingman is low on experience.

• Flight procedures such as the requirement to make a turn shortly after takeoff in an instrument flight, changing radio frequencies during critical periods of the flight, or distracting the pilot's attention by needless radio transmissions must be eliminated.

Now, in closing, one final word. We used to say there were two kinds of T-6 pilots: those who have ground looped the airplane and those who haven't ground looped it *yet.* By the same token, there are two kinds of pilots so far as pilot vertigo is concerned: those who have experienced vertigo and those who have not experienced it *yet.* The man who has not experienced it yet is the one who is most dangerous because the first time it happens will probably be the worst. If you have had this occur and have learned to cope with it by believing your vision and what your eyes tell you, the better off you will be in flying. ★

PLAY THE PERCENTAGES

▶ Seatbelts keep you in the car. You are *five times* more likely to be killed if thrown out!

▶ Seatbelts support you, prevent your being thrown against shattered glass and jagged metal that cut and tear. You are 60 per cent less likely to be injured if using seatbelts!

▶ Seatbelts promote better posture, more relaxation, less fatigue for drivers and passengers. Protect on quick stops, too!

▶ Use seatbelts *all the time!* Over one-half of accidents causing death or injury involve speeds below 40 mph. Three out of four traffic deaths occur within 25 miles of home.

(City of San Antonio, Tex.)

Careful, Capt Camshaft . . . we should be at the hayride any time now.

SPEED KILLS ????

Lt Col James A. Talbot, MATS, Scott AFB, Ill.

It seems to me that every time some self-appointed authority on traffic safety gets carried away and writes an article it ends up with some violent statistics illustrated with very gory pictures of smashed-up automobiles and blanket-covered (thank goodness) people. The main thing promoted in these treatises is that someone was going too fast, with the only conclusion to the reader being that SPEED KILLS! This is a conclusion, but not a very valid one.

If speed killed, then every passenger who has ever flown in an airliner clear back to 1924 would be stone cold dead. Every passenger of a train would be likewise, as would be anyone who had progressed in whatever manner at a rate of over the posted state speed limit. This seems to be the key point regardless of whether the guilty party was going faster than prudent for that particular portion of the road. However, there is more to speeding than just the fact that you may not be able to keep your automobile under control.

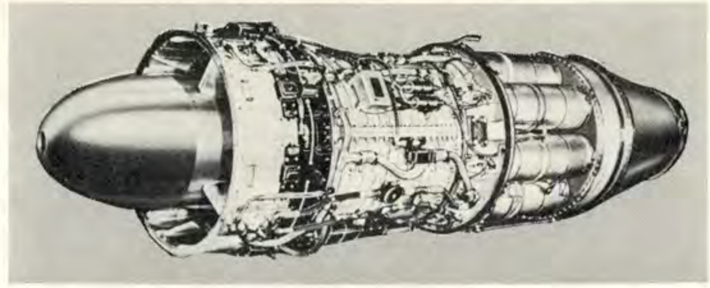
If you are going faster than the legal limit on the open road, you are exposing yourself and others to several opportunities for accidents. For one thing, oncoming drivers are counting on the fact that you are traveling no more than the legal speed limit. They base their timing for passing slower traffic on depth perception insofar as how far away you are when they start to pass. They gauge how far down the road they will be when they have passed the car in front of them and how far short of this point you will have come toward them. Now the point here is that this works well if you are going at the speed they expect you to be going. If you are going faster than that you ruin all calculations and, I cannot but agree, SPEED KILLS!

Consider too, the motorist in front of you who is purring along at the legal speed limit. He may not be aware of what is behind him. He just checked to the rear a short time ago and you weren't there then. However, you are really traveling, so you move up on him rapidly and start to pass. There may be a slow-moving little bug in front of him which you can't see or a stray dog wandering down his lane of the highway he doesn't want to hit. So he naturally gives way to the left. If he moves left at just the wrong time, again I cannot but agree, SPEED KILLS!

One of the aspects of speed is that it is relative. A driver who has been steadily eating up the miles at a high rate of speed will find it very difficult to slow to the posted speeds within city limits. The greater the differential has been, the more apt he is not to slow completely to the lawful speed. This false sense of slowness makes the driver feel he is creeping, when actually he is going much too fast for city conditions of blind intersections, traffic, and pedestrians. If another driver entering one of these intersections feels he has plenty of time to cross the intersection in front of you, or would have if you were going at the (legal limit), then I must agree, SPEED KILLS! Equally disastrous would be the result if a child darted into the street from behind another parked car and you could not stop quickly enough because you were overdriving your brakes. Again you can say SPEED KILLS!

Speed limits are posted because the state department of highways computed them to be a safe speed for the roadway conditions and line of sight. They presuppose use by average drivers who possess average reaction times, average faculties, and driving average condition cars at that location under good weather conditions. Now, sir, you know you have a brand new car, your eyes are 20/20 and your reactions are hair-trigger quick. But if you are barreling along at a high rate of speed and the road curves more sharply than you can turn, then again I agree, SPEED KILLS! If, under the same circumstances you top an abrupt hill and find a horse-drawn load of hay across the road, then again I agree, SPEED KILLS! If, still under the same circumstances, you are unable to avoid a chuck hole and blow a tire, once more I nod affirmatively and say, SPEED KILLS!

I started this essay by criticizing authors who promote the theory that speed kills and I find that I have been grossly guilty of citing examples which prove they are right. But look at it more closely, fast driver. Study these examples a little more. The SPEED didn't kill. It was excessive speed that caused hard contact with someone or something that actually resulted in killing. Before the accident you were going very fast, but you were very much alive. When your speed was suddenly stopped however, you were dead. So the next time you nudge the throttle, operate your car in such a manner that you eliminate any chances for sudden stoppage and you will be alive to write your own theories about SPEED KILLS! ★



Throttle Technique Prevents Stall

Reprinted from General Electric Jet Service News

By now, anyone who has operated the J47-25 and -25A engines is aware of compressor stall possibilities. Many articles have appeared in these pages with respect to compressor stall, what causes it, how to get rid of it, and the possible damage it can do to the engine. Every effort should be made to prevent compressor stalls and they *can* be prevented.

The causes of compressor stall are numerous. They all result in an excessive pressure ratio across the compressor. If the acceleration rate is too fast, the compressor will stall. During the excessively fast acceleration, too much fuel is dumped into the engine downstream of the compressor. This excessive fuel causes the back pressure to rise until the maximum allowable pressure ratio is exceeded, and the compressor stalls.

Too many tabs in the tailpipe makes an engine stall-prone. The tabs reduce the exhaust area which increases the pressure in the tailpipe. This increased pressure is reflected through the engine to the discharge side of the compressor. This increase in pressure doesn't of itself cause the excessive pressure ratio, but it does reduce the amount that the pressure can be increased before the ratio becomes excessive.

Making accelerations on cold days with the ESP (Engine Stall Prevention) off can cause stall. This is essentially the same as setting the acceleration rate too high. The ESP system was specifically designed and incorporated on the J47 engine to ensure satisfactory acceleration when the outside air temperature (OAT) is less than 60° F. The technical orders require the use of the ESP system when the temperature is below 60° F. If you do not use it, the acceleration rate may be too high and compressor stall may occur. No matter how well the engines are maintained and conditioned, there are some that just will not accelerate on cold days without stalling if the ESP system is off. Of course the acceleration time could be lengthened to eliminate the stall problem, but thrust response would then be untenably compromised.

A damaged or dirty compressor can contribute to compressor stall problems. The compessor condition does not increase the pressure ratio, but it does lower the pressure ratio at which stall will occur. It is obvious, therefore, that a damaged or dirty compressor will stall more easily.

One other cause of compressor stall — throttle technique — has not been discussed too frequently. Smooth throttle movements have always been recommended but the reasons for such action warrant some additional explanation. It's easy to forget that a perfectly good engine, properly conditioned in accordance with applicable technical orders, can be stalled if improper throttle technique is employed.

To understand how this might happen, one has only to refer to the curves in Figure 1. Various lines of fuel flow versus engine speed have been drawn. These include an operating line, an acceleration line, and a deceleration line. The operating line represents the fuel requirements for steady-state operation at any engine speed. The decel line represents the amount of fuel scheduled during engine deceleration. In general, this is the minimum amount of fuel that can be scheduled to the engine without a flameout.

At the upper left of the illustration, a shaded stall "bubble" is shown. Any time that fuel is scheduled in such a way that a speed versus fuel flow line crosses into this shaded area, you will have just bought yourself a compressor stall.

Between the stall bubble and the operating line, the acceleration line is shown. During accelerations the fuel scheduled to the engine follows this line as speed increases. You will note that the acceleration fuel flows are always greater than the steady-state requirements.

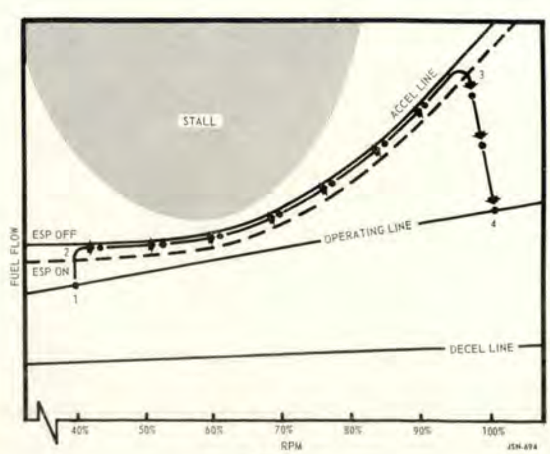


Figure 1

This "excess" fuel provides the energy to accelerate the engine quickly. A dotted acceleration line is also shown. This line is the ESP "ON" acceleration line and is slightly lower than the normal or ESP "OFF" acceleration line. In other words, there is less "excess" fuel, hence slower accelerations with ESP on.

To more fully understand what happens, let's watch the fuel flow on the curve for a normal acceleration check as the conditioning crew makes it. Prior to the acceleration, the engine is running at 40±1 per cent, steady-state. The fuel flow is on the operating line, point 1. The throttle is advanced rapidly and the fuel flow increases immediately to point 2 on the acceleration line. As engine speed increases, the fuel flow will follow the acceleration line to the right and upward. At 98 or 99 per cent rpm, the fuel regulator will cut the fuel flow sharply to the steady-state requirements for 100±1 per cent rpm. This sharp drop is shown from point 3 to point 4. This is the fuel-flow cutback that you see at the end of every acceleration. The conditioning crew measures acceleration time from the instant the throttle is advanced, point 1 to point 2, until the fuel-flow cutback, point 3 to point 4. If this time is within the limits specified by the applicable technical order, the acceleration rate is satisfactory and no adjustments are necessary. As you can see, this engine did not stall because the fuel-flow line didn't cross into the stall bubble. It's a good engine; it meets the TO requirements and there are no malfunctioning parts or components.

Now let's take a look at this engine during a flight. The fuel flows and pressures at altitude are lower in absolute quantities, but the illustration is still applicable since no absolute values have been assigned. Let's suppose the engine is being operated at 90 per cent steady-state. For some reason it is necessary to reduce power and the throttle is chopped. During the deceleration immediate power is needed and the throttle is advanced rapidly. Movements of this kind are not unnatural during some refueling evolutions.

In Figure 2 the 90-per cent steady-state condition can be seen at point 1 on the operating line. When the throttle is chopped, the fuel flow drops sharply to point 2 on the deceleration line and then follows this line as engine speed decreases. At about 65 per cent rpm, power is needed and the throttle is rapidly advanced. The fuel flow immediately jumps from point 3 on the deceleration line to point 4 on the acceleration line. At this point, no stall has been induced. However, since the compressor-turbine rotor has considerable mass, we cannot instantaneously stop the deceleration and commence acceleration. Even though the energy has been added via increased fuel flow the engine will continue to decelerate. The result is obvious. For a given speed, fuel flow is too high and the line crosses into the shaded area from the back side with a resulting compressor stall.

This type of operation has been termed a Bodie acceleration. Essentially, it is an acceleration during a deceleration. During ground operation, some engines cannot be subjected to Bodie accelerations without compressor stalls; even fewer can negotiate this kind of acceleration during flight.

The question, "How does the ESP system help?", is sometimes asked. The help provided by the ESP system can be seen in Figure 3. During a throttle burst the fuel flow increases only to the dotted ESP-on acceleration line. Even though the engine should coast down a little, the fuel flow line will not enter the shaded stall area. Use of the ESP, however, should not be considered as a panacea. Some engines will stall during a Bodie acceleration, even with ESP on. The ESP system *does* give more stall protection in all cases. However, it may or may not be enough additional protection. Use of the ESP system is not license for promiscuous throttle jockeying.

For maximum protection against compressor stalls the engine must have a clean, undamaged compressor, and the engine must be properly conditioned. This much is the task of the maintenance force. The operator must then use smooth throttle techniques, he must refrain from making Bodie accelerations, and he must make prudent use of the ESP system if compressor stalls are to be kept to a minimum. ★

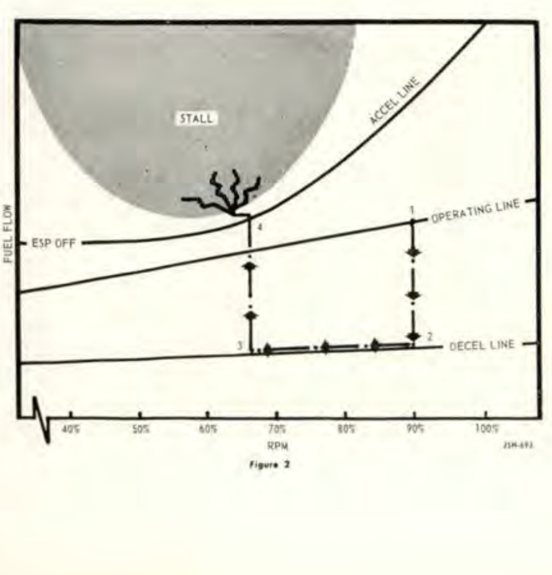


Figure 2

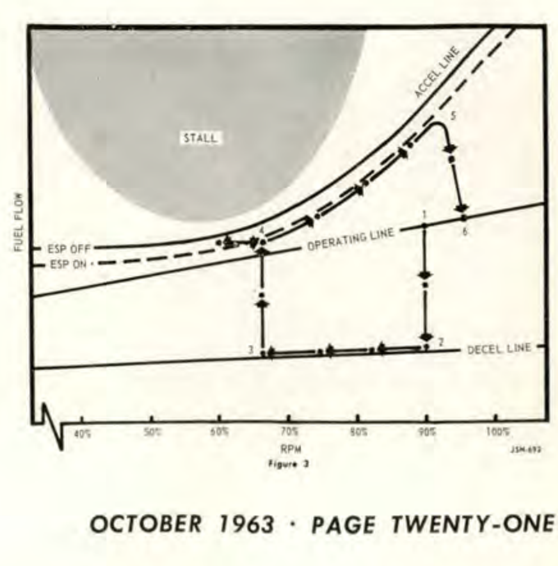


Figure 3

WHO CHECKS THE CONTROLLER?

Maj George H. Tully,
Director of Flying Safety AFCS,
Scott AFB, Ill.

Controller personnel of Podunk Air Force Base were enjoying a short period of rest and relaxation. Aircraft in three flights of local F-100s had landed smoothly and two transients had been sandwiched in to boot. No inbounds were on the boards and all the local traffic had terminated.

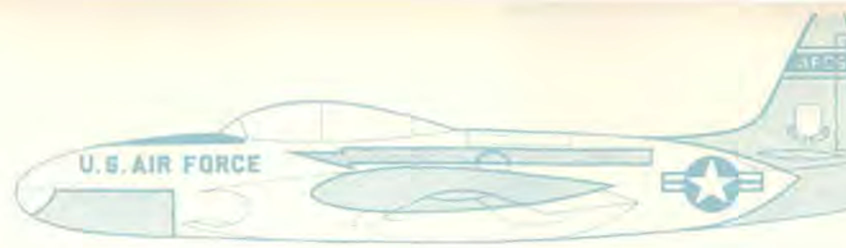
"Podunk Tower, Derby 08, over," boomed loud and clear from the tower speaker.

Airman Kilroy keyed his mike and responded, "Derby 08, Podunk Tower, over."

"This is Derby 08, VFR on top maintaining FL 255, simulating navigational aids inoperative, estimated fuel 25 minutes, position unknown but probably NW of your station. Request DF assistance, over."

The rest and relaxation posture

Shown at right is a drawing of an AFCS T-33 used in service evaluation work. Note the distinctive markings typical of aircraft used on these missions.



of the controllers changed instantly. The watch supervisor, monitoring closely, instructed Airman Kilroy to commence recovery procedures.

"Check standby magnetic compass and transmit for course," was Airman Kilroy's prompt reply to Derby 08.

"Podunk Homer, Derby 08 transmitting . . . Derby 08."

"Derby 08, course to Podunk, zero eight five. Emergency safe altitude within one hundred nautical miles is eight thousand. Podunk weather — 3000 broken, visibility ten miles, wind one seven zero degrees, five knots, altimeter two niner niner seven. Courses are furnished with zero wind. Squawk mode three code zero four flash. Transmit for course, over."

"Derby 08, Roger."

Radar contact is established almost immediately. Five minutes elapse and Derby 08 is on GCA final approach for runway 17.

" . . . . . eight miles from touchdown, on course. Heading one seven eight. Seven miles from touchdown on course. Heading one seven eight. Turn left heading one seven five, six miles from touchdown. Ten seconds to glide path, check gear down. Begin descent, turn left heading one seven two. Twenty feet below glide path, adjust descent. On course, four miles from touchdown, cleared to land, wind 170 degrees, 7 knots. Forty feet below glide path, adjust descent. Heading one seven two, on course, three miles from touchdown. Going dangerously low, sixty feet below glide path, seventy-five feet low, below safety limits, two miles from touchdown. Derby 08, if you do not have runway in sight, go around, acknowledge."

"Derby 08, runway in sight, landing, over."

"Roger 08, after landing completed contact Podunk Tower on two five one point two."

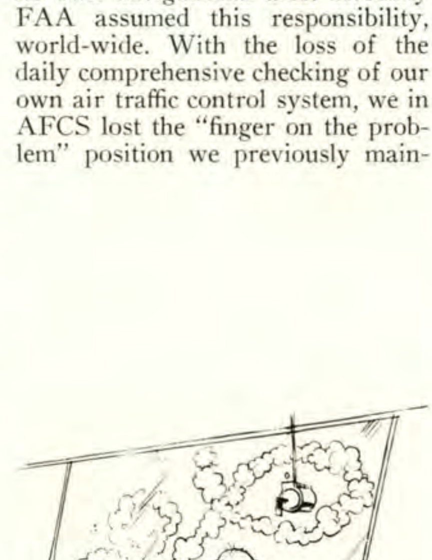
What was wrong with this approach? Most pilots would say it was O.K. Let's listen to the service evaluation pilots as they taxi to the ramp.

"Well, Al, what do you think?"

"Everything was perfect, right out of the book, and technique was good up to the glide path warning and gear check which were in error. At the point we were given go-around instructions we were 225 feet below glide path, or 180 feet above the ground, which is well below the safety altitude of 370 feet at two miles. It looks like the final controller was trying to get us in or bust and when he did send us around his procedures were incorrect. This will be an action report for sure. If we can teach this controller to observe safety limits we may keep an F-100 out of the tree tops some rainy day. I've got the recorder, let's brief the GCA Chief Controller and Flight Facilities Officer on this one."

The preceding lines provide you with an idea of the mechanics of an AFCS service evaluation flight. What's it all about? Why?

AACS, now recognized as AFCS, has through the years flight checked its own navigational aids. Recently FAA assumed this responsibility, world-wide. With the loss of the daily comprehensive checking of our own air traffic control system, we in AFCS lost the "finger on the problem" position we previously maintained via comments of our flight check crews. Obviously, we still need to insure adequate air traffic control capability of AFCS facilities To this end, three facility checking (service evaluation) flights have been activated. These are the 1866th, Scott AFB, Illinois, equipped with five T-33 aircraft, responsible for the conterminious U.S. and the Northeast as far as Thule. The 1868th, Wiesbaden AB, Germany, equipped with three T-33 and two C-140 aircraft. (The C-140s back up our mobile communications squadrons in Europe by providing instant NAVAID checks on newly activated airfields where the "mob" outfits deploy.) The 1867th, Clark AB, Philippines, equipped with two C-140s (same mission as above for the Far East AFCS mobile comm squadron) and one T-33 detached and assigned Yokota AB, Japan, responsible for USAF/Japan bases requiring service evaluation.

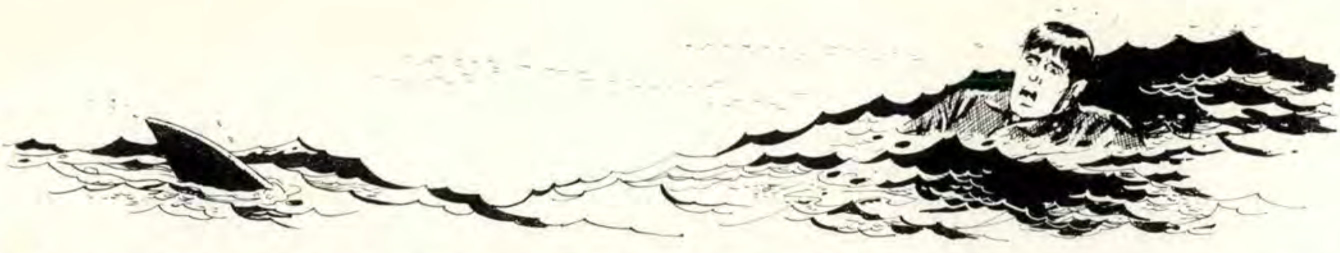


Roger, Roger, Roger, you're emergency . . . stand by for a minute.

We in AFCS feel that pilots of this small fleet of aircraft keep our air traffic controllers on their toes. The service being provided you by our controllers is considered excellent but the little extra look-see by the service evaluators contributes to controller efficiency. You'll recognize our birds by their distinctive paint jobs and you'll hear some of the conversations as an evaluation aircraft works on a particular airfield or approach control.

How does this affect you? Why is this article in Aerospace Safety magazine? We feel that the greatest by-product of the mission is safety. Improvement of air traffic control techniques, sharpening of terminology, exercising of the DF facilities, recognition of aircraft gyro out symptoms, and other air traffic control items bring about this safety by-product.

We in AFCS are in business for one reason — to provide you, the users, with safe, accurate, and efficient air traffic control service. The service evaluation program I've briefly described for you is a positive check on our traffic service capability. ★



MAKE THE SHARKS WORK FOR IT

Capt Denis A. De Luchi, 397 Bomb Wing, Dow AFB, Me

You're a passenger this time — forward with the pilots, savoring a deep feeling of relaxation. Let them do the flying. Below you can see the ocean, deep blue, with insignificant little waves shimmering in the sunlight, and puffs of cumulus providing the necessary contrast. Maybe you're just a little anxious to get there, but it's a pleasant trip.

What's that? A fire light. Your mood begins to dissolve. The copilot looks out at the right wing and turns back with his brows knit. The pilot is retarding the throttle for that engine. Neither one of them notice you, but you're helping them scan the engine gages, and you don't find the reassurance you're searching for. The engine is shut down, but the fire light is still on. The copilot looks out again, and this time his eyes are wide when he turns around. Both pilots are into the checklist now, moving a little more rapidly, a little more purposefully. The copilot glances out once more, but he doesn't look back this time. He just shakes his head. Now both of them have visible sweat on their foreheads. Fire! It's a real fire, and it's not going to go away by itself. What's that the pilot is saying? *Bail out!*

Bail out? You watched the action like an observer in a dream, but now you're awake and part of it. Bail out! They mean it! As you rush back, you feel that knot form and grow in your stomach. Can't panic. Hold onto yourself. Now, where's a chute? There! Good. You get it on with a minimum of fumbling. Ready to go. Wait. You forgot your life raft! Are you planning to swim all the way to . . . where do they keep . . . there's one there! Come on. Come on. Move. Everyone's going. Now how do you put this thing on? You've been briefed a million times, even once just before takeoff, but you never really listened, and your mind's drawing blanks. Just get it on any old way. You can figure it out later. No time left. Just hook it on and get out!

Made it. Good work, boy. It looked bad there for a second, but you made it. Just an easy ride to the water and you can wait for the rescue plane. No sw . . .

Suddenly, the water doesn't look so picturesque anymore. What are you going to float in? Don't see anybody around. Got to get that raft working. Hurry. Hurry! Here comes the water. How does it work? Something about a zipper. Nothing. C'mon. Quick! You're in the water. Maybe you can still get it open.

Naw. No use now. It's heavy when it's not inflated, and it's dragging you down. Better let it go. So there you are, dog-paddling in the middle of the ocean, and you're getting mighty tired. And even if those dark shapes that are nosing around are just your imagination, you know you can't last long. It looks like it's all over, but you're almost calm for the first time since the fire light came on. Just one ironic thought is troubling you. It would have been nice to make the sharks work for it.

The preceding scene may seem melodramatic or exaggerated, but it points out a startling fact: Many of us fly with the MB-2 life raft, but not so many are exactly certain of its operation. It's use is quite simple; anyone can be an expert in five minutes. And anyone who travels in aircraft over water should be.

Here's a quick check out, or in many cases, a refresher. The kit has two kinds of snaps: a standard snap and an ejector snap. Simply attach the ejector snap to the left parachute D-ring and the standard snap to the right, with the zipper facing forward. Then, when you're descending under a nylon canopy, release the ejector snap on the left side. Par 5-4(c), Section V of TO 1453-2-1, states: "Grasp the slide fastener release lanyard on the right front edge of container and pull upward to remove slider from the slide fastener. Continue to pull upward to inflate the raft. The inflating raft will fully open the container and be deployed. Maintain pull on release lanyard until raft is inflated since cylinder valve may snap shut if the valve is not in the fully open position."

Once you're down and snug, what can you expect to find? The contents will include: a UHF-VHF radio, a flare, wool sox and hood, three boxes of matches, a can of water, a fishing kit, dye marker, rations, signal mirror, lensatic and button compasses, and a manual to tell you how to use all this swag.

One final caution: It's so obvious that it's a shame to mention it but experience has proven it necessary. That is, now that you're an expert on the use of the MB-2, don't hide it under golf bags, A-3 bags, etc. Not being able to find one is as big an irony as not being able to use one. Either way you don't qualify to march in the "National Starve the Sharks Week" parade. ★

(Ed. Note—Remember, too, three other areas critical to water survival:

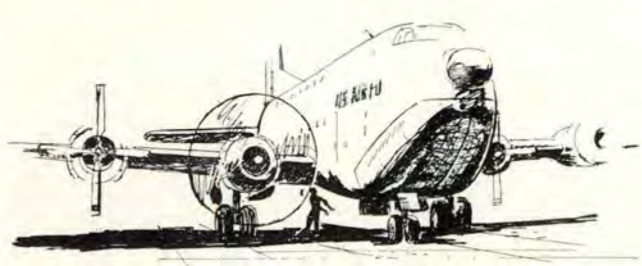
1. *Proper use of a life preserver,*
2. *Getting clear of the chute harness after landing,*
3. *Boarding the life raft.)*

Aerobits

PROP TIP—Fortunately, deaths and injuries resulting from people walking into propellers are rare these days, but occasionally some luckless soul gets nicked. This happened to an aircraft commander who should have known better, but who let his concentration on a task get the better of his caution.

During runup following a load stop, hydraulic pressure indicated the Nr. 3 engine pump out. Since there was no maintenance available the crew went to work to correct the malfunction. This called for rotating the engine. Precautionary procedures were taken and the flight engineer turned the engine over with the starter for about 30 seconds. During this time the AC and other crewmembers were in the wheel well area. The AC happened to look up and saw the base operations officer drive up. Thinking he would warn him that the prop would be turning, the AC walked along the right side of the fuselage toward the front of the aircraft. As he came in line with the propeller, a blade struck him on the head, inflicting a minor injury.

Although the AC should be commended for his concern for the operations officer, the distraction of the latter's arrival apparently supplanted caution in the AC's mind. This mishap, which could have been much more serious, might have been prevented had there been interphone communication between the cockpit and the ground.



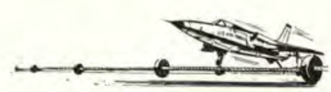
LOADING MISHAPS—This accident occurred while two airmen were removing practice bombs (MK-76) and loading MK-106s (the real thing).

The practice bombs had been offloaded from the aircraft and were being loaded onto the truck to be returned to storage. One airman was about three feet from the the truck that was carrying an MK-76 type practice bomb when an MK-106 bomb, already loaded on the truck, exploded. The other airman, who was

loading the MK-106 bombs, was about four feet from the truck, with his back to the truck at the time of the explosion. Fortunately, he was not injured, and there was no damage to the truck nor the aircraft.

This accident occurred because someone failed to insert the safety pin and safety clip in the neck of the "practice" bomb. Subsequent movement of the bomb on the the truck allowed contact with another object with enough force to activate the explosive.

Action taken locally by the munitions OIC to prevent recurrence directs that all practice bombs (MK-76) be handled with the safety pins and safety clips installed. As a further precaution, checklists have been developed to insure positive procedures for handling, loading and transporting practice bombs, with emphasis on inspections for checking safety pins and safety clip installation.



BAK-9: What is the aircrew sensation to a BAK-9 engagement? A very smooth and gentle deceleration, quite similar to a drag chute deployment is experienced when engaging at moderate speeds (100 knots). As engaging speeds increase, the initial deceleration is more pronounced, but then, so is the feeling of relief which accompanies it.

What can the pilot do to enhance the operation? The following pointers may be worth considering for future rapid mental reference:

- Deploy the tailhook well in advance of the BK-9 cable.
- Steer toward the center of the runway, if possible.
- Continue normal braking until within a few yards of the cable, but don't use the brakes when

crossing the cable.

• After engagement, use nosewheel steering as required.

• After coming to complete stop, hold brakes. Obey hand signals of crash crew. To disengage from the BAK-9, release brakes while the aircraft is rolled backwards a few feet by means of the electric retrieve motor. Hold brakes while crash crew stows tailhook.

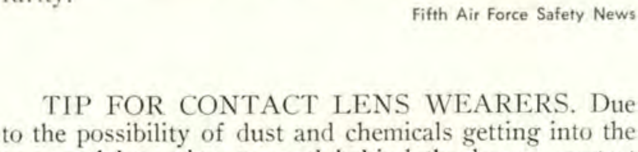
• If an overshoot is likely at a base that has only a plain old jet barrier, drop the hook. It has been known to catch the J-Bar cable when the landing gear misses.

• By all means, have confidence in the system. It's tough and reliable and a missed engagement is a real rarity.

Fifth Air Force Safety News

TIP FOR CONTACT LENS WEARERS. Due to the possibility of dust and chemicals getting into the eyes and becoming trapped behind the lenses, contact lens wearers are warned to never work in dust areas or around chemicals without wearing protective goggles. Life Sciences specialists point out that washing the eyes at an eye fountain is ineffective unless the contact lenses are removed, and these are not the most easily removable appliances ever invented.

Should dust or chemicals get into the eyes, flush immediately with copious amounts of water, holding the lids apart to assure water contact with all eye and lid tissues. The importance of this immediate flushing is indicated by the recommendation that it be done, for several minutes, even though a delay results in calling for medical attention.



JUDGMENT—The mission was a high-low-high photo reconnaissance for command competition. The second pilot in the team took off 50 minutes after the first pilot. Shortly after he took off, the first pilot advised him to forget the first target because of weather and to proceed to the second target. The second pilot acknowledged this transmission and it was the last one received from him.

The aircraft struck a mountain in the vicinity of the first target approximately 100 feet below the crest. The pilot's body was found in the wreckage.

The Accident Board assessed pilot factor in that the pilot entered a valley in which visual flight conditions could not be maintained, and he failed to initiate a climb in time to avoid the mountain range. Some additional findings, not contributing to the accident, were:

• Pilot took off six minutes after the weather briefing had expired.

• Pilot failed to place the automatic parachute

AERO BITS

CONTINUED

lanyard key in the automatic lap belt.

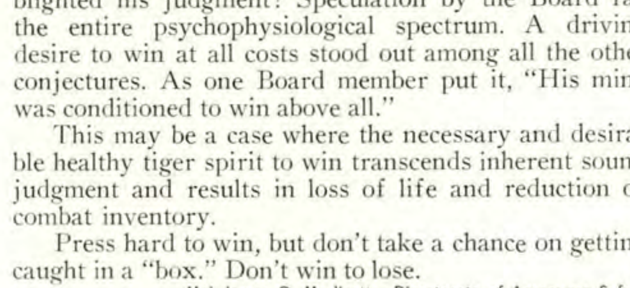
• Pilot failed to indicate the correct minimum fuel on the aircraft clearance.

The $64 question is WHY did a highly experienced pilot—one who had previously distinguished himself in USAF competition—end up in this "box?" What blighted his judgment? Speculation by the Board ran the entire psychophysiological spectrum. A driving desire to win at all costs stood out among all the other conjectures. As one Board member put it, "His mind was conditioned to win above all."

This may be a case where the necessary and desirable healthy tiger spirit to win transcends inherent sound judgment and results in loss of life and reduction of combat inventory.

Press hard to win, but don't take a chance on getting caught in a "box." Don't win to lose.

Maj James O. Modisette, Directorate of Aerospace Safety



SIX BUCKETS—Although this happened to a T-37, it could have been any kind of jet so we're passing it on as a reminder. The pilot landed at an away-from-home base and RON'd, requesting post- and preflight. Having encountered no difficulties during the flight, he entered none in the forms. When the maintenance troops got around to checking over the bird they found six damaged turbine buckets and placed the aircraft on a red cross.

Next day the pilot filed and proceeded to his aircraft where he looked over the forms, found no discrepancies and flew off to another base. There the bucket condition was found again and the pilot notified that his aircraft was grounded. Meanwhile, a message from the preceding base arrived advising that the aircraft should be

grounded.

This is one of those cases that emphasizes the need for careful checking of the 781. And Transient Maintenance might bear down a little on informing the pilot when discrepancies are noted.

LAP BELT RELEASE—In the August issue in Aerobits is an item about the hazards associated with failure to attach the chute arming lanyard anchor to the lap belt. In addition to the referenced ejection fatalities, in which omission of this procedure was a factor, other cases have been reported involving probable inadvertent actuation of the manual release lever. During the three-year period, 1960-1962, there were 10 such cases, whereas eight cases have already been reported during the first five months of 1963.

Although the causes of inadvertent actuation of the manual release are difficult to determine, in one case it was strongly suspected that the sleeve of the pilot's flight suit caught on the release lever. In another instance, it was believed that violent gyrations of the aircraft resulted in the pilot's arm striking the release. More recently, evidence indicated that the lap belt was opened manually by coming in contact with the seat portion of the "G" suit hose. The "G" suit hose had apparently been connected over the top of the lap belt. As the pilot was forced upward from the seat by the man-seat separator, the "G" suit hose was extended to almost full length and moved along the length of the lap belt from the hinge point to the manual release lever. The release lever was engaged on the lower side causing it to release. These findings were substantiated by crimps and tears in the "G" suit hose.

Interim Safety of Flight Supplements have been issued, covering the routing of "G" suit hoses under the lap belt to preclude interference with parachute/lap belt connection. It has been recommended that ASD conduct appropriate tests for the permanent solution of this problem on all present and future ejection seat equipped aircraft. Meantime, increased emphasis should be placed on the "follow through" in ejection seat indoctrination programs. This procedure will result in the immediate detection of malfunctioning components of the escape system.

Robert H. Shannon, Life Sciences Group
Directorate of Aerospace Safety

C-130B—Two recent incidents in a C-130B brought to light a problem that all pilots should be aware of when making actual or simulated engine-out landings. During the first flight Nrs 1 and 2 engines were simulated out, gear and flaps down, 12,000 pounds of fuel, 3000 pounds in each outboard tank, 2000 in each inboard and 1000 in each auxiliary tank. All systems were operating normally. On turn to final at 150 KIAS, the right outboard scavenge flow-OFF light flicked on and off. On final, the aircraft descended to 500 feet above the ground and go-around was begun. Nrs 3 and 4 engines were advanced to 932 degrees TPT, with the right wing down and the turn and slip indicator ball at the far right side of the race. Soon the scavenge flow-OFF light on Nr 4 came on followed a few seconds later by the fuel low pressure warning light, then the generator warning light. The engine was dropping through 50 per cent rpm so it was feathered and the aircraft landed.

On the next flight a similar situation developed except that the engines on the other side were placed at flight idle. This time Nr. 1 engine flamed out. With the aircraft level, a normal relight was accomplished.

Investigators determined that with the boost and scavenge pumps located on the inboard side of the fuel tanks, and with all booster pumps on and Nrs 2, 3 and 4 engines on crossfeed, with the aircraft out of trim the resultant angle of the wing is great enough to allow the fuel to move to the outboard side of the tank on the low side. This isolates fuel from the boost and scavenge pumps and causes fuel starvation to the engines on the low wing side.

As a result of this incident, interim Safety Supplement 1C-130A-SS-1-16 was issued 7 June 1963, to alert crewmembers to the possibility of fuel starvation in a prolonged wing down and out-of-trim condition, such as might occur during a simulated or actual engine failure condition. The Safety Supplement directed the fuel crossfeed switch to be open and boost pump switches on for all tanks containing fuel, during actual or simulated engine-out approaches and landings. On C-130B and E aircraft, the fuel crossfeed separation valve will be open. ★

FALLOUT

STANDBY MAGNETIC COMPASS

Recently an aircraft accident occurred when a pilot, using DF assistance, flew headings approximately 180 degrees different from those issued by the DF station. He finally corrected *only* after being advised to check his gyro compass against his standby magnetic compass. The advisory was issued when the DF controller detected that the aircraft's transmissions were growing progressively weaker. The aircraft crashed, due to fuel starvation, after commencing use of the corrected heading.

AFCS is taking action to include an advisory on checking magnetic compass during inital DF controller contact. However, this accident, plus some incidents, indicates that pilots are not frequently cross-checking their magnetic standby compass against their gyro compasses. All pilots should definitely include the standby magnetic compass in their frequent instrument cross-checks to insure reliability of gyro compasses.

The above is predicated on non-radar controlled operations. AFCS radar equipped facilities are frequently checked on gyro-out recognition capability and handle aircraft gyro-out when the situation requires this action. The comments in paragraph 2 are aimed particularly at non-radar controlled or monitored operations; however, the magnetic compass cross-check should be accomplished frequently during all phases of flight.

Maj George H. Tully
Director of Flying Safety
AFCS, Scott AFB, Illinois

SEVEN EMERGENCIES

My heartiest concurrence with 1/Lt D. K. Reed for his comments in his article, "Seven Emergencies In One Hour," in the May issue. I've discussed this subject with several FAA representatives in this area, and the general consensus seems to be that transmissions should be made on guard when a controlling agency determines that safety could be compromised.

If the FAA and all other controlling agencies have adopted this as a policy, and little can be found wrong with the concept, then we are experiencing an awfully lot of emergencies while taxiing, receiving takeoff clearances, flying practice DF steers, awaiting flight clearance, flying VFR while not in the vicinity of any immediate danger, and a whole host of other everyday situations. Safety is very definitely compromised when a pilot is forced to turn off his guard receiver in order to be able to read his own instructions which are being blocked out by the constant chatter on guard, or what is loosely called guard.

We have tried to get our aircrews to record all non-essential usage of guard, identifying both the ground and airborne violators. In nearly every case we have documented, no action has been deemed necessary, since each case was judged as a situation which *could* have been one where safety *might* have been compromised, had the transmission not been made on guard. I do not consider such judgment very realistic.

I realize that the paper work would stack into the path of the next astronaut, however, the only thing that will reduce the misuse of guard is a violation on each clear case of misuse. Such a violation would, one would think, at least make the constant user of guard stop and think before cluttering up what should be our emergency channel with non-emergency transmissions. I also realize that this problem has been in existence since guard channel was born.

Capt Robert B. Bennett
Flying Safety Officer
98 Ftr Intcp Sq, Dover AFB, Del

AIR FORCE 22 — NAVY 19

Inspired by the article "Seven Emergencies In One Hour" in the May issue, I maintained a log of transmissions on UHF guard while on an SAR mission. Between the hours of 0940 and 1750 local, *158 guard channel transmissions were intercepted.* None of these transmissions involved a bona fide emergency, and at 1750 our guard channel receiver failed, probably due to overuse.

This clutter on guard conceivably could, but fortunately didn't, interfere with the conduct of our search, which involved 11 aircraft. Only three of the transmissions, incidentally, concerned an aircraft on the search mission. The search area ranged from the coastline to as much as 110 miles offshore, and was within UHF range of one center, four major civilian airports, three large Air Force bases, three major Naval Air Stations, and numerous smaller civilian and military fields. Of the 158 transmissions received, 21 were not identifiable; in 18 calls, the caller was not or was only partially identified; in 29 calls, the unit called was not or was only partially identified. Only eight of the transmissions were made by aircraft, and four of those were in response to calls from ground units. Perhaps the crowning call of the day came from a ground control unit to an aircraft, requesting that they switch to 121.5. Incidentally, I couldn't come to any positive conclusion as to whether it's Navy or Air Force common — 22 of the calls were initiated by Air Force units, and 19 by Navy units.

Lt R. E. Larson
Flying Safety Officer
USCG Air Station, San Francisco, Calif

SURVIVAL TIPS

The article on desert survival ("What To Do Until The Chopper Comes," May issue), is well done and in conformance generally with AFM 64-3, "Survival Training Edition." Two discrepancies, however, were noted:

1. The Survival Manual states (P. 2-36): "Purify all water by boiling for one minute plus one additional minute for each 1000 feet above sea level." The USAF Survival School at Stead AFB teaches the same rule, rather than five, plus five minutes as written in your article.

2. The Manual (P. 4-14) also recommends against the use of barrel cacti or other desert plants as a water source. Available evidence indicates that such water may or may not be effective in quenching thirst, but that too much effort is required. Conservation of energy is a prime factor in any survival situation. In this case, apparently, the results don't justify the effort. The Manual states that the survivor will use his strength more effectively by searching for a well or other source.

Maj Allen V. Mundt
AF-CAP Liaison Officer, Nevada Wing
Reno, Nevada

The author of the article comments on the two discrepancies you mention:

"I am interested in all comments whether they are constructive or critical.

"It has been found that the one-minute boiling time previously considered adequate to kill bacteria in contaminated water is not sufficient. The five-minute boiling period is now taught by the leading survival schools such as Stead, where I was a student last year, and the Arctic Survival School in Alaska, where I was a former instructor. Strictly from a personal view of one who has spent years drinking untreated ground water, I would definitely boil mine for five minutes. Incidentally, the Manual states: 'Boil your water for AT LEAST *one minute.'*

"The Major's second point referred to the preference of searching for a well in the desert rather than depending on the water provided by the barrel cactus. I have two comments on this:

"First, as far as desert wells are concerned, the Manual, also the training film 'Sun, Sand and Survival,' refer to the old world deserts of North Africa which are inhabited by wandering herdsmen caravans, and criss-crossed with trails that eventually lead to water. In these deserts the Major has a very good point; however, in the southwestern deserts of the United States these vast areas of wasteland are virtually uninhabited, except for isolated communities, superhighways and occasional gasoline stations. Desert trails, as such are virtually unknown and desert wells even more non-existent. In this case, a survivor would not spend his time in search of this type of water supply.

"Secondly, I would like to quote Dr. Chester R. Leathers, Arizona State University Assistant Professor of Botany, who has supplied our survival school with the following information: 'The top of the barrel cactus can be sliced off and the moist, white bulk food will relieve both thirst and hunger. From a barrel three feet high, as much as two pints or more of water can be obtained.' This is, as I stated in my article, wrung out in a parachute, undershirt or handkerchief. Therefore, this would be a more logical way of obtaining emergency drinking water.

"I hope this clears up everything, and I would like to thank the Major for his interest."

WELL DONE

Captain Roger J. Wichers

479 Tactical Fighter Wing, George AFB, Calif.

Just prior to air refueling, Captain Roger J. Wichers, 479 Tactical Fighter Wing, George AFB, California, noticed a slight loss of thrust in his F-104 and that the nozzles had drifted halfway open. When he pulled the emergency nozzle area control, the nozzle closed so he thought the problem was minor. About 30 seconds later the engine oil low level light came on. Captain Wichers then lit the afterburner and pushed the emergency nozzle area control handle back in.

Realizing that, with the afterburner functioning, he would need fuel soon, he maneuvered behind the KC-135 to hook up. As he moved in, he pulled the throttle back slightly and the afterburner blew out. After successfully obtaining a relight, he made a hookup using only speed brakes but started closing on the tanker too rapidly. He extended full speed brakes and instinctively pulled the throttle back slightly. Once again the afterburner blew out. Now the nozzles would not fully close and the afterburner did not relight. The aircraft would not maintain altitude without the afterburner and started descending slowly.

After two unsuccessful attempts, Captain Wichers was able to light the afterburner at 22,000 feet and immediately climbed back to the tanker to try another hookup. After two passes he asked the KC-135 pilot to increase his speed, then using speed brakes, hooked up and filled his aircraft with fuel. He stayed hooked up and continued to use fuel from the KC-135. Approximately 100 miles out from base his aircraft started to oscillate and fell off the tanker, but rather than try another hookup, Captain Wichers flew a trail position on the tanker until over the base.

Due to cloud cover Captain Wichers was forced to make a weather penetration that was made even more difficult because he did not want to cut out the afterburner until the runway was in sight. Radar monitored his penetration and vectored him over the field where, by skillful maneuvering, he landed the aircraft successfully.

Although the oil pressure fluctuated for the last hour of the flight and investigators found less than one gallon of oil remaining, the engine was not damaged. Oil was lost through a cracked line leading to the nozzle area control pump.

Captain Wichers demonstrated outstanding pilot ability and sound evaluation of the emergency to save a valuable USAF aircraft. Well Done! ★

Won't hurt 'em to walk in — been doin' nothing but sitting for two hours.

Are you sure this is the base that says it's ready for a Rex Riley Award?

TWO POINTS OF VIEW

That's OK. If I get too much to drink, I'll pull off the road and go to sleep.

He musta' got sleepy and pulled off the road.

*U.S. GOVERNMENT PRINTING OFFICE 651222