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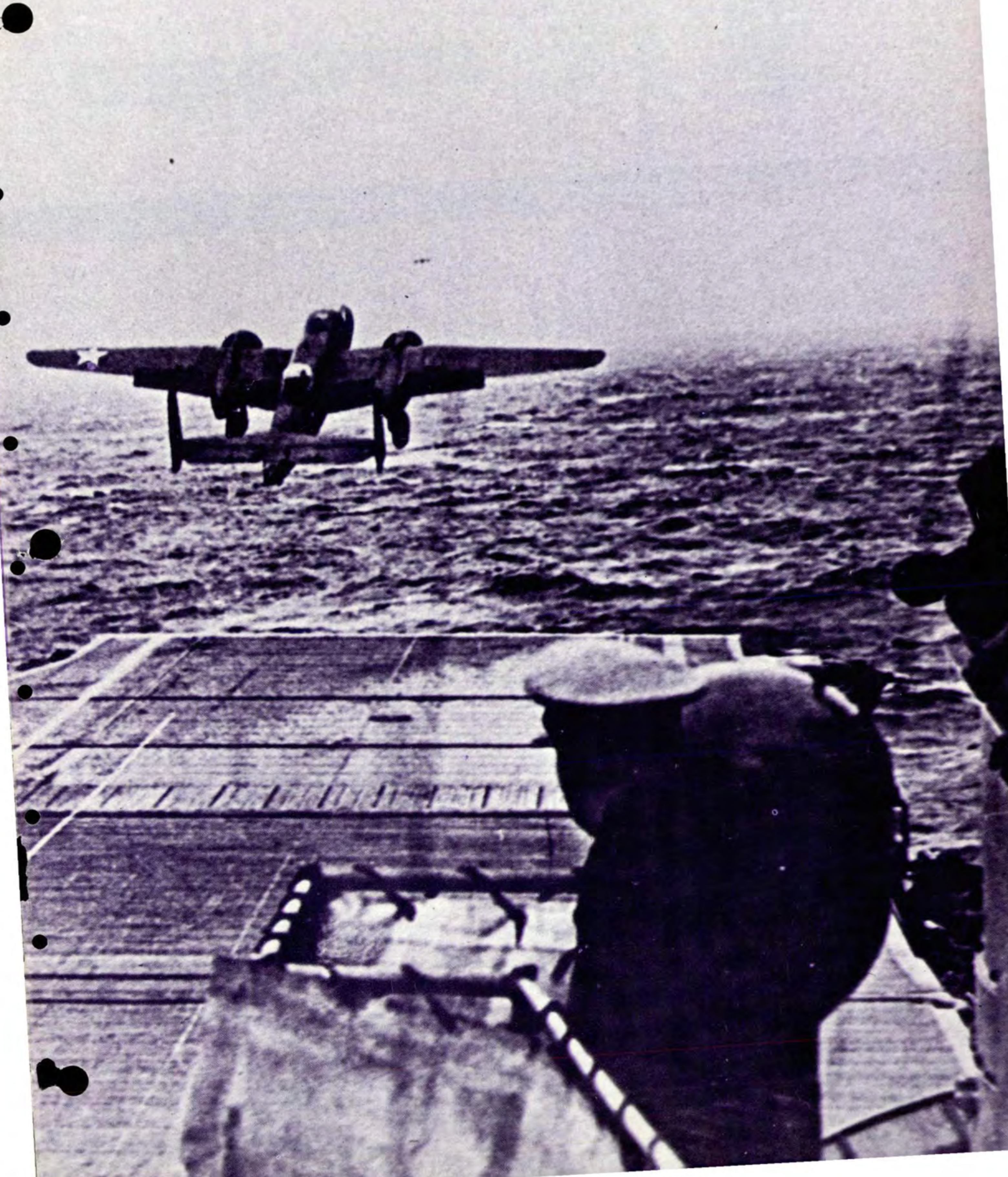
SAFETY APRIL 1976




UNITED STATES AIR FORCE APRIL 1976

AMERICAN REVOLUTION BICENTENNIAL 1776-1976

# aerospace SAFETY

THE MISSION - - - - - - SAFELY!



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## REGULAR FEATURES



DEPARTMENT OF THE AIR FORCE • THE INSPECTOR GENERAL, USAF

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APRIL 1976 AFRP 127-2 VOLUME 32 NUMBER 4

**Wanted: Manuscripts.**

Well known publisher wishes to see your unpublished manuscript. Material limited to subjects of interest to aircrews. Suggested fields include safety, aerodynamics, weapons delivery, navigation, airfield facilities affecting aircraft operations, weather, life support equipment and use, survival, tactics, and other aircrew related subjects.

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ACT NOW! ★


# RIDE the FOAM

Purpose of the mission was to ferry four OV-10s from Nakhon Phanom to U-Tapao AB, Thailand. Rustic 01 was leader of the formation. The crew consisted of the pilot and a crew chief passenger. Approach for landing at U-Tapao was VFR for an overhead traffic pattern to Runway 18, Weather throughout the afternoon was high clouds, visibility greater than seven miles and wind southerly at eight knots.

On downwind, after extension of the gear handle, the "wheels" warning light was observed and the left main landing gear indicator showed "up." The nose and right main gear indicated "down." Hydraulic power was off. Rustic 02, in trail on downwind, called that the left main gear was up. Rustic 01 retracted the landing gear and went around, requesting Rustic 02 chase him and close for a visual check.

The two aircraft joined after departing traffic to the east and climbed to 5000' MSL. Rustic 01 then lowered the gear again and the wingman confirmed the left gear doors were closed as for normal gear up flight. The right main and nose gear again extended and indicated down and locked, and again, hydraulic power was observed to be off, indicating the extension cycle was complete from the standpoint of the hydraulic system. Several attempts to get a down indication by cycling the system while porpoising and yawing the aircraft proved fruitless. To prevent overheating the hydraulic system, these attempts were spread over an approximated 30 minute period. Further attempts to get a safe indication by applying both positive and negative G were unsuccessful. There was no indication of the cause of the problem.

Finally Rustic 02 was forced to land because of a faulty external fuel feed system and was replaced as chase by Spad 01, leader of the second element of OV-10s. U-Tapao tower and approach control were kept advised of events throughout and Rustic 02 was directed to dispatch an OV-10 Supervisor of Flying to the control tower. Further attempts to lower the gear proved futile and all indications pointed ultimately to a gear up landing.

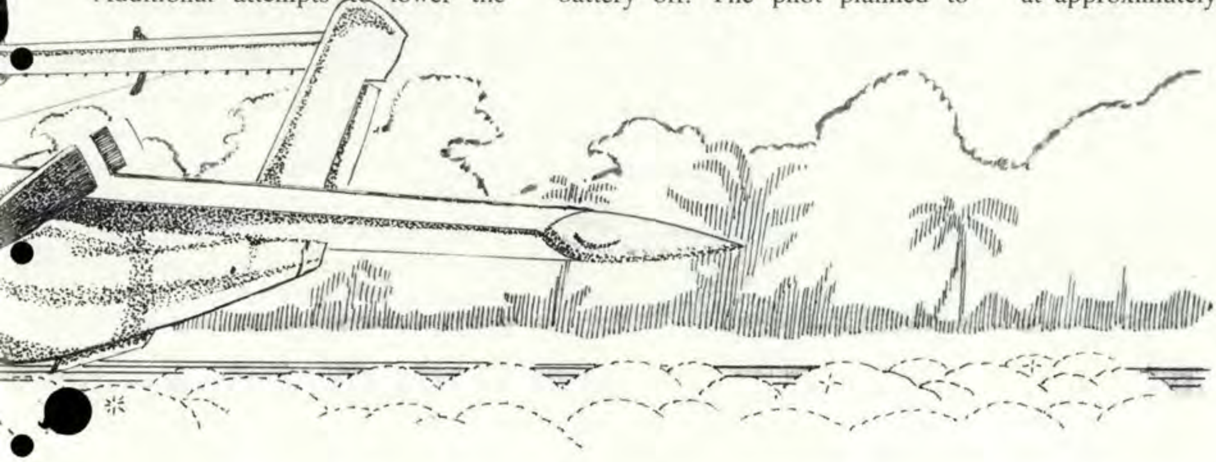
Spad 01 was advised to land and assist with preparations for the event.

Two additional flights of four OV-10s were inbound to U-Tapao and the tower and approach were advised that Rustic 01 would hold until all were recovered. Additionally, Rustic 01 suggested recovering other traffic prior to the runway being closed. At this point, Rustic 01 advised he could remain airborne for an additional 1+30. Runway foaming was requested and approach control was advised that the external fuel tank would be jettisoned prior to landing.

Rustic 01 then continued to orbit, waiting for recovery of inbound aircraft to be completed and to burn fuel down to a practical minimum. Additional attempts to lower the gear were performed, but without success. Approximately 30 minutes prior to intended landing time Rustic 01 was vectored to the U-Tapao jettison area, over water, where the now empty 230 gallon centerline tank was dropped.

Rustic 01 requested status of the foaming operation and was advised of normal progress for a landing some 15 minutes later. En route from the jettison area to the pattern, a landing attitude stall was performed with engines at flat pitch to determine stall speed. Stall was indicated at approximately 72 Kts. Clearance for a low pass between the taxiway and runway was requested to provide the pilot a clear picture of the terrain on either side of the runway.

In final preparation for landing, the supervisor of flying and the pilot reviewed procedures. The passenger was rebriefed and challenged to confirm that all prelanding actions had been completed. Pattern flown was a wide left closed downwind, following the low pass down the runway. Base leg was approximately 1.5 miles from the runway and final approach was established at 85 KIAS with a glide slope approximating that normal for a GCA. At approximately one-half mile on final, pilot and passenger rechecked all loose items stowed, shoulder harnesses locked, visors down, rear seat pin installed, front seat pin convenient for quick installation, and battery off. The pilot planned to flare short in order to touch down at the beginning of the foam at approximately 75 KIAS, to insure the aircraft could be flown onto the runway rather than dropped from a stall.



The longer than normal final approach proved to be a sound decision because of the time required to establish desired 85 KIAS airspeed. The OV-10 at low gross weight without gear or external stores proved surprisingly clean, and the approach speed and glide path were stabilized at one-half mile from the runway.

The sight picture of the 18x2000 foot strip of foam proved deceptive. Over the overrun at approximately 150 feet altitude, and 3000 short of the foam, propellers were feathered. This was somewhat earlier than anticipated; but necessary to allow touchdown near the desired spot. The acceleration resulting from engine shutdown was surprisingly obvious and estimated at five knots. The final maneuvering for touchdown proved no problem; however, the pilot had to "feel" for the runway after arriving at normal touchdown and remembering there was another three feet of altitude to lose because of no landing gear. The additional five knots from propeller feathering caused touchdown to occur about 500 feet into the foam instead of at the desired point.

Touchdown was flat and smooth at approximately 75 KIAS and directional control was effective. A slight drift to the left was easily counteracted with rudder and aileron. The aircraft departed the foam slightly left of centerline at approximately 30 KIAS and decelerated rapidly with a continued slight left drift and forward pitch which could not be corrected. The front seat pin was installed as the aircraft stopped, canopies opened, and both occupants exited.

Subsequent examination revealed minimal aircraft damage confined to the sponsons and antennae for the FM radio homing, radar beacon and ALR radar warning system. The feathered propellers did not contact the runway and the nose gear doors were lightly scraped, apparently during the forward pitch as the aircraft decelerated leaving the foam. Cause of the left main gear malfunction proved to be a broken main landing gear uplock bell crank connected

# FOAM continued

to the bungee which opens and closes the gear doors.

The pilot of Rustic 01 was Lt Col Edwin R. Maxson, who was awarded a WELL DONE (page 29) for his handling of this mishap. His analysis of the event and recommendations should be of interest to all pilots.

ANALYSIS AND RECOMMENDATIONS

Technical order guidance for handling the incident proved generally adequate; however, the situation and local environment required certain decisions which could have affected the outcome. First of these was the decision to jettison the 230 gallon external tank. Despite the cockpit indication that the tank was empty, some trapped fuel remains in the tank and constitutes a fire hazard. In addition to the fire hazard consideration, I also questioned the potential for directional control and lateral stability as the aircraft slowed if the landing was made on the tank. Although the wind was down the runway at eight knots at time of landing, I felt any adverse crosswind could add to the potential for side stress should the aircraft depart a straight path after touchdown. The lack of damage to the propellers and the minimal damage to the sponsons bore out the decision to jettison the tank.

Given the option of landing on the runway or the taxiway, I opted for the runway because of its greater width and a general impression that the runways and adjoining shoulders seem to be more carefully engineered than taxiways at most airfields.

The decision to have the passenger install his ejection seat safety pin was reached because of his lack of experience and familiarity with the aircraft, the seat and egress procedures. He had received formal ejection seat and egress training the day prior to the flight and I had given him a pre-flight briefing and demonstration on emergency procedures, specifically including ground egress, but this mission was his first in the OV-10. My capability to eject both of us with my system despite his seat being safed was the final criterion for that decision. The passenger's coolness and attention to instructions minimized the need for this precaution; however, I strongly recommend this procedure under such circumstances.

My pre-landing stall maneuver did not give me an accurate indication of flight conditions with both engines shut down. The flat pitch condition I chose for the maneuver created more drag than I experienced on short final following engine shut down. For the practice stall I set the torque at approximately 580 pounds, at the first indication of flat pitch. I estimated that approximately 650 pounds would have more closely simulated the engine out characteristics I ultimately experienced with the propellers feathered. Stall warning occurred during the experiment at 72 KIAS; however, I estimate the actual stall speed under engine out conditions at approximately 65-68 KIAS. Half flaps were used for both the in-flight maneuver and landing; aircraft gross weight was approximately 9100 pounds. Technical order data indicates stall will occur under these conditions at 66 KIAS.

The problem stemmed from an incorrect power setting for engine out simulation in the practice stall. The lower than anticipated stall speed plus the estimated five knots gained by feathering the propellers resulted in touchdown approximately 400 feet longer than intended. Under similar conditions I recommend the practice stall be accomplished and results cross checked against the technical order. Recommend touchdown be planned for 5-8 knots above indicated stall.

Foaming for this incident consisted of one strip 18x2000 feet beginning 2000 feet down the runway. After touchdown at 75 KIAS, approximately 50 feet into the foam, the aircraft decelerated slowly and departed the foam at the far end at approximately 30-35 KIAS. An additional 2000 feet of foam would probably have permitted the aircraft to come to a stop before going onto the dry runway. Recommend 4000 feet of foam be considered, circumstances permitting.

During the time I was awaiting recovery of inbound aircraft the 56 SOW/DO contacted the 19 TASS in Korea and the chief OV-10 pilot at Rockwell Corporation in Columbus, Ohio. Both agencies concurred with the analysis of the problem and the decision to execute a gear-up landing. When feasible, recommend taking advantage of the OV-10 capability for holding to allow supervisors time to contact other units and agencies for technical assistance and advice. ★

# 1975 USAF SAFETY TROPHIES

## Secretary of the Air Force Safety Trophy

### AIR TRAINING COMMAND

ATC had the lowest aircraft accident rate, the fewest aircraft destroyed, and the fewest aircraft accident fatalities in the 29-year history of the command. ATC was also significantly lower than the Air Force average in every category of ground accident prevention evaluated.

### ALASKAN AIR COMMAND

The Alaskan Air Command did not experience a single major or minor aircraft accident for the first time in 5 years. Also, the command did not experience any explosives or missile accidents, and ground accidents were reduced in every category.

## Maj Gen Benjamin D. Foulois Memorial Award

### AIR TRAINING COMMAND

ATC's aircraft accident prevention accomplishments were judged to be the most effective of all major commands. The command flew more than half a million sorties involving intensive student flight training events in a high density traffic environment. The award will be presented at the Naval Air Station, Pensacola, Florida, during the Annual Awards Dinner of the Order of Daedalions, 15 May 1976.

# THE RISE OF THE EJECTION SURVIVAL RATE


**MR. RUDOLPH C. DELGADO**
**Directorate of Aerospace Safety**

On 29 August 1949, a young lieutenant, flying an F-86 aircraft out of a Southern California Air Force base, ejected when the aircraft lost aileron boost and went out of control when one wing tip tank would not jettison. He had to manually open his lap belt, kick away from the seat, and pull the parachute ripcord (that is how it was done in those days). Even though he lost his helmet, and the seat hung up in the risers, rode down with him, and hit him on the head during PLF on a rough mountain top, the ejection was otherwise uneventful and he survived.

He probably did not know it at the time, but the lieutenant was making Air Force history. He was the first USAF crewman to use an ejection seat to escape from a disabled aircraft.

During the intervening years, from that momentous day in 1949 through 31 December 1975, 4,265 other crewmen flying noncombat missions found it necessary to eject from their aircraft. Of these, 3,518 survived. This makes the ejection survival rate for those 27 years 82%.

There was one other ejection in 1949 and it, too, was successful, so that year's survival rate was 100%. That was never to be repeated. From then on, as the number of ejections increased, the survival rate decreased. It hovered between 89% in 1959 (262 survivors out of 296 attempts) and 74% in 1972 (91 survivors out of 123 attempts). In 1975, however, a significant improvement was recorded. There were 79 ejections and 72 crewmen survived for a remarkable 91%. What makes the 1975 survival rate even more significant is the fact that this record was achieved with virtually the same ejection systems that were in use in 1972 when the lowest rate was attained.

Between 1972 and 1975 there were no major improvements made to ejection systems that could be credited with improving the survival rate. Who then, or what, rates the credit for 1975's high survival rate? The aircrews themselves, that's who. They did this simply by making their decision to eject

Ejection systems such as the Martin Baker H7 in the F-4, shown on page 6 and during inspection, below, are reliable and will save lives when used within their operational envelope. Initiation outside the envelope accounts for most ejection fatalities.

and executing it while they were still within the safe escape envelope of their ejection system. This indicates a high degree of knowledge and understanding on the part of the crewmen involved concerning the capabilities and limitations of their particular ejection system. Armed with this knowledge and understanding, they were in a position to make the decision to eject at the proper time and thus save their lives.

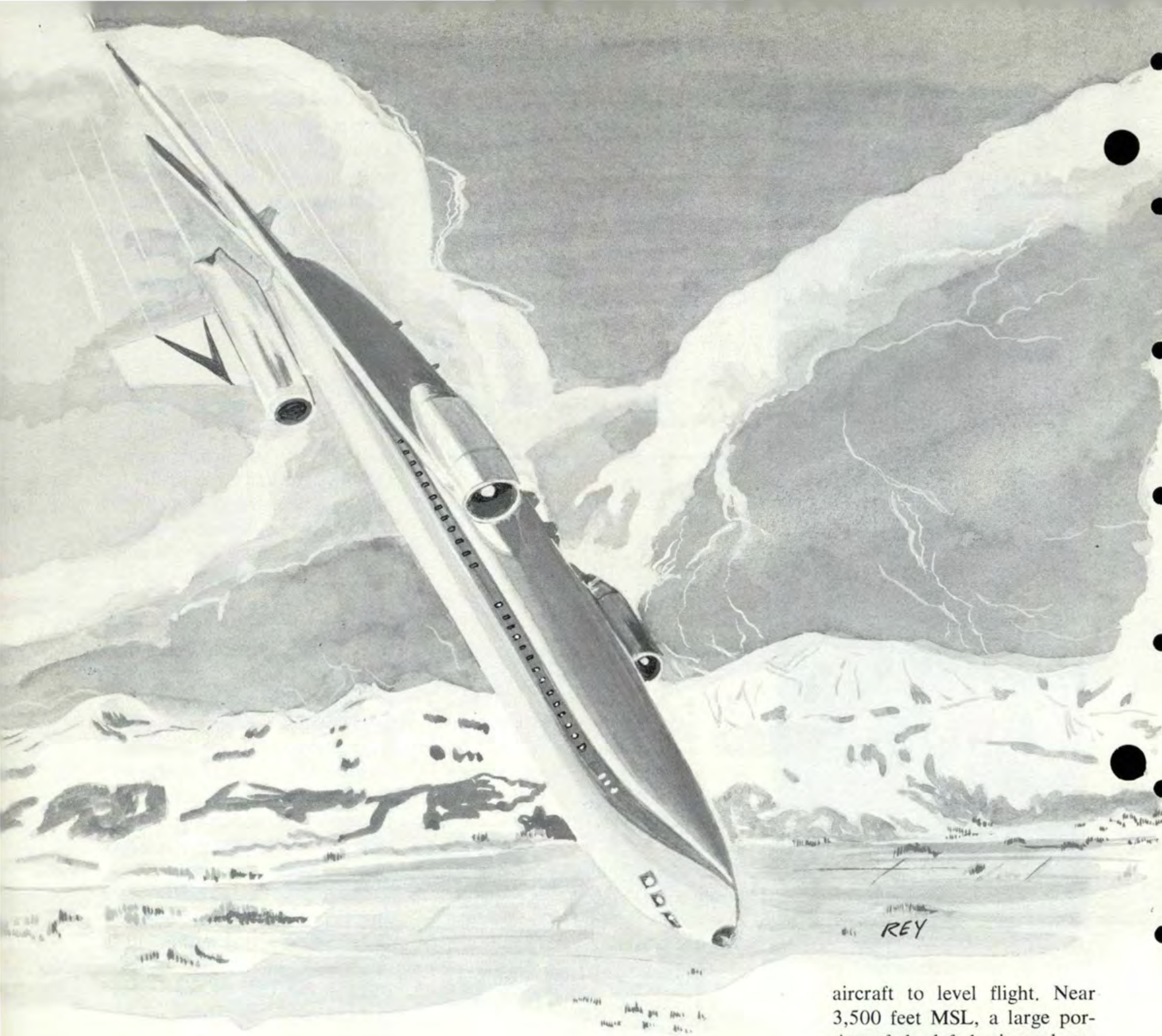
Crewmen who know their ejection system's limitations can save their lives even when flying in older aircraft with a less sophisticated ejection system. This was also proven in 1959 when the next highest survival rate was recorded. Ejection systems in those days had a lot less capability than do present day systems—zero/zero was unheard of.

Nowadays there is talk about super sophisticated ejection systems, such as the high technology ejection seat, that can allegedly recover an ejectee from such conditions as zero to 50,000 feet altitude and zero to 600 knots airspeed plus varying conditions of inverted flight and high sink rates. This is all very good and these systems will be welcomed, but the reality of the matter is that none of these are flying right now and it might be at least two years before a limited quantity will fly. These may someday be used in some of the newer weapon systems such as the A-10, B-1, F-15, and F-16.

In the meantime, the systems that have been around, in some cases since the 50's, will have to do. And, they will do if used within their design limits. No matter how primitive the system, if it is used within its defined safe-escape envelope, it can save a crewman just as well as a modern one.

Historically, the primary cause of ejection fatalities has been initiation outside the safe-escape envelope. This was also true for 1975. Six of the seven fatalities were attributed to this. Many times accident boards are not able to determine what conditions were present to cause crewmen to delay their ejection until it was too late. In some cases, though there has been evidence to suggest there was an opportunity for safe escape, the initiation was delayed until this opportunity had passed. In these cases, it can only be speculated that crewmen might have overestimated their ejection system capability. They might have thought they could try to cope with the aircraft problem a little longer, assuming they could eject at the last second and survive. They were tragically wrong.

The best insurance a crewman can have for surviving an ejection is to be armed with knowledge of the capabilities and limitations of his particular ejection system. He then must use this knowledge to make the decision to eject at the proper time, when his aircraft is no longer of use to him. ★




*The following is quoted from a commercial jet accident investigation report:*

"The aircraft stalled at 24,800 feet MSL and entered an uncontrolled spiralling descent into the ground. Throughout the stall and descent, the flight crew did not recognize the actual condition of the aircraft and did not take the correct measures necessary to return the aircraft to level flight. Near 3,500 feet MSL, a large portion of the left horizontal stabilizer separated from the aircraft, which made control of the aircraft impossible.

"The National Transportation Safety Board determines that the probable cause of this accident was the loss of control of the aircraft because the flight crew failed to recognize and correct the aircraft's high-angle-of-attack, low-speed stall and its descending spiral. The stall was precipitated by the flight crew's improper reaction to erroneous airspeed and Mach indications which had

# ATTITUDE

LT COL ROBERT J. BRUN
Directorate of Aerospace Safety

resulted from a blockage of the pitot heads by atmospheric icing. Contrary to standard operational procedures, the flight crew had not activated the pitot head heaters."

The three crew members, who were the only persons on board, died in the crash and the aircraft was destroyed. When we reflect on the experience level of the average commercial crew, the 12-minute duration of this flight, and the relative magnitude of their initial error, we might begin to wonder how such a simple problem was allowed to slowly develop into an in-flight loss of control.

The answer, in a few words, is that attitude instrument flying was abandoned for all practical purposes, despite several verbal exchanges between the crew relating to the unbelievably high readings on the pitot-static instruments. For instance, as the aircraft passed 16,000 feet enroute to FL 310, the copilot, who was at the controls, remarked that they were doing 340 knots and climbing 5000 feet a minute. As the climb progressed, recorded data showed an increase in both airspeed and rate of climb which eventually exceeded 6500 fpm prior to the stall.

The crew made two radio transmissions during the descent. The first was a mayday stating "we're out of control descending through 20,000 feet"; and 39 seconds later, "we're descending through 12, we're in a stall." Total time for the descent was 83 seconds and the peak recorded rate was 15,000 feet per minute.

Results of the investigation indicate the recently upgraded copilot responded in reverse on two consecutive pretakeoff checklist items, and the error here is an object lesson for all cockpit crew members. Switch location and crew habit patterns sometimes lead to a checklist callout procedure wherein two or more consecutive items are called before pausing for a response. In this particular case, it appears that the flight engineer normally stated, "Ice protection (engine anti-ice), pitot heat" before pausing for the responses. All available evidence indicates the copilot responded with "Off, On" but actually turned on the engine anti-ice and left the pitot heat off.

As a result of this error, the pitot pressure inlets for the three independent systems were blocked by ice at approximately 16,000 feet resulting in a constant pitot pressure from that point onward in the flight. The stick shaker, which is activated by angle of attack instrumentation, was initially set off at a calculated airspeed of 165 knots as compared to the 412 KIAS shown on recorded data. Although the crew had reason to attribute some part of the abnormal aircraft performance indications to light gross weight, winter weather conditions and the possibility of strong up drafts, the aircraft attitude should have warned them of the approaching stall.

During the last few seconds of controlled flight, there was an almost simultaneous activation of the stall and overspeed warnings, but the copilot apparently continued to react to the airspeed indicators and their associated warning systems. Both pilots misinterpreted the final stick shaker control vibration. The copilot stated "there's that Mach buffet," and the captain commanded "pull it up." A combination of calculated and flight recorder data indicate the pitch attitude would have been about 30 degrees nose up as stick shaker speed was approached, whereas a plus 5 degrees is normal for climb.

All of us can think of many routine aircrew actions which should have stopped this accident sequence before takeoff or early in the climb. However, the real thought paralyzer in this review is why was the last clear chance for survival never taken? Basic attitude flying would have saved the day even after the stall occurred, and the failure to correlate attitude and performance indications long before that point is a question that will never be fully explained.

Looking back over the entire experience, there are some additional lessons in aircrew attitude as well. It proves once again that flying is a business which requires a challenging attitude and that our success or failure as flyers may well be determined by how often we exercise that prerogative. ★

# THE IFC APPROACH

Most of this month's article deals with questions the IFC receives about low altitude approach procedures.

**Q:** What is a procedural track and how is it depicted?

**A:** A procedural track is a maneuver that is used in place of a procedure turn, or a holding pattern in lieu of a procedure turn. It is designed to align the aircraft on the inbound course to the final approach fix (FAF), at FAF altitude in the final approach configuration. The procedural track is depicted by a heavy blue line showing the intended aircraft ground track and may employ an arc, course, dead reckoning (DR) leg, teardrop, or any combination of these.

Figure 1 is an example of an arc to radial approach. Pilots are expected to lead the turns, both onto the arc and onto the final approach course.

Figure 2 depicts a DR leg that intercepts the final approach course. As you can see, the 130 degree leg has no course guidance. Apply any known wind to the DR leg heading so as to make good the ground track of 130 degrees.

Figure 3 shows a teardrop procedural track. Since the 120 degree outbound course is a desired ground track, use the course intercept immediately after station passage procedures outlined in AFM 51-37 to intercept the course.

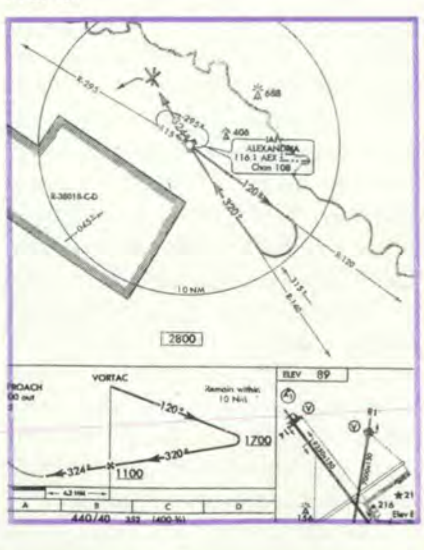
**Q:** When may I depart my last assigned altitude when cleared for the approach in Figure 3?

**A:** AFM 51-37 says, "Start the descent to the turn altitude when the aircraft is established on the procedural track course." However, if excessive maneuvering is required to capture the outbound course, the approach may become difficult or impossible to fly. Consider an aircraft that is approaching the Alexandria VOR from the south, at an

FIG. 1


FIG. 2


FIG. 3




assigned altitude of 3000 feet. Application of the above rule would prevent descent to 1700 feet until established on the 120 degree radial outbound. An unknown wind could possibly prevent course interception prior to turning back inbound. In this situation, use high altitude penetration procedures, i.e., when a descent is depicted at the IAF, start descent abeam the IAF after you have established a parallel or intercept heading to the procedural track course. The reason you can use this procedure is because AFM 55-9, United States Standard For Terminal Instrument Procedures (TERPS), directs approach designers to allow the same protected airspace around both high and low altitude IAFs.

Beginning an approach at the IAF, however, should not be confused with a radar vector to intercept the approach at a point other than the IAF. Design protected airspace varies inside of the intermediate fix (IF) and you have no way of determining how much protection is given at any other point. Figure 4 shows how both primary and secondary protected airspace is reduced from the intermediate fix to the final approach fix. Since the IF is not depicted on approach procedures, there is no way for the pilot to determine where the reduction in airspace begins. Therefore, except for a descent starting at the IAF, you must be on course prior to descent.

The revised AFM 51-37 will not require an aircraft to be on course for a descent that starts at the IAF.

**Q:** When may I turn inbound on a teardrop procedural track like the one in Figure 3?

**A:** When a specific turn fix is not depicted, you may turn inbound at any time as long as you do not ex-

By the USAF Instrument Flight Center
Randolph AFB, Texas 78148

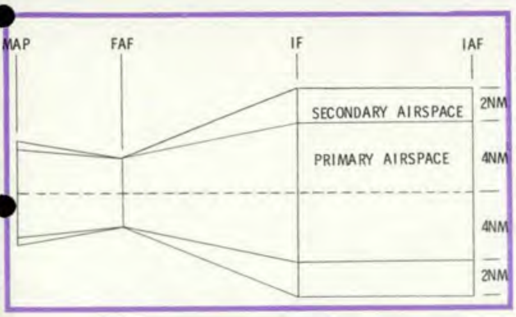



**FIG. 4**

ceed the published "remain within" distance. The point where you initiate the turn inbound should depend upon aircraft turn performance, winds, and the amount of descent required on the inbound course. Ensure that you fly outbound far enough to allow sufficient time to capture the inbound course, descend to the FAF altitude and establish approach configuration.

**Q:** AFM 51-37 and most flight manuals tell me to configure prior to FAF. If no final approach fix is depicted on an approach, when should I perform my landing configuration?

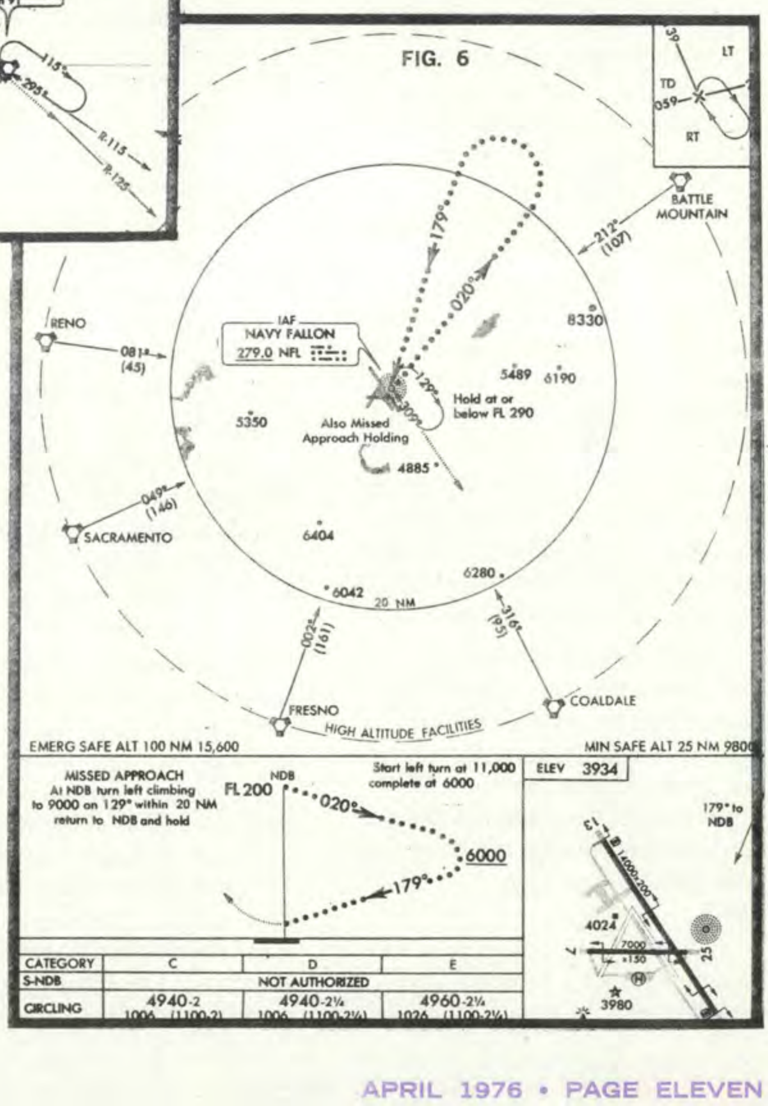
**A:** Approaches without FAF's exist in both high and low altitude instrument approach procedures. They are used when the approach is designed off a VOR or NDB which is located on the airfield. In most cases, a FAF would be either impossible or impractical to define.

In the low altitude structure, these procedures normally incorporate a procedure turn. Figure 5 is an example. The final, in this case, begins at the point where you intersect the final approach course inbound. When you are on course inbound, you are on final approach. A point to think about on approaches like this, is that you can reach the missed approach point more quickly than you think. Prior planning is necessary to ensure that you reach MDA and configure to land as soon as possible. Consider lowering the gear and flaps, if applicable, prior to the turn inbound.

In the high altitude structure, (see Figure 6), a procedure with no FAF incorporates a penetration turn. Here, the final approach begins on the inbound course 10 miles from the navigation facility. If normal descent rates are used to depicted turn altitudes, an aircraft will fly outbound far enough to allow sufficient time to configure after completing the penetration turn and prior to reaching the final approach segment. Fuel considerations and directives that govern your operation may dictate whether you perform your landing configuration outbound or inbound. In lieu of specific directives, either is acceptable. ★

**FIG. 5**


**FIG. 6**



# WHEN IT RAINS . . .

CAPTAIN GUY P. SUMPTER
54 FTS
Reese AFB TX

"Any questions, sir?"

"No ice?" I asked.

"No sir. None forecast and none reported so far," the duty forecaster answered.

"O.K. Thank you much," I said, reassured that on this leg of our cross-country, the T-38A trainer we were flying would not suddenly find herself in a compromising situation with Old Man Ice. Ice and the Talon mix (as all '38 drivers are frequently reminded) about as well as oil and water!

Let's see, I recounted to myself. A ragged ceiling at 2500 ft, layered up to about 14,000 ft, rainshowers in the vicinity, but no thunderstorms reported along our intended route. Not exactly "clear and a million," but not bad for a mid-June, early-morning departure from Tyndall.

My student, 2Lt Dodd, and I timed our preflight and engine start so as to avoid taking an unplanned shower; then we taxied out to the active runway. After being cleared for takeoff, and after a careful check of the navigation equipment, we began our takeoff roll. Gear's up. Everything's going smoothly, I thought, as I paid close attention to my student's performance. Wait a minute! What's wrong here?!

I had just begun to transition to the gauges when I noticed that the main and standby ADIs each indicated approximately sixty degrees of bank—in opposite directions!

In a flurry of intercockpit communication, the student confirmed that his ADI indications were identical to mine. By this time we were entering the overcast. Even though I quickly considered ducking back under the clouds, it was too late—we were in solid IMC.

With the VVI indicating a 3000 fpm climb, and a constant airspeed of 300 knots, I elected to continue the climb, hopefully to one of the spaces between cloud decks, that the Tyndall forecaster had "promised" us earlier. Talk of needle, ball and airspeed flying had always been cheap, but now I was going to get to try my hand at it.

Only a matter of seconds after first noticing and confirming the erroneous ADI indications, I uttered the most common of all UPT phrases, "I've got the aircraft!"

"Roger, you have the aircraft," was the response from Lt Dodd.

Informing Departure Control of our emergency situation, I requested and immediately received clearance to continue the climb straight ahead, out over the Gulf of Mexico. At approximately 8500 ft MSL, we broke out between layers and leveled off. "Remind me to buy that weatherman a beer when we get back on the ground," I joked nervously to myself.

Just then, as if it had been patiently awaiting its turn to fail, the HSI began to spin.

"Request no-gyro vectors away from any known weather," I snapped to Departure Control.

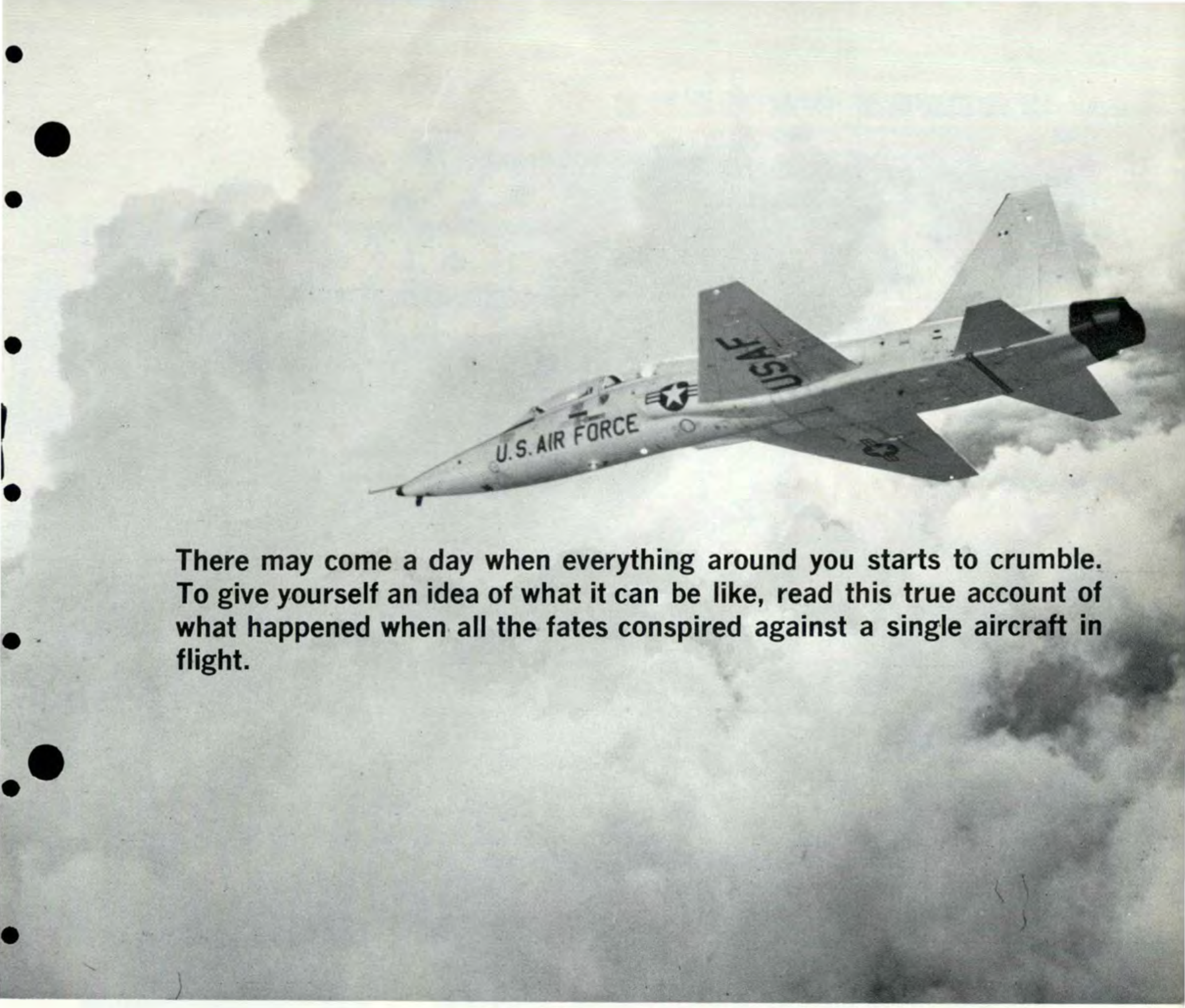
"Turn. . . ." Pause. "Stop turn," was the controller's response.

This, however, proved to be our last outside radio contact of the mission. Our UHF radio had suddenly decided to jump on the equipment failure bandwagon, which was, by this time, getting as crowded as we cared to see it!

After flying the heading we had received for a short, yet seemingly long, time, we spotted the blue-green of the ocean below and began a spiralling descent down through the hole in the undercast. Once we were safely below the clouds (about 1500 ft MSL), I picked up a heading on the mag compass that I knew would get us back over land. The DME from Tyndall read 30 NM at the time. 15 NM later we were over the Florida coast.

An attempt to fast-slave the HSI proved successful, so I then tuned the Tyndall ILS and turned to an intercept heading for the localizer course.

As we drew closer, it was apparent that the rainshower we had so cleverly avoided prior to takeoff was now over the field. Nevertheless, I elected to attempt




**There may come a day when everything around you starts to crumble. To give yourself an idea of what it can be like, read this true account of what happened when all the fates conspired against a single aircraft in flight.**

the landing, rather than risk further equipment failure.

Flying the ILS while trying to retain visual contact with the ground, we finally spotted the runway approximately a mile and half out. Our "white rocket" touched down very close to the approach end; however, this was where all similarity to a normal landing ceased. The heavy-weight bird began to hydroplane and weathervane in what turned out to be 15 knots of crosswind blowing across a two-inch thick sheath of water standing on the runway. 8000 ft of runway later we had finally slowed sufficiently to turn off. As we did so, the right main tire, exhausted from the ordeal, flattened itself against the concrete.

A few seconds of mutual silence, and then two heavy sighs of relief. Time to close our flight plan.

*Captain Guy P. Sumpter graduated from UPT at Moody AFB, Georgia in Class 69-03. He went directly to Vietnam to fly the U-10 there and eventually in Korea. He accumulated over 600 combat hours in the U-10. Captain Sumpter then went to Travis AFB to fly the C-141. He flew the C-141 for two and one-half years and became an Flt Examiner in it. He moved from there to Reese AFB and the T-38 where he is now an instructor pilot in the T-38 and a flight commander. He has accumulated over 3000 hours of total flying time. Captain Sumpter has amassed over 1000 hours of instructor time in the T-38.* ★

FROM WHENCE WE CAME

# B-25s OVER TOKYO

## 18 APRIL 1942

MSGT DAVE SYLVA
63 MAW Norton AFB CA

B-25 bombers on deck of the Hornet enroute to launch area. They had flown from Eglin Field, FL, where crews practiced very short takeoffs, to McClellan Field near Sacramento, CA, and loaded aboard at Alameda NAS on San Francisco Bay.

"Tell Jimmy to get on his horse," was the message to Lt Col Jimmy Doolittle (shown here in later photo as a brigadier general). Cryptic message meant the mission was "on."

On December 7, 1941, carrier borne planes of the Imperial Japanese Navy broke the back of the US Pacific Fleet. In every corner of the world the Axis powers were smashing their way through Allied defenses. Distance and censors kept the awful truth from the American people, but no matter how they tried to soften the blow, there was no escaping reality. Guam had fallen, the Japanese had sunk *H.M.S. Prince* of Wales and *Repulse* and were driving the British down the Malay Peninsula. On December 22, the tiny garrison on Wake would be overwhelmed. On Christmas Day, Hong Kong would surrender. The American Army in the Philippines, stripped of air power, was retreating into Bataan on Luzon. The situation was desperate.

Damage control parties were still fighting to free trapped sailors and to save what was left of the Pacific Fleet as the meeting got under way. President Roosevelt told his staff he wanted "a bombing raid on Japan as soon as humanly possible." The raid would be for psychological effect only. It would boost the morale of the American people and our Allies. It would give the Japanese an emotional setback. It did that and more. It altered the course of World War II.

A plan to bomb Japan from Chinese bases was drawn up. Twelve B-24s under Col Harry Halverson flew east across the Atlantic to Africa. Before they could fly to New Delhi and on to China, they were diverted to Egypt to fly the first Ploesti oil field mission.

The next best hope was a carrier strike. Unfortunately, the short range of the Navy planes would put the strike force and the too valuable carriers within the attack radius of Japanese land-based bombers.

Having been a bastard son of the Army for so many years, the Air Force had learned to improvise. Both Army and Navy flyers had spent their lives and given their lives overcoming "fundamentalist" thinking. Nothing was impossible. Some problems just took a little longer to solve. This problem would also be solved.

On January 4, 1942, at another meeting, the Chief of Naval Operations, Admiral Ernest J. King, was discussing plans for the invasion of North Africa. He offered a suggestion that Army bombers be transported on one of the three carriers to be used. The seed was planted. General "Hap" Arnold, Chief of the Army Air Force, taking notes wrote: "We will have to try bomber takeoffs from carriers. It has never been done before but we must try it out and check on how long it takes."

A Navy officer, Captain Francis S. Low offered a suggestion to Admiral King that Army medium bombers be launched from a carrier for a strike against Japan. He had watched Navy pilots at Norfolk, VA practicing short takeoffs from a simulated carrier deck painted on the runway there. Later, he had seen Army twin engined bombers making simulated bombing runs over the same runway. The two perceptions meshed into the germ of an "impossible" idea.

The idea was examined by Admiral King's staff and the plan began to take shape. The brand new carrier, *Hornet*, could take 16 North American B-25 *Billy Mitchell* medium bombers on her flight deck. Steaming at better than 25 knots and escorted by a screening force, the Hornet would take the bombers to within 500 miles of Japan. After launching the bombers, the Hornet would do a one eighty and head for home. The bombers would strike their targets and fly on to Chinese fields. It would work, if, and it was a big if, Army pilots could get a bomber off a carrier deck. There was only one way to find out.

Arnold called an old and trusted friend, Lt Col James H. Doolittle, to oversee the project. Doolittle had just finished working the jinx off Martin's B-26 *Marauder*. Now he was told to see what it would take to get a medium bomber off the ground in 500 feet carrying a 2,000

**B-25s took off in a squall that lashed the task force. All 16 made successful takeoffs in exactly one hour.**

**Raider flying over Yokosuka navy base. Hub of propeller on right engine can be seen at lower right.**

**We wish to gratefully acknowledge the Air Force Museum at Wright-Patterson AFB, Ohio, for providing the photographs accompanying this article.**


Doolittle sits beside wing of his aircraft. All of the raider aircraft either crash landed, ditched in the sea or were abandoned.

Lt Robert Hite blindfolded and being led away to capture. He spent 40 months in Japanese prison camp and returned home when Japan surrendered.

pound bombload and enough gas to fly two thousand miles. The answer was typical of Doolittle; "I'll need a little time on that one. Give me a day or two." He had the answer the next day. The B-25 could do it if the crews were properly trained and if the plane was given extra tanks. Doolittle got that job too.

Twenty-four *Mitchell's* were modified to include the required extra fuel tanks. Twenty-four crews were assembled out of the 17th Bomb Group and the associated 89th Reccy Squadron. The men were volunteers who had been told only that they were needed for an extremely hazardous mission that would require the greatest skill. Of this "First Special Aviation Project" only Doolittle and his deputy, Major John A. Hilger knew that it involved a carrier takeoff.

The selected crews reported to Eglin Field, Florida at the end of February. A flight instructor from Pensacola NAS, Lt Henry L. Miller was given the job of training the Army crews in very short field takeoffs. He found that the crews were sharp and that they learned quickly.

While training progressed, the armaments officer, Capt Ross Greening, dummied 50 calibre broomsticks to give the B-25's the illusion of protection in the tail. He also fashioned a 20¢ bombsight that was more accurate at low altitude than the highly secret Norden bombsight.

On March 21, a message was flashed to Eglin: "TELL JIMMY TO GET ON HIS HORSE!" The mission was on. Doolittle assembled his 22 remaining crews and told them that they were leaving. They took off from Eglin and flew to McClellan Field near Sacramento, California.

From McClelland, the planes flew to Alameda NAS where 16 of them were hoisted aboard the *USS Hornet*. The larger planes took every inch of available deck space. The crews were mixed in with the Navy people wherever berths were to be found.

April 2, 1942, the *Hornet* weighed anchor and headed west. Her escort included the carrier *Enterprise* out of Pearl and fourteen other warships.

While the convoy zigzagged its westerly course, the war went on. April 9, the exhausted garrison on Bataan had surrendered. The sick and wounded defenders set out on a death march to prison camps.

As the days dragged by, the crews performed maintenance on their planes and had their pockets picked by Navy card players. The Navy crew had been told the destination of the *Hornet* the same day they left San Francisco Bay. Morale was high and both Army and Navy men, friendly enemies, forgot all previous rivalry. Harmony was the order of the day.

The raid was to be launched after the *Hornet* had put the planes within 400 miles of Japan. From this distance, Doolittle hoped to be over Tokyo at Sunset on April 19.

Three a.m. on the 18th, patrols from the *Enterprise* spotted Japanese surface vessels. An alarm was sounded, but the task force turned to a new heading and avoided detection. At 6:00 a.m. another Japanese ship was sighted, this time from the *Hornet* herself. At almost the same time, *Hornet's* radioman intercepted Japanese radio traffic from somewhere close to the carrier. The element of surprise was gone. The task force had been seen and the patrol vessel, before she went under to the *Nashville's* guns, had flashed a warning message to Japan.

Only one choice could be made. At 0800 hours the *Hornet's* loudspeakers blared "ARMY PILOTS, MAN YOUR PLANES!" The task force was 630 miles east of Japan. An early launch would put Doolittle's raiders over the targets in broad daylight. There was nothing else to


Unidentified American flyers shown with Chinese who befriended them.

President Roosevelt presents Doolittle with Medal of Honor. Others in photo, General Henry (Hap) Arnold, Mrs. Doolittle and Gen George C. Marshall.

do. Each moment the takeoffs were delayed put the task force in danger of attack by Japanese land based bombers.

At 0820, April 18, 1942, Doolittle's plane released brakes and lumbered down the flight deck into the teeth of the squall that lashed the task force. Five minutes later, the second aircraft lifted from the *Hornet's* deck. Exactly one hour after Doolittle's takeoff, the sixteenth plane flown by Lt Bill Farrow was airborne.

The Navy's job done, the task force turned 180 degrees and retired at flank speed. The Raiders pressed on to the heart of the Japanese Empire. They had no idea of what waited ahead for them. The enemy had been warned. The targets, Tokyo, Yokohama, Nagoya, Osaka and Kobe, would be swarming with fighters—if the bombers got that far. The added distance and weather would alter their plan to land at friendly fields in China. There was no way alternate plans could be worked out now.

The Mitchells, each loaded with two 500 pound bombs and 1,000 pounds of incendiaries, raced for their assigned targets. Some of the raiders would encounter enemy fighters, some would catch flak. Some would, much to their surprise, find that the Japanese mistook them for their own and waved to them as they flashed over their heads.

All of the planes unloaded their bombs. They did what they had set out to do. Even if only in token measure, Pearl Harbor was avenged. The agony that had tormented the American people as we suffered defeat after defeat was somehow less stinging.

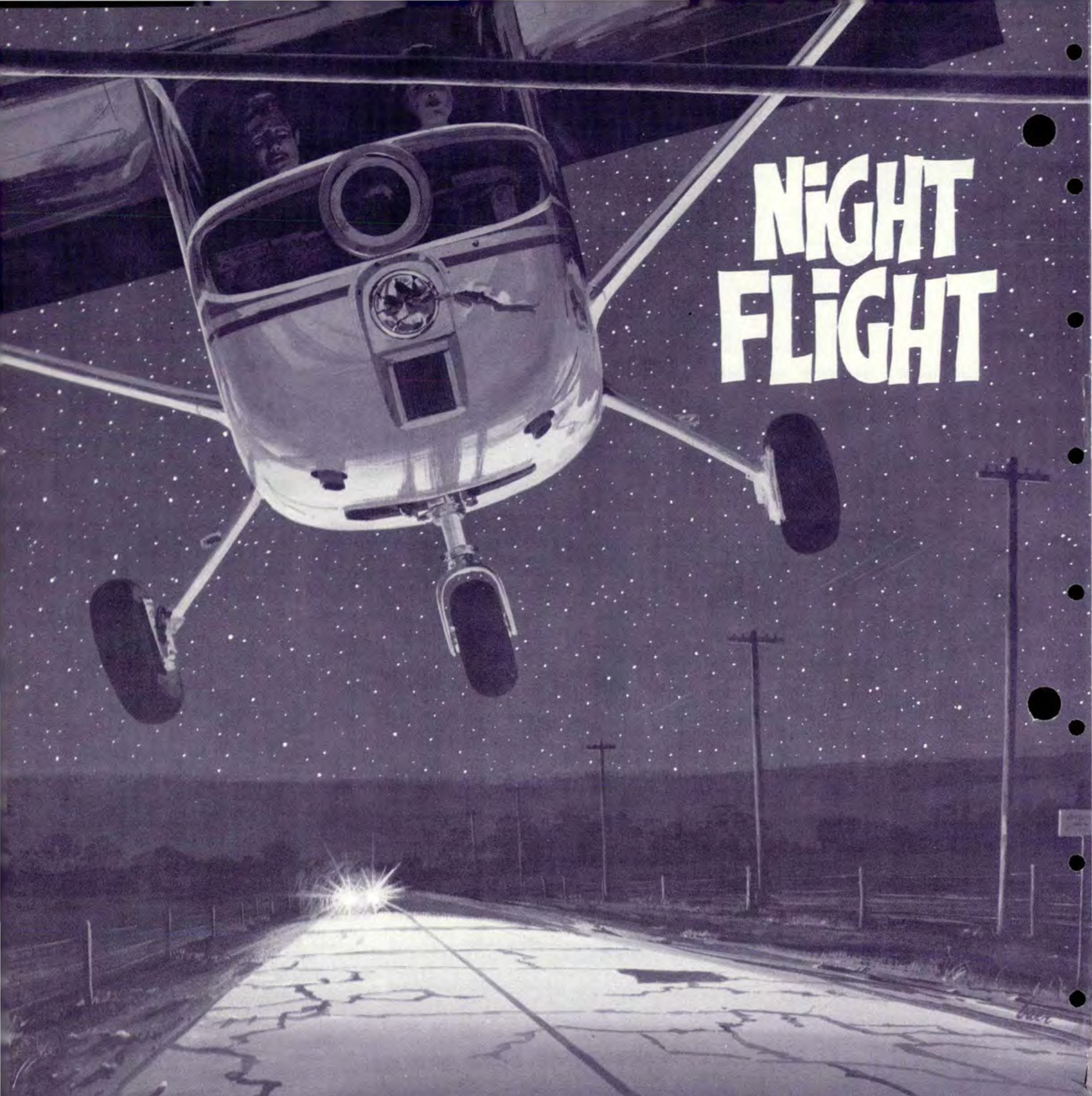
None of Doolittle's planes would be saved, though. They would crash land in China or ditch in the Yellow Sea. Crews would bail out and hope they landed among friends. One plane landed in Siberia. It was confiscated. The crew was interned and put to work by the Russians. They escaped and made their way home more than a year later.

Most of the Raiders made it home but not all. Three of them, SSgt William J. Dieter, Corporal Leland Faktor and Sgt Donald Fitzmaurice died in the crashes of their planes. Eight raiders fell into Japanese hands and suffered the hell of torture and captivity for three years. 1/Lt Bob Meder was allowed to die in prison of beri beri. Three prisoners of war, 1/Lts Bill Farrow, Dean Hallmark and Sgt Harry Spatz were executed by their captors in October 1942. They gave all they had to give.

Yes, they did what they set out to do and in doing it the eighty raiders of Doolittle's "Special Project" changed the course of the war more than they realized.

Admiral Isoroku Yamamoto, the man who had planned the Pearl Harbor raid, was responsible for the defense of the Emperor and the home islands. The success of the Doolittle strike proved that the Americans still had teeth. Yamamoto suspected that the raid had come from an aircraft carrier. The carriers had escaped destruction at Pearl Harbor and were still ranging in the Pacific. He devised a plan to bring the enemy to battle on his terms. The fight he picked cost him his carrier force instead and ended Japanese offensive plans in the Pacific. It was called the Battle of Midway.

One year to the day after the Doolittle raid, on April 18, 1943, US Army Air Force fighters intercepted and ambushed Admiral Yamamoto's plane over Bougainville. The man who started the chain of events on December 7, 1941—the man whose embarrassment and frustration had brought about the destruction of his Fleet at Midway died in the flaming wreckage of his plane. ★



# NIGHT FLIGHT

A couple of years ago, when I was a T-38 instructor pilot at Laredo AFB, Texas, I instructed civilians, during my off duty time, for a company based at Laredo International Airport. One day I had to make a flight to Corpus Christi, which is on the coast about 150 miles southeast of Laredo. Since it was a sunny spring day, I invited a friend to accompany me on this flight, a lieutenant named Lisa. She had never flown in a small single-engine plane before, her total flying experience having been just one flight in a commercial jet.

After taking care of my business, we did a little shopping and had a nice dinner at an oceanside restaurant. We planned an 8:30 p.m. departure for a night time ride back to Laredo.

An hour later we were cruising at 4500 feet about 25 miles from Laredo. It was a beautiful night, very clear, but no moon! Flying over Southwest Texas on a clear, dark night is an unusual experience. One gets the illusion that you are

CAPT RICHARD P. KEIDA, 772 TAS Dyess AFB TX

flying over the ocean with small, brightly lit islands scattered here and there. In reality, the islands are small towns separated by vast, unlit areas of desert and ranch land.

I was sitting in the right seat, and Lisa was actually flying the Cessna 150 from the left seat. She was doing an excellent job, so I was relaxing and enjoying the ride. Suddenly I felt a light vibration in the seat and soon the entire airframe began to vibrate!

I took control of the aircraft and then—wham!! The only propeller departed the airplane, and the engine started reving up now that the load of the propeller wasn't on it anymore.

I shut it down and quickly ran through my emergency procedures and set up a glide, knowing that a forced landing into that dark area below us was inevitable. I explained to Lisa that we had a problem—but since we were still "flying" she was not at all upset! She thought that we were just going to coast up to the runway—still 20 miles in front of us!

I radioed approach control at Laredo and declared an emergency, explaining that I was going to attempt a forced landing, and requested assistance after we had completed our landing. With this taken care of, I concentrated on setting up my landing pattern.

Since it was so dark, I decided the landing light would be helpful. Unfortunately, when the prop broke away, it hit the cowling just below it. The landing light *was* in that cowling—but no more! Now we were in real trouble! Below us was some rough terrain and mesquite trees, all hidden in the "black" darkness. Desperately looking for some ground reference points to facilitate the landing, I kept rolling the aircraft into some shallow turns to see what was below us.

Unknown to me at the time, there was a resident of Laredo, along with his wife, parked on the highway just under us. They had just decided to return to Laredo—and on came their headlights as they started down the road. Lisa saw this car and calmly mentioned it to me. As I looked at the stretch of pavement in front of the car, I decided to use that highway as a runway! My plan was to spiral down over the car and when I was low enough, just glide over the top of his car and land in front of him on the well lit road!!

I still had a battery operated rotating beacon working and as I approached his convertible he noticed us and *stopped!!* We went gliding right over the top of his car—still about 100 feet in the air. Soon we were out of the range of his lights but by now I had the grayish outline of the highway ahead!!

One of the reasons you don't select roads for makeshift runways is that power lines usually follow them! When small airplanes and power lines collide, the lines seldom break and the aircraft is usually seriously damaged.

Well, at this time, the rotating beacon flashed its red beam of light in front of us—and lit up a power line!! The only one that crossed that highway for the next 14 miles!! All I could do was slam forward on the yoke. The power line struck the fuselage just above the canopy! We could hear it scrape along the fuselage until it reached the rudder —and with a "snap" it was gone —along with the rudder!! Now with a "nose-low" attitude, I yanked back on the yoke and all we heard was a squeak.

The squeak was the tires contacting the highway! Another "grease job" landing! I let the aircraft come to a stop in the ditch on the left side of the road—not a scratch or bruise on either one of us!

We were given a ride back to Laredo by the fellow and his wife, who still did not believe what they had seen. After completing the necessary calls and reports, I explained to Lisa how close we came to being seriously injured. Only then did she show any visible emotional concern!

The reason for this flight ending short of its destination was some poor maintenance. A nick was found in one of the prop blades earlier that morning—along with a small crack! They were both removed with an electric grindstone—which left the prop slightly unbalanced. This became so severe after a couple of hours of flight, it caused the crankshaft to fail at the forward main bearing. As a result, that part of the crankshaft, spinner, and prop all left the aircraft!!

Obviously, we can't supervise every bit of maintenance on each aircraft. Even if we could, equipment can still fail during normal use. We can, however, psychologically prepare our crew members to handle emergencies. Simulated emergencies can be practiced in a flight simulator. The simulator program should be realistic and have emphasis placed on *practical* emergency situations. A good accident prevention program should include this type of training. It should also be monitored closely as further insurance against a possible accident! ★

LT COL MALCOLM F. BOLTON
430 TFS Nellis AFB NV

# F-111


# NACELLE FIRE ANALYSIS

# why the bold face emergency

The military specifications for the F-111 required General Dynamics to provide a nacelle fire extinguishing system. The General Dynamics design is a high rate discharge system which incorporates a halogenated chemical as the extinguishing agent. The specification required the system to provide a 6 percent concentration by volume of this agent throughout the nacelle for at least 0.5 seconds. The design parameter used to meet this condition was nacelle air flow at the 1.2 mach, sea level flight regime.

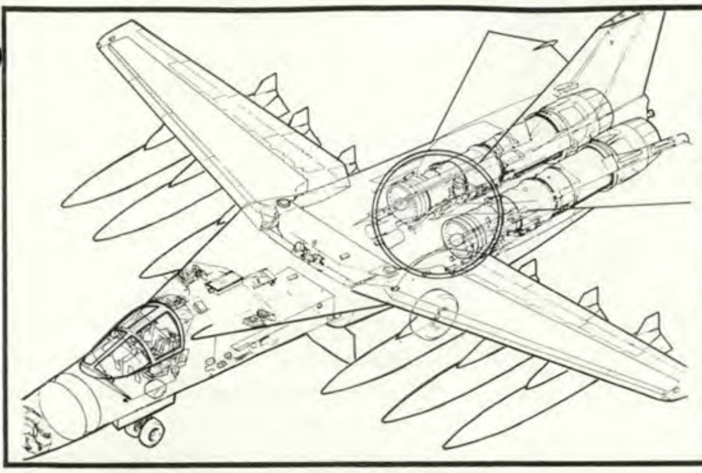
This high nacelle air flow condition (approximately 35.2 lbs/sec) with velocity ranging from 85 to 250 feet per second establishes the quantity of agent required. At any other flight condition, nacelle mass air flow rates will be less than the design point and the concentration of agent in the nacelle will be greater than the design value of 0.5 seconds. Of critical importance is that the upper limit of the agent dwell time (concentration at least 6%) for flight is only 1.3 seconds. Therefore, a crew member can never expect more than 1.3 seconds of agent at any point for fire suppression. With the one shot system in the F-111, if fuel and a source of ignition remains in the nacelle after the agent is discharged, the fire will reignite and the aircraft will be lost.

In the cases where fuel tank rupture has occurred, fuel flow was not stopped as the agent was discharged. Since tank wall rupture will always be a possibility, the problem must focus on eliminating all ignition sources within the nacelle prior to expiration of agent dwell time. Prior to discussing these sources of ignition, an understanding of the ignition characteristics of JP-4 is needed.

The Spontaneous Ignition Temperature (SIT) of JP-4 under static laboratory conditions of a sea level, standard atmosphere is approximately 435°F. SIT is defined as the lowest temperature at which a substance will ignite in air without an external source of ignition. Of interest is how SIT changes when a velocity is imparted to a JP-4 fuel/air mixture. At only 2 ft/sec, SIT elevates to 800°F, at 8 ft/sec it is up to 1050°F and by 20 ft/sec, it is up to 1200°F. Air velocities throughout the nacelle at all flight conditions are at least 20 ft/sec and most often are between 60-185 ft/sec. In other words, for something to ignite a major fuel leak in the nacelle it will have to have an extremely high temperature. By analyzing engine component temperatures, it can be seen that the engine itself cannot be an igition source.

Nacelle air temperature never exceeds 420°F. This temperature occurs under 1.2 mach, sea level conditions and is the extreme condition of the F-111 flight envelope. The hottest component anywhere in the nacelle is the 16th stage bleed air line. At 1.2 mach, sea level, it is 980°F. At 2.2 mach, it is 1000°F. Nacelle airflows under these conditions are greater than 200 ft/sec which elevates the SIT far above these temperatures. Nowhere in the flight envelope does the SIT approach the temperature of an engine component; therefore, some other ignition source must be available. The three critical ignition sources are the afterburner flame, electrical shorts and disintegrating engine rotating parts.

The afterburner flame is an obvious source of ignition. There are numerous cases of afterburner fuel line or fuel pump failure that created a fire sufficient to trigger the fire



# procedure was changed . . .

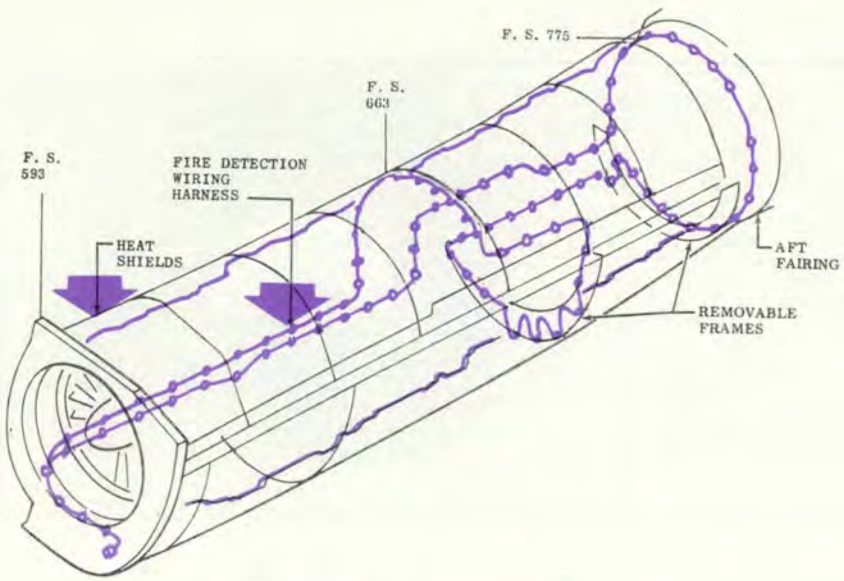
detect loop. In every case, the fire was extinguished as soon as afterburner operation was terminated—both the fuel and source of ignition were removed.

What happens when a fuel manifold ruptures and fuel streams throughout the nacelle? In looking at F-111 fire history, there is little evidence to indicate that the afterburner flame will ignite a massive nacelle fire under these conditions. Air velocities within the nacelle have already been established. Studies show that upstream flame propagation within a laminar flow cannot take place at fuel/air mixture velocities greater than 2 ft/sec. The F-111 nacelle air flow however is far from laminar and will be very turbulent throughout the nacelle. Studies show that upstream flame propagation in this case cannot take place in velocities greater than 20 ft/sec. Remember, nacelle air flow is on the average of 100 ft/sec; therefore, it becomes theoretically impossible for an afterburner ignited fire to burn forward in the nacelle. (Dumping fuel in afterburner is a vivid illustration of this phenomenon.) Nevertheless, there are far too many variables to rule this out and it must be planned for. Closing the throttle first is the logical procedure and flight test data further verifies this.

F-111 flight test data shows that 2.5 seconds is required for the nozzle to close when the throttle is retarded from maximum power to idle. Furthermore, in all cases, the afterburner flame will always be out by nozzle closure. Normal reaction times would indicate that by the time the throttle is closed, and the fire pushbutton depressed, the afterburner flame will be out by the time the agent dwell time is depleted. Again, the critical step points to closing the throttle and getting the source of ignition extinguished prior to discharge of the agent.

Concern has been expressed over ignition sources from electrical shorts due to wire deterioration in a nacelle fire. If a nacelle fire occurs, will the insulation melt and leave exposed wires which will short together to cause reignition of any fuel still in the nacelle? Although this possibility exists, the probability of occurrence is felt to be small. For one thing, as soon as the generator drops off the line, electrical current remaining within the engine bay is minimal. This alone argues for closing the throttle immediately. Nevertheless, wiring in the engine bay was designed under the assumption that the wires might be exposed to fire.

Engineers designed the F-111 engine bay wiring using two types of insulation. The generator feeder wires are insulated with a Dacron/fiberglass coating over a silicon based wire wrapping. In exposure to extreme heat, this material will char and even though it will flake off, the charred residue will still provide insulation. Furthermore, the generator feeder lines are laced through insulator blocks which physically separate them from one another. Nothing but the most violent force could cause a short. Other wiring in the nacelle is teflon coated. Teflon will melt when exposed to extreme heat but in all cases, exposure time and not total temperature is the governing criterion. All evidence suggests that the exposure time in the nacelle fires witnessed to date is too short to significantly deteriorate any of the insulation. Regardless, shutting down the engine immediately, so that the generator is disconnected prior to agent dwell time expiration, is the best possible guarantee against an elec-




**F-111 Engine fire detection system.**

trical short being an ignition source.

Thus far compressor disintegration has not been addressed. I feel it is the most serious hazard to survival of a nacelle fire. Of all the engine fire procedures, closing the throttle as the first immediate step becomes absolutely critical under compressor failure conditions. Rotating engine parts become a continuous source of ignition if the engine is allowed to run.

The TF-30 engine fan case and compressor rotor are constructed of titanium alloy. The energy required to penetrate the fan case with a compressor blade will generate a temperature at the fracture of 2000°-2500°F. In addition, with the engine compressor components breaking up, the probability is high that internal engine parts will rub together. At normal $N_2$ rpm, metal to metal contact will produce temperatures of at least 2000°F in fractions of a second. If one of these superheated parts enters the nacelle, it will ignite the fuel even at the highest air flow within the nacelle. The point is that unless the throttle is cut off, the engine will continue imparting high temperature engine fragments into the nacelle air flow.

Consider a typical case seen thus far. The crew hears or feels a thump. Engine instruments appear normal but almost immediately a fire light is on. The old procedure required the pilot to depress the fire pushbutton to cut off fuel to the engine/nacelle area and then discharge the agent. From previous discussion, the agent will last a maximum of 1.3 seconds and during this time the fire will be extinguished. Now observe what the engine is doing. At cruise conditions of approximately 6000 lbs per hour fuel flow, the engine will continue to run for up to 17 seconds. Even at a maximum power where fuel flows are 36,000 lbs per hour, it will run for 2.7 seconds. The point is that the engine is still running at whatever rpm the throttle is demanding after all agent has vented from the nacelle. The compressor, now failed, is still running at normal power! The probability is very high that it will continue to disintegrate and impart high temperature particles of titanium into the nacelle. The agent is gone, the fire reignited and the aircraft will be lost.

Unfortunately only one statistic is available to substantiate this position. Approximately 10 minutes after departure, the right engine/3rd stage compressor rim failed. It exhibited identical failure modes to the recent F-111 failures. The aft fuel tank and saddle tank were ruptured. High temperature parts of the engine were identified as the source of ignition and a very intensive fire resulted. Bold face procedures called for the first step of an inflight fire to be throttle off, then pushbutton depress followed by agent discharge. The pilot followed these procedures, the fire was extinguished and the aircraft was safely recovered. Throughout the recovery, fuel from the punctured tanks continued to stream through the nacelle; however, it never reignited!

It is absolutely imperative to get the engine shut down immediately. Without an afterburner flame, with the generator off the line and with the compressor rotor at windmill rpm, the probability of a successful recovery is greatly improved. ★

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# UNWANTED LIFT

MAJOR ROBERT L. GARDNER
Directorate of Aerospace Safety


Hey, all you aero clubbers and light plane buffs! Have you ever dinged a wing tip or curled the ends of the propeller on your little bug smasher?

It's not hard to do; in fact, it has happened to a couple of aero club pilots recently. In both cases the aircraft were on the ground when one wing began to fly. Here is what happened.

## INCIDENT ONE

A Cessna 172 was cleared to land number three behind two Navy P-3 aircraft. The first P-3 made a touch-and-go and was on downwind when the Cessna landed. The second P-3 had made a full stop and was at the end of the runway awaiting taxi back approval. The Cessna 172 pilot landed long to expedite a turn off at midfield. The landing was normal with no side drift. But, shortly after touchdown the left wing was raised by a gust of wind or a lingering wing tip vortex from the P-3 aircraft which had previously landed. The aircraft swerved left and the propeller and right wing tip struck the runway surface.

The pilot recovered directional control after leaving 150 feet of tire marks. He then cleared the runway and taxied to parking for damage assessment. The propeller tips were bent to the rear about three inches and the right wing tip fairing and outer wing tip panel skin were scuffed and torn on the lower side.

## INCIDENT TWO

After landing on the active runway an aero club aircraft was directed by tower to turn off at the first taxiway, although a C-130 was holding short for takeoff at that intersection. Another C-130 was in an adjacent run-up area performing a maintenance engine run. There was not enough clearance to exit to the left of the holding transport, so the aero club pilot passed in front of this aircraft and turned off on the asphalt stabilized shoulder of the run-up area. Due to insufficient room to taxi between the C-130 in number one position and the one on the run-up pad, the light plane pilot continued on the asphalt shoulder and taxied behind the transport making the ground run. The prop blast caused the light plane to veer sharply right lifting the right gear off the ground resulting in left wing tip-to-ground contact. The dragging wing turned the aircraft back to the left and the nose dipped with the prop striking the ground. The pilot shut down the engine as the aircraft continued around to the left coming to rest on its left wing tip and nose. The aircraft then rocked back on its main gear and the pilot restarted the engine and taxied clear of the C-130s.

In this case the left wing tip was dented and both prop blades were bent.

## LESSONS LEARNED

These two incidents emphasize that light airplanes want to fly, sometimes even on the ground. Unfortunately the asymmetrical lift generated by unequal airflow over the wings results in rolling moments which may be impossible to control. Wake vortices, wind gusts, propeller and jet blast, and helicopter rotor wash can spell trouble especially for light aircraft. When these phenomena are encountered during takeoff or landing, loss of control may occur resulting in an accident. As pointed out by the above examples, aircraft damage may occur when we tangle with these conditions during ground operations.

Since wind gusts, vortex, and prop or jet wash air velocities are not usually detected by visual clues, pilots must be alert for the conditions and factors which generate them. Light aircraft should not be operated in the accelerated turbulent airflows caused by jet engine or propeller wash. Likewise, helicopter down wash and the wake of larger aircraft should be avoided.

Sometimes controllers and pilots are led to believe clearance is adequate and unwittingly and needlessly permit exposure to hazardous conditions. Remember to give yourself plenty of room and never stop flying your aircraft until it is in the chocks. ★

# FIGHTER

**CAPTAIN JOHN E. RICHARDSON**
**Directorate of Aerospace Safety**

During the air combat over North Vietnam, it became apparent to USAF and Navy tacticians that our kill ratios were much too low. This problem was the subject of a special study in 1968. The study identified many deficiencies of which one major contributor was poor aircrew performance in combat. Part of the problem was that there was no realistic method of teaching pilots to recognize the proper missile firing envelopes and to simulate combat against a maneuvering enemy.

In an attempt to solve the training problem, the Navy developed the Air Combat Maneuvering Range (ACMR). This system is established at the Marine Air Station, Yuma, Arizona and NAS Miramar, California. It consists of remote and unmanned tracking stations, a master station, control and computation vans and facilities for display and debriefing.

The ACMR uses advanced electronics and computer technology to augment the actual air-to-air combat training engagements flown on the Yuma ranges.

The aircraft are equipped with an Airborne Instrumentation System (AIS). This component of the system looks like an AIM-9 sidewinder and gets its power directly from the aircraft weapons bus. The AIS can operate on any aircraft capable of carrying external stores. The AIS transmits all flight maneuvering missile parameters and actual aircraft performance to the remote ground stations. These remote stations then pass the data to the tracking, control and computation and finally the display stations.

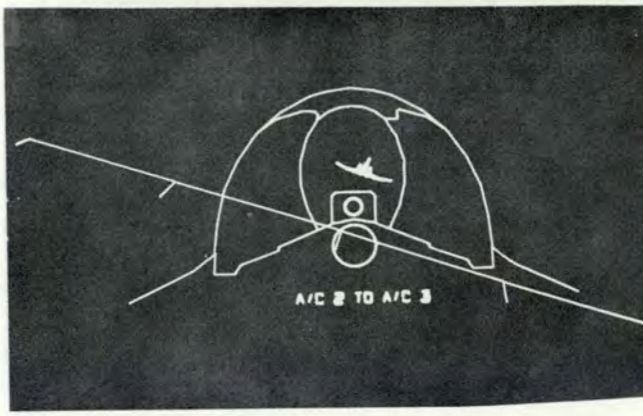
At the display station, the ground instructor pilot (GIP) has all the information he needs to monitor and instruct the pilots engaged in the ACM training. The GIP has three displays. On one he sees the aerial situation. This situation is three dimensional and displays the entire battle from any angle or range through 360°. The display also provides a past position indicator which shows the flight path of the engaged aircraft.

The other two screens provide alpha numeric information on types of aircraft, weapons, status, pilots, and critical flight parameters (g load, closing velocity, etc.). The system also has the capability for the instructor to insert safety limits for each parameter. Then, when an aircraft approaches the limit, such as minimum altitude, the display of that aircraft begins flashing and the instructor hears an audio tone.

The computer has been programmed with the operational parameters of the AIM-7 and AIM-9 missiles. As the battle progresses, the flight data is fed into the computer. When a pilot presses the trigger to simulate a missile firing, the computer automatically assesses all the parameters, g loads, cockpit switch position, range, etc. The launch is displayed on the aerial situation display by a ribbon emanating from the aircraft and tracking the enemy. If all flight and launch parameters are met, the computer registers a "kill." The average time from launch to "kill" or "miss" report is displayed in about 10 milliseconds. The instructor can then relay the information to the pilots within seconds of the occurrence. Thereby establishing and reinforcing the visual clues to proper missile launch parameters.

The computer also makes a record of the entire mission so that the GIP has the information for use in

# PILOTS even "simulate" it




**Lt Commander Kent Stauss, VF-1 Sqdn at Miramar NAS, CA, monitors a live dogfight training exercise (top photo). Line between aircraft 1 and 3, lower photo, is trajectory of the fired missile weapon system.**

debriefing. This is the second great advantage to this system. One of the most difficult things an ACM instructor must do is teach a student how to perform the basic air-to-air maneuvers, when the only tools are his hands or model airplanes on sticks. Now the ACMR display can show what successful and unsuccessful maneuvers look like not only in plain view, but actual cockpit view as well. The display gives the student total recall of the mission. Each maneuver can be reviewed and analyzed, greatly increasing the value of each training sortie. Finally, this training has the advantage of avoiding the use of costly live missiles and targets while actually providing a more realistic combat environment.

While the ACMR is a very effective system, the Air Force is already working on an improved system. Called Air Combat Maneuvering Instrumentation (ACMI), it differs from ACMR primarily in updated technology and other improvements which provide more flexibility. These improvements include: increased cockpit view capability, ability to handle increased numbers of aircraft on the range; the Navy system can handle four maneuvering aircraft, ACMI will handle eight. The ACMI programming will allow realistic hostile environment simulation by including data on current Soviet missiles.

In this time of austere funding and increasing costs, it is vital that every hour of flying time be productive. Spokesmen for the Navy Fighter Weapons School estimate that use of the ACMR has increased aircrew accuracy to the point where they are putting 85 to 90 percent of their shots on target. This and the value in research and development make the ACMR a most promising development in the technology of air combat. ★

# OPS TOPICS

FLYING SAFETY OFFICERS

HQ AAVS has extra copies of The Aircraft Accident Investigation Board training films. These super 8 cartridges are numbered FR 1427A through E, and are available at your local film library.

THE PEN PULLED IT!

EOD was notified by the Base Ops Crash Phone that a flare had functioned inside a helicopter on the flight line. An EOD team was dispatched and found an MK 6 Float Lite burning on the flight line approximately 200 feet from a helicopter. The flare had been removed from its packing container for possible use during a rescue mission. It was not used, however, and when a crew member picked the item up after the flight, the igniter was pulled by a pen protruding from his shirt pocket. The crew member carried the burning item from the helicopter, and it was allowed to burn out while the fire department stood by.

CRACKED FLOOR

The T-38 was on a mission, one leg of which required the crew to wear under arm LPU's. On the next leg, since the LPU's were not required, the IP stored his under his ejection seat. When he lowered the seat it contacted the LPU. This pressure plus the stress of cabin pressurization was enough to rip the sheet metal floor of the cockpit. The crew became aware of the failure when they lost cabin pressure during the climb to altitude.

RESCUE RECORD FOR '75—824 SAVES

The aircrews of the Aerospace Rescue and Recovery Service saved 824 lives during 1975. In addition to the many other saves world-wide, they rescued 152 in support of the *S.S. Mayaguez* operation.

The ARRS celebrated its 30th anniversary on March 13th. The record of service of ARRS crews since 1946 has been exemplary. We, the staff of *Aerospace Safety*, join with the rest of the Air Force in wishing a happy anniversary and continued good fortune to all in the Aerospace Rescue and Recovery Service.

FAILED TANK

During a routine air refueling, the F-4 crew heard a thump and then saw fuel venting from the right external tank. Both the wingman and the boom operator confirmed the venting fuel, so the crew terminated refueling and returned to home base. Both tanker and receiver had used proper procedures. However, this was the first flight in quite a while with external tanks installed. It is probable that the tank pressurization and vent valve had collected moisture and subsequently froze at altitude. Thus, when the refueling was started, the increased pressure caused the tank to rupture.

HE FLEW THROUGH A WHAT?

The F-4 was returning to base from a forward location in IMC under radar control at FL310. The crew was aware of a reported volcanic eruption and had altered course to remain at least 20 NM upwind. However, without warning, the aircraft entered a cloud of volcanic ash. Although the aircraft was only in the cloud for about 90 seconds, the ash scoured the windscreen canopies and leading edges of all surfaces. What's the weather symbol for volcanic ash?

# OPS TOPICS

**WRONG IDENT**

Recently an approach controller mis-identified an Air Force C-9 and gave it an incorrect vector. The reason for the mistake was that another aircraft had idented when the controller requested an ident from the C-9. In addition, the other aircraft followed the instructions for the C-9. The FAA controller has a difficult enough job without such added problems. It is more than just a violation of regulations to ident and follow instructions for another aircraft. It is dangerous. In this case the C-9 was in mountainous terrain. Only the C-9 pilot's awareness of his position prevented a more serious mishap.

**T-39 GEAR ACTUATOR END CAPS**

Another T-39 has suffered a hydraulic actuator end cap failure. Fortunately, the pilots recognized the symptoms and made an uneventful landing. A new procedure is in the mill for the next dash one change but until we get it, be sure you know the system and the symptoms of the various gear malfunctions.

**GROUND EGRESS**

The F-101 had a problem on landing and departed the runway. There was no serious damage; loss of control was due to a failed nose gear actuator bracket. However, the problem encountered by the WSO on egress was more serious. After the aircraft came to a stop, the pilot told the WSO to "get out." The WSO interpreted this to mean emergency egress. When he attempted to release the survival kit, he had difficulty rotating the handle far enough to release the kit. This, plus difficulty in locating the handle, led the WSO to elect to egress wearing kit and parachute. He crawled over the canopy rail, then lost his grip and fell to the ground suffering some slight injuries. The WSO had received emergency egress training, but evidently the stress of the situation, plus some unclear procedures in the dash one, led to his mishap. How long has it been since you *really* practiced an emergency egress? You might need the knowledge in a hurry.

**REFUEL PROBE— UH DRAG CHUTE— EXTENDED**

The F-105 was nr 3 in a night air refueling mission. The pilot completed the refueling checklist but inadvertently pulled the drag chute handle rather than that for the refueling probe extension. The chute functioned correctly, and the pilot then jettisoned it and returned home for a review of checklist procedures and cockpit "switchology." ★

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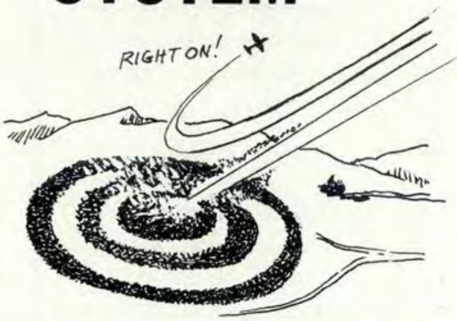
**ANNUAL REUNION**

The 366th TFW Gunfighters Association will hold its annual reunion 21-23 May 1976 at the El Tropicano Hotel, San Antonio, Texas. Contact Captain Frank Mercy, Gunfighter Reunion Committee, Box 377, Randolph AFB, Texas 78148, or phone 1-512-653-8339. All past and present officer members of the 366th TFW since the Wing's activation in 1943 are invited to join the Gunfighters Association and attend the reunion.

# LASER TARGET DESIGNATOR SCORING SYSTEM



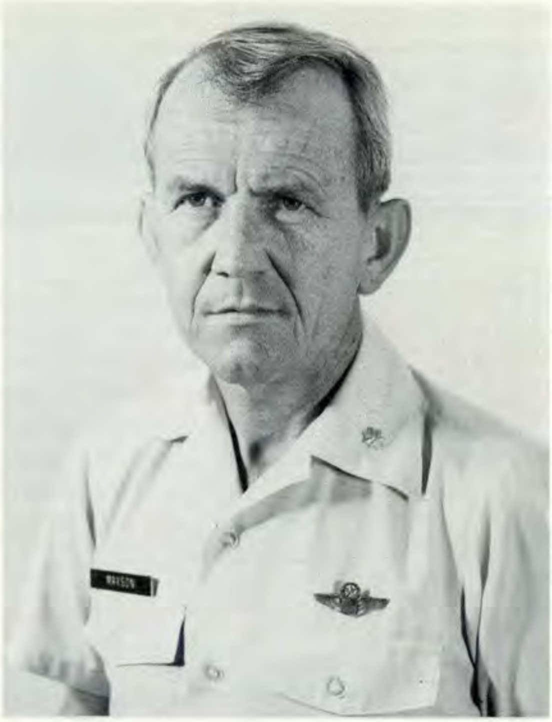

A new system developed by Air Force Systems Command's Armament Development and Test Center (ADTC) will be a boon for training tactical aircrews in the use of laser target designators.

Called the Laser Target Designator (LTD) Scoring System, the new device acknowledges the presence of laser pulses and instantly notifies aircrews that they are on target. The new system can also be easily carried by two people and transported in the trunk of a car.

During a training exercise, LTD can be set up quickly at a target site or scored at a tactical range. Each time a laser pulse is detected within the system's field of view, a wide angle lens projects the laser energy onto a sensing mechanism. An audio signal is then immediately transmitted to the aircrew indicating "on target" designation.

Each pulse detected within the scoring system is recorded on a built-in counter and correlated with a similar timer resulting in a score for each run.

The LTD Scoring System is in the final phase of operational testing at Eglin's Tactical Air Warfare Center. ★



# Lt Col EDWIN R. MAXSON
## 56th Special Operations Wing (PACAF)
## APO San Francisco, CA

On 27 June 1975, Lt Col Maxson, with a crew chief passenger, was leading a flight of two OV-10s from Nakhon Phanom AB to U-Tapao AB, Thailand. On downwind Lt Col Maxson lowered the landing gear but the left main gear would not extend although the right and nose gears indicated "down." Lt Col Maxson retracted the gear and went around, requesting his wingman to close for a gear check. The wingman joined on Lead's wing and the two aircraft departed traffic for attempts to lower the gear. When it became evident that the gear would not lower, Lt Col Maxson and the supervisor of flying conferred and decided upon a gear up landing on foam. Lt Col Maxson jettisoned his external fuel tank and had his passenger install his ejection seat safety pin (the seat could still be ejected by the pilot). Enroute from the jettison area to the pattern a landing attitude stall was performed with propellers at flat pitch to determine stall speed. Stall was indicated at 72 kts. Final approach was established at 85 KIAS and all final checks were made by the pilot and his passenger. An uneventful landing was made in the foam with only minor damage to the aircraft. Cause of the gear malfunction was a broken main landing gear uplock bellcrank connected to the bungee that opens and closes the gear doors. By his calm, professional handling of this emergency, Lt Col Maxson prevented possible injury and damage or loss of an aircraft. WELL DONE! ★



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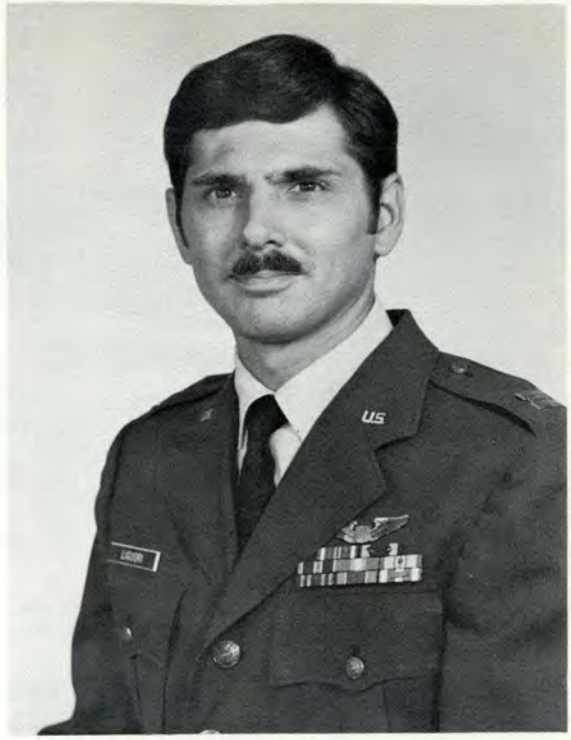
UNITED STATES AIR FORCE

# Well Done Award

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



## Capt ANTHONY L. LIGUORI
### 911th Tactical Airlift Group (AFRES)
### Greater Pittsburgh Intl Airport
### Pittsburgh, Pennsylvania

On 19 May 1975, an Air Force Reserve C-123K crew commanded by Captain Liguori was participating in a paratroop drop mission at Fort Benning, Georgia. The aircraft departed Lawson Army Airfield enroute to Friar drop zone with a flight crew of eight, 36 student paratroopers, two jump masters and two qualified jumpers who were to act as wind testers. When the six minute warning was called, the paratroops stood up and prepared to jump. Captain Liguori began a left turn from downwind to base in the drop pattern when he felt a snap in the aileron controls, the yoke went to full left deflection and the aircraft began a roll to the right. Captain Liguori continued to hold full left aileron, applied full left rudder, advanced power on the right recip engine and directed the copilot to bring the right jet to 100 percent. As the right jet reached full power the roll to the right stopped and aircraft control was regained. By holding full left aileron, full left rudder and differential power Captain Liguori was able to maintain wings-level flight; however, aircraft control became marginal at speeds below 130 knots. Due to the high airspeed required to maintain adequate control, it was decided to attempt a landing with the paratroopers on board rather than continue the drop as this was to be their first actual jump. Captain Liguori was able to maneuver the aircraft to a position where a no flap, straight-in approach was flown using full aileron and rudder, and differential power for directional control. After landing it was discovered that the right aileron down control cable had broken allowing the right aileron to go to the full up position. Captain Liguori's reaction to an emergency situation of unknown cause and his superior airmanship prevented the loss of a valuable aircraft and the lives of the 46 persons on board. WELL DONE! ★

# FROM WHENCE WE CAME

0820, April 18, 1942. The pilot released brakes and the aircraft lumbered down the flight deck into the teeth of a squall.

That pilot in the lead aircraft was Jimmie Doolittle, then a lieutenant colonel in the U.S. Army Air Corps. And he was leading 15 other B-25 "Mitchell" bombers on the historic raid on Tokyo by land based bombers launched from the deck of an American aircraft carrier, the Hornet.

Doolittle's raiders wrote a chapter in the rich history of the U.S. Air Force that ranks with the many great moments "from whence we came."

For the story of the Doolittle raid and more photos, please turn to page 14.

Top left. B-25 Mitchell bombers fill most of carrier deck during Pacific crossing.

Top right. Lt Col Jimmie Doolittle fastens a medal he had earlier received from Japanese to a bomb for return trip.

Bottom left. Wreckage of Doolittle's plane on Chinese hillside.

Bottom center. Doolittle crew, left to right, SS[illegible] A. Braemer, SSgt P. J. Leonard, 1st Lt R.E. [illegible] Doolittle, and unidentified Chinese.

Bottom right. Four Tokyo Raiders with Chinese friends.

Near right. Missionaries who helped downed flyers in China by providing refuge from Japanese searchers.

Far right. Decoration of Tokyo Raiders by Madame Chiang Kai Shek at Chungking, China. Brig Gen James Doolittle.