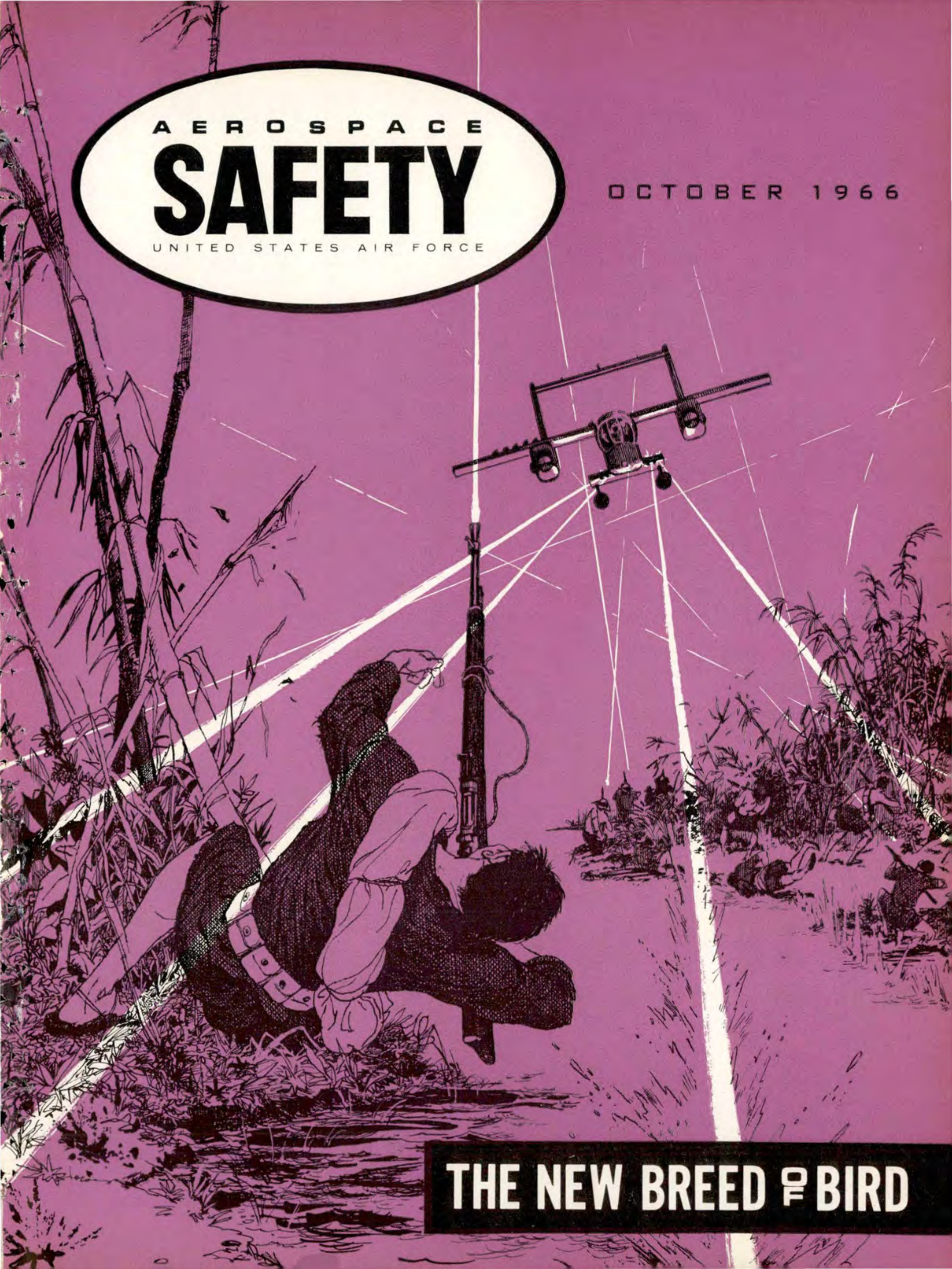
AEROSPACE

SAFETY

UNITED STATES AIR FORCE

OCTOBER 1966



THE NEW BREED OF BIRD

A E R O S P A C E
SAFETY

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AFRP 62-1 VOLUME 22 NUMBER 10

Fallout

SAY WHAT YOU MEAN

In your "Personal Equipment Notes" (Jul 66 issue), you note: "The photos at right of batteries taken from survival radios carry a message. Unfortunately, there are some who don't know how to read that message. . . ."

Well, after reading this, one can only wonder why USAF requires that info as vital as the old-age date of batteries must be presented in an esoteric code? There's plenty of other printing—and space available—on most of those batteries. Instead of some Phoenician code, why not just come right out and say in contemporary English (in bold face type, yet): "CAUTION! Change batteries after FEB 1965"—rather than use a cryptic "0265"?

By effectively over-complicating what is actually a very simple matter, it sure looks like someone managed to fumble the ball.

SMSgt Edward M. Parr, AFRes
San Fernando, Calif.

Actually, the date shown is the date of manufacture. Perhaps the message should be "mfg. Feb. 1965."

ICE CRYSTALS AND FLAMEOUTS

I've read with interest your article "Ice Crystals and Flameouts" (Dec 1965) and think there is a rational explanation of why these flameouts occurred, and it is as follows: Most anti-icing systems are designed to cope with supercooled water at temperatures down to say −40°F, which is the lowest temperature at which supercooled water is supposed to exist. Now if one has ice crystals in the atmosphere instead of supercooled water and if these impinge on a heated surface, it is necessary to supply not only the sensible heat required to keep the water from freezing but the latent heat of fusion must also be provided to convert the ice crystals to water. This means that some anti-icing systems which work quite satisfactorily with supercooled water are unable to cope with ice crystals, particularly if the temperature is as low as the −57°C, quoted.

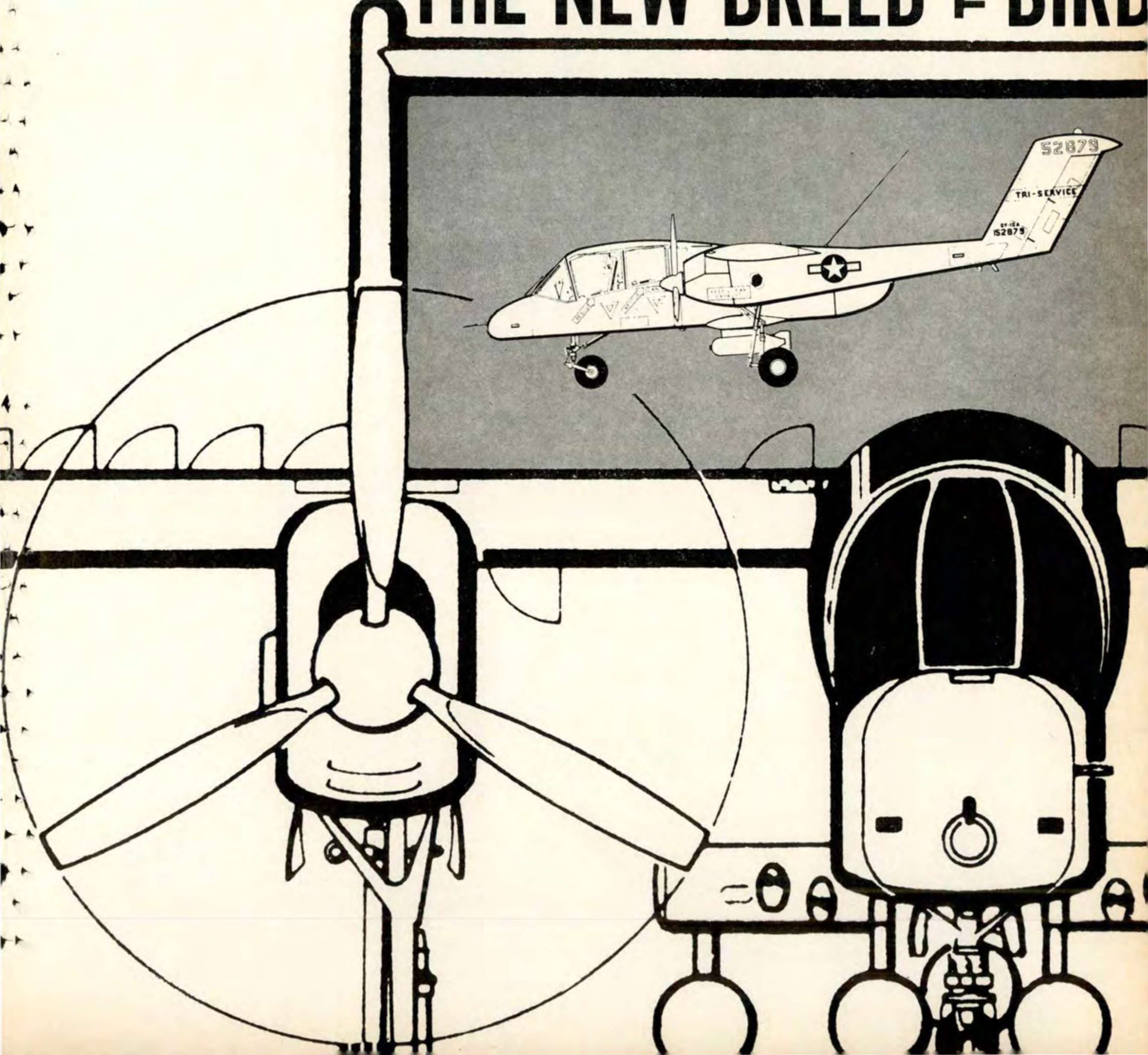
Following this line of reasoning I would assume that what happened to these engines was that the ice crystals contacted the heated inlet guide vanes but were not immediately melted for the reasons noted above and that some quantity of ice collected on the guide vanes. After this ice collected, the heat loss to the atmosphere from the guide vane would be reduced and melting at the ice-guide vane interface would occur with subsequent shedding of the ice. This shed ice could account for the engine flameouts. . . .

E. L. Smith
61 Durocher Street
St. Lambert, P.Q., Canada

Designed for COIN

Operations, the OV-10A Is . . .

THE NEW BREED OF BIRD



Maj Frank J. Tomlinson, Directorate of Aerospace Safety

In the business of thinking up and building new operational systems, particularly aircraft, most thoughts and actions are directed towards developing a system which will fulfill desired operational requirements. This is as it should be, for accomplishing the mission is the only reason for the system's existence. Aerodynamic configuration, propulsion, avionics systems, armament, flight controls, and the like are optimized toward mission performance requirements. Systems reliability and airworthiness are additional vital considerations which must be taken into account during the concept formulation and contract definition phases of an operational system life cycle.

We sometimes lose sight, during the system design and construction process, of the fact that safe operation of the aircraft is of paramount importance. If the bird will perform the mission, but has a tendency to abort, is prone to excessive component failure or is extremely hazardous to operate, then the hope that it will get to the target is negated by the fact that it probably never will.

Some of the newer systems incorporate many safety features which have been developed from analysis of failures. To say that they represent the ultimate in the art of safety engineering application would be rather foolhardy.

However, it is encouraging that some of the more critical problem areas have received special attention during original design formulation and subsequent development.

As an example of some of the safety features incorporated into one of the newest aircraft scheduled for the USAF and USMC inventory, let's take a quick look at the OV-10A. This aircraft is a STOL system designed for COIN and/or FAC operations. Its multimission performance capabilities are impressive as evidenced by Figure 1. However, its inherent safety features are more impressive. Here are some of the more significant items of interest from a safety aspect.

• Twin engines which provide for a wide margin of safety during all phases of flight, including combat.

• Simple, uncomplicated systems design, using proven components which enhances overall reliability and maintainability.

• Rugged landing gear optimized for STOL takeoffs and landings from unprepared surfaces.

• Ejection systems for both crewmembers, which is unique for an aircraft in its STOL category.

• Outstanding cockpit visibility for both crewmembers.

• Effective fire detection and extinguishing systems for both engines.

• Excellent maneuverability at low airspeeds which provides the crew with a safety margin during low altitude operations.

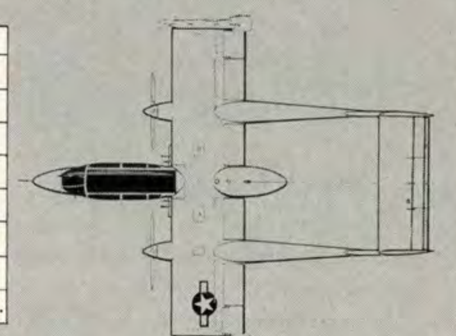
• Crew compartment armor and self-sealing fuel tanks for increased survivability during combat operations.

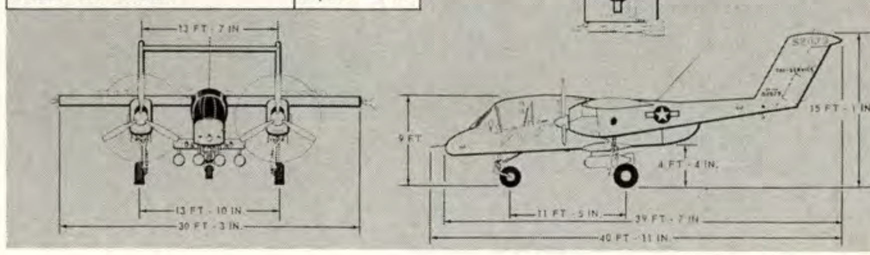
• Engine selection and installation designed to minimize FOD.

• Simple flight control systems incorporating uncomplicated direct mechanical linkage with redundancy features.

THREE-VIEW

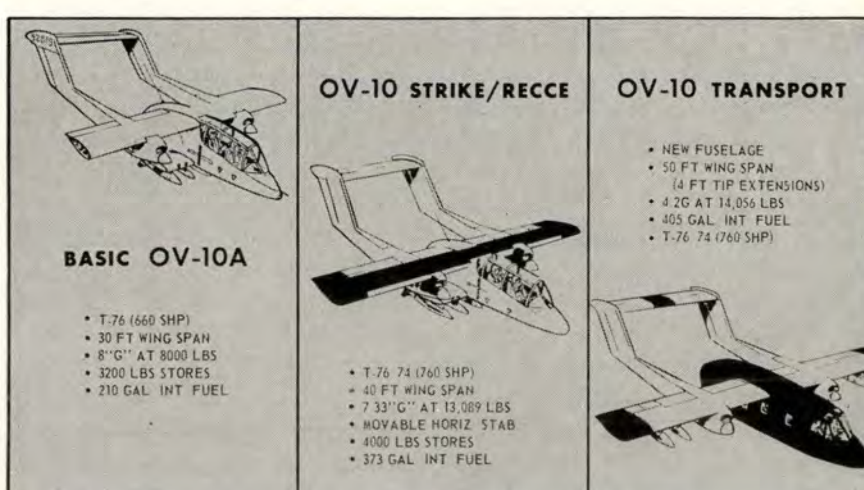
EMPTY WEIGHT	5,267 LBS
STRUCTURAL LOAD FACTOR (LIMIT) FLIGHT DESIGN GROSS WEIGHT	8.0 7,569 LBS
LANDING SINK RATE LANDING DESIGN WEIGHT	20.0 FT/SEC 8,441 LBS
APPROACH SPEED	60 KNOTS
MAXIMUM SPEED (GUARANTEED) AT SEA LEVEL	265 KNOTS
SERVICE CEILING (TWO ENGINES)	27,000 FT
MAXIMUM OVERLOAD TAKE-OFF WT	13,264 LBS
MAXIMUM ORDNANCE LOAD	3,270 LBS
UTILITY BAY VOLUME	75/110 CU. FT.





The items enumerated above serve to illustrate the fact that by the application of sound safety engineering techniques, we can enhance safe operation of a system without restricting its basic mission capability. Preservation of lives and conservation of our combat capability through the prevention of accidents is far too important to be left to chance or happenstance. Safety of operation *can* be designed into a system without degrading mission accomplishment—*it is up to all of us to insure that it is.*

ED. NOTE: A new AF film that tells all about this new concept is now available: SFP 1467 (U). "Aerospace Systems Safety." 20 Min. Color. ★



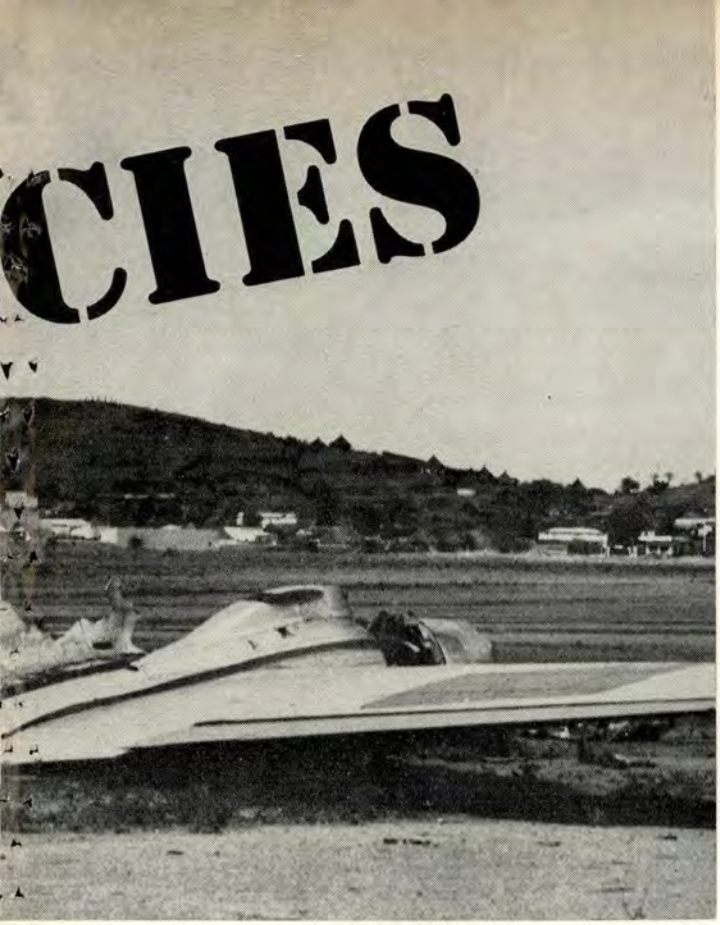
Two days prior to the accident, the aircraft departed home station on a directed transport mission in support of a rescue operation. Although a qualified pilot was available, an individual who was not qualified in the aircraft was assigned as the copilot. The first takeoff attempt was aborted due to low manifold pressure in number one engine. Nevertheless, motivated by the urgency of the mission, a second takeoff roll was continued with the left engine producing 34″ manifold pressure. At destinaiton, the flight mechanic corrected the malfunction by removing a bird's nest from the carburetor intake.

Several flights were made hauling fuel in a remote area. On two sorties, fifteen 55-gallon drums of JP-4 fuel were carried although no tie-down equipment was available. Then, the non-qualified copilot was replaced; however, again with an individual who was not qualified in the aircraft. (During the accident investigation, when the aircraft commander was queried as to what duties the copilot performed, he replied, "Specifically, he filled the seat.")

Prior to the takeoff which resulted in the accident, the pilot roughly computed the weight of his 31 passengers and their field equipment, weapons, ammunition and rations to arrive at a takeoff gross weight. However, a weight and balance Form F was not completed or filed as required, and the pilot did not insure that the aircraft was properly loaded or that the CG was within safe operating limitations. It should also be noted that although no seats or seat belts were installed, supervisory personnel directed the flight. The pilot failed to compute a takeoff and landing data card as required in the pilot's flight handbook; however, he roughly computed a takeoff distance and max allowable payload but did not consider pressure altitude or wind. He guessed at the surface temperature. This information, although available, was not used because his procedure was to have the radio operator file the clearance and get the weather briefing. However, in this instance, as in the two prior sorties, the radio operator failed to get the weather briefing, and the pilot didn't ask for one.

Other discrepancies revealed in the investigation were: no flight orders, the pilot did not have a current flight physical, the flight mechanic was overdue his physiological training, preflight checks were not made as required in the Dash One, crew briefings to include emergency procedures were not made as required and the mandatory items on the "Before Takeoff Checklist" were not reviewed.

Before takeoff, the pilot briefed the flight mechanic to perform the copilot's duties and elected to make a short field takeoff on the 3000-foot dirt strip. He knowingly de-



DURING TAKEOFF FROM A REMOTE AIRFIELD, A VC-47 CRASHED AND BURNED. FORTUNATELY THE CREW AND PASSENGERS ESCAPED WITH NO FATALITIES AND ONLY A FEW INJURIES.

Lt Col Murray Marks, Directorate of Aerospace Safety

viated from the published Dash One procedures for "Minimum Run Takeoff" because, as he stated to the investigation board, he felt "his procedure" was good. He held the brakes, applied full power, then commenced takeoff roll. After reaching 50 knots, the flight mechanic gave the "go" sign, and the pilot called for one quarter flaps. The flight mechanic extended the flaps to one-quarter, which was attained after 60 knots and almost simultaneously with lift-off at about 70 knots; the pilot maintained the aircraft in the three-point attitude throughout the maneuver. (The Dash One procedure calls for the back pressure on the column to be gradually reduced and then to lower one-quarter flaps at approximately 39 knots, keeping the aircraft in a tail-low attitude.)

Immediately after lift-off, the aircraft attained an extreme nose-high attitude — probably the result of the back pressure on the column to maintain the three-point attitude and the excessive speed at which the flaps were lowered. The pilot exerted full forward elevator pressure without making any trim adjustment. At approximately 20 to 30 feet above the ground, he was able to lower the nose momentarily, but the left wing dropped and the passengers (with no seat belts) and the cargo (not tied down) fell to the left side of the aircraft, aggravating the situation.

The aircraft pivoted on the left wing and the fuselage returned to the ground about 220 degrees from the takeoff direction. The Gooney slid backwards with the main gear, engine cowling, both props and the left engine separating from the aircraft. Although the aircraft caught fire immediately, evacuation of the crew and passengers was accomplished with relatively few injuries and no fatalities.

The primary cause of the accident was pilot factor in that the pilot used improper takeoff technique and procedure and failed to comply with published directives. A contributing cause was supervisory factor in that the mission was directed with a non-qualified copilot, no seats or seat belts available for the passengers or tie-down equipment for cargo, and mission briefings were inadequate with little emphasis placed on the hazards involved. Pilot factor was also assessed as a possible contributing cause in that the pilot failed to complete a weight and balance Form F and to insure that the aircraft was properly loaded within safe operating limitations during takeoff.

Operation from a remote site is not a license to ignore established operating procedures. Dash One procedures and checklists should be rigidly complied with. Deviations, omissions, and the use of unauthorized procedures frequently result in serious consequences. ★

Mark THE Spot

Capt John Kranz, 317 Ftr Intcp Sq (AAC)

Shortly after noon the first word was flashed to the Squadron. A midair collision! A fighter and target aircraft had collided during an intercept mission. Within 10 minutes everyone in the local area had gathered in Operations. The chatter hushed each time a telephone rang and all eyes searched the commander's face as he replaced the receiver. Cautiously, as though saying it might prompt the reverse, he told the group, "GCI has contact with the target aircraft. He is under control and attempting a recovery minus a bunch of wing. The target also said he had heard the interceptor pilot say he was in trouble and getting out. GCI has marked a chaff bundle which they think is his ejection position."

I looked at my watch and figured there were about seven hours of daylight left. Everyone was looking at the weather board and thinking out loud. The area was circled in grease-pencil. The weather was middle cloud cover with surface winds and a temperature of minus forty. The forecast called for increasing cold after sundown and gusty surface winds. It didn't look very encouraging — too windy and too cold. A parachute landing would be rough, with a wild, dragging ride a very real possibility. And if you get by the landing, you face the numbing, incessant cold. It would be rough, all right, and everyone agreed he'd better be found before dark.

When the target pilot called in from the alert strip, everyone got a real boost in morale. The landing was no sweat, he said, but we knew better because the alert pilots who watched the approach said it was the sorriest looking airplane they'd seen this side of a salvage pile. So we all felt pretty proud of the pilot — the way you feel when a fellow pilot does a darn good job.

Night came. There had been signals from the rescue beacon but only intermittently and for too short a duration. At least we were sure he was alive as long as the signals were repeated. But now, with the darkness, the snow began to fall. Visibility in the area dropped so low even the choppers had to hold off. All night the signals were heard intermittently, but as morning came, the signals faded. All day long the area was searched, expanded, and searched again. The second night fell. There were no signals being received anymore and no sightings by any search aircraft. The temperature was holding below minus forty as it had since the first day. We all feared the same thing — it's taking too long. It is very frustrating to wait and wonder and not have any answers. And yet you knew the searchers were doing their best.

Then, on the third day, he was spotted. A chopper arrived and picked him up. Suddenly it was over. It seemed so unreal that after all the waiting, the days of wondering where he was, that he could be spotted, picked up, and be drinking a cup of coffee at the alert site within an hour. But that's what the chopper people tell us all the time anyway, isn't it? Just let them find you or know where you are, and they'll do the rest.

Well, we had a happy ending to this survival episode. The pilot was in excellent shape, just darn tired. He knew what to do in his particular situation and he did everything right. We are convinced he saved his own life for those three days in circumstances which records show many other people have died. He beat the odds. And that's what it's all about, isn't it — beating the odds? Then let's take a new look at aircrew survivability and rescue and see if the odds can't be stacked more in the favor of success.

There are certain factors that enhance the probability of success. Among these are the accuracy of determining the accident/ejection location, the accuracy of determining the ground survival site, and the speed in effecting personnel rescue. The goal, of course, is the successful rescue of the individual(s) involved. Success is acknowledged to be a factor of speed. And speed in rescue is dependent upon accuracy of search. The ratio of successful survival to unsuccessful decreases as search time increases. This indicates that every effort must be made to provide a search capability, on the scene, as soon as possible. The interceptors and target aircraft in this command are not equipped to ADF the rescue beacon. Therefore it is evident in our operation that any consideration of aircrew survivability/rescue must recognize this fact: there is no on-scene, time zero, search capability in the accepted sense of the word. The probability of successful rescue is less than optimum from the start. Until suitable search aircraft reach the general area there is very little positive search action available, and an unlikely chance of visual sighting depending on weather and terrain.

In examining this aircrew survival episode, certain events stand out as significant:

(1) There were no aircraft airborne in the collision area during and immediately following the collision, that had an ADF capability. This is significant in that survival site location could not be determined immediately.

(2) Within 30 minutes after the collision, two interceptors from the alert site flew directly over the survivor. This is significant in that it indicates the response that can be made available through on-scene aircraft, notably interceptors and target aircraft, and the difficulty of visual sighting. It is further significant when survival sites beyond 100 miles of a base are considered.

(3) As the search time continued, the search area was constantly expanded. Although many reports of beacon reception were forwarded, there was no clearly defined, precise position indicated. As the weather turned unfavorable, the decreasing probability of success was evident as the rescue beacon failed. Again, rapid detection by on-scene aircraft would have precluded the difficulties encountered by an extended search.

Our present situation (and probably yours), is considerably less than optimum. Effective utilization of the present, and programmed, rescue beacons is limited to the response time of the support aircraft. Time is the critical element in survival success. A healthy man, with adequate equipment and training, can survive — but not indefinitely. By the end of the second day, the pilot found he was very fatigued. Had there been restricting injuries, precluding mobility, the outcome would have been seriously in doubt.

The odds, then, are improved considerably by on-scene aircraft with an immediate search capability. In our area, ADF equipped interceptors and target aircraft would offer the most flexible and immediate response. In your area the situation could very well be different. But the important point is: is the search and rescue capability optimum? Remember, you bet your life it is. The USAF, you, mother and the kids can accept no less than survivability consistent with the highest state of the art. ★

Recently Lt General R. L. Bohannon, USAF Surgeon General, made a presentation to the air staff on the subject of physical conditioning. While his remarks were made to a rather special audience, the advice he had to offer applies to all Air Force personnel who:

- *have gained a few inches around the middle,*
- *keep puffing on cigarettes despite the advice of an overwhelming number of medical authorities,*
- *occupy a chair (or a cockpit) for many hours a day without countering the results of this sedentary activity,*
- *are eager to get to the dinner table but reluctant to leave.*

The Surgeon General's remarks add up to good advice for

I have been thinking that it was about time for me to come over with my little black bag — as your friendly flight surgeon — to remind you of a few principles of preventive maintenance, as they apply to physical fitness and coronary heart disease.

Despite the fact that the American public knows a lot more about medicine than it used to, and can be addressed in sophisticated language, I still intend to speak in common, everyday language, because I believe that only the most straightforward talk is likely to get the message across in the face of the great American tendency to hedge, equivocate, vacillate, dodge the issue, rationalize, find some other way — except the only really right way:

Witness: hundreds of faddish diets — instead of mainly just eating less as a permanent habit.

Witness: the great American affinity for gadgets, and machines, to get around doing work: golf carts, exercycles, relaxacisors, "10 seconds a day physical conditioning" — instead of real physical exertion.

Witness: filter tip cigarettes — instead of *no smoking.*

To begin with: though "executive health" is a phrase we are hearing more and more frequently, and though executives are thought to be subject to certain special health problems because of the unique stresses to which they are exposed, in reality, they are no worse off healthwise than others in their age group, and they should be relieved of the pall of self-concern that has grown up in the popular press.

The executive is a superior person, who usually has fewer difficulties and better health than most people — *if* he follows sensible safeguards and avoids excesses of *all* kinds.

However, that "if" is the item about which I want to talk this morning. "IF" he follows sensible safeguards AND avoids excesses of all kinds, such as, overeating, overdrinking, overworking, excessive smoking, excessive inactivity (another phrase for NO exercise). A recipe for a heart attack: Eat too much, smoke a lot, drink a lot, worry, follow a sedentary occupation.

To speak specifically regarding heart disease, our present experience for active duty Air Force members shows that: On an average day, 195 members will be absent from duty for coronary heart disease; and

- one will die before being admitted (there are two coronary artery disease cases dying every minute in the United States;
- 15 will be admitted;
- one will die after being admitted;
- two will be separated for physical disability.

Findings which have been emphasized as potential cause factors in coronary heart disease are increased serum cholesterol level, increased blood pressure, overweight, reduced lung ventilation, electrocardiographic abnormalities, physical inactivity, high dietary intake of calories of saturated fats, cigarette smoking and heredity.

For prevention, first, I would like to impress upon you the importance of *diet.* We all have a tendency to become less active as the years pass and to eat more than we should, which results in overweight. Excess weight, even in mild degrees, and even at middle age, is directly related to excessive mortality rates. When the problem is recognized, everyone wants a special diet. But fad diets are not the answer; with such diets, people usually regain lost pounds as soon as they begin to feel virtuous about having lost weight, and begin to be "good to themselves" for awhile. So, the main thing is really to just eat less; *i.e.,* change your eating habits for good, not for just a few weeks. It's largely a matter of will power; and I hesitate to believe that anyone of you, having attained his present considerable status, lacks will power. It's more likely to be a case of indecision. If you are overeating, you must decide to eat less for the rest of your life. Any special diet, for special problems like high blood fats, can be obtained from your flight surgeon. The Air Force policy is that the various types of diets are matters between the individual patient and his physician.

Another cardinal rule for good

health: If you don't smoke, don't start; if you do smoke, stop; if you can't stop, cut down, and don't inhale. Stopping can be done gradually or immediately, depending on the personality and the decision, and the will power again, which I cannot believe you don't have. I'm not going to bore you with a lot of statistics. Just believe me, the statistics so far amassed are overwhelming. And it's not lung cancer that causes the greater number of people to be incapacitated, but chronic cough, bronchitis, low vital capacity of lungs, emphysema, coronary artery disease, cancer of the larynx, esophagus, urinary bladder. Any reasonable person must admit that smokers are playing with fire in more ways than one.

The late Bob Benchley was known as a man who dearly loved martinis and other potent beverages. Once a friend asked him, "Bob, don't you know that stuff is slow poison?" "Yes," replied Benchley, "But I'm in no hurry." The same could be said more truthfully about smoking. If you are physically able to be here today, the chances are that you will not die from smoking tomorrow or even next week. I can practically guarantee, however, that by smoking excessively you are not postponing the date of your funeral by one day, and you are likely to be advancing it by several years.

Now, after proper diet and no smoking, there comes the third main factor in prevention of coronary disease — *proper physical exercise*. A program of physical conditioning is essential to health. Middle-aged men with sedentary living habits have improved their functional capacities by 25 per cent as the result of a ten-week course of daily 30 to 40 minute workouts consisting of the simplest form of exercise: alternatively trotting and walking. The 5BX exercises (except for a few which might cause knee or back injuries in those who are susceptible) are good for you. But we are working on a new regime of physical conditioning at Lackland Hospital, designed to meet the special needs of the Air Force. I personally prefer limbering up exercises, stretchings, pushups, pullups, situps, and jogging and brisk walking alternately for 20-30 minutes daily, or bicycling, as a change from time to time. Physical conditioning exercises not only help to regulate the body chemistry (decreasing cholesterol levels) but also make me feel better; and they help maintain a larger energy reserve for the duties of the day. They also afford the necessary daily mental relaxation all executives need in addition to semi-annual vacation periods.

Let me wrap this up by repeating the three principal factors of preventive maintenance over which you can exert control, if you are determined to do so: proper diet, proper exercise and elimination of smoking.

See you in the gym? ★

AVAST YE SWABS! WE'VE BEEN TORPEDOED!

Maj Guy J. Sherrill, Directorate of Aerospace Safety

These words, or their more salty four-letter equivalents, would have been entirely pardonable on the part of the Admiral who had just settled down in the stern of a U-11 on a bright spring morning. No sooner had this redoubtable gentleman satisfied himself that the brown-shoe Navy had everything ship-shape than he felt an abrupt shudder and noted an Air Force T-33 emerge from immediately beneath the starboard engine.

Happily for all concerned, both aircraft and their crews returned safely to their takeoff base. Inspection of the T-33 revealed a badly mangled vertical stabilizer and wrinkled aft section. The U-11 incurred damage to the right wing, nacelle, and gear doors.

Mid-airs are like the game of horseshoes. Coming close counts. In this case the troops almost scored a ringer. But the circumstances of this near-tragic accident involved neither skill, cunning, nor any great deal of athletic talent — just two airplanes at the same place at the same time! How so? Let's review it briefly.

The U-11 departed on a VFR clearance and was flying a standard instrument departure route in VFR conditions. It was not under radar control or on departure control frequency and leveled off at 4500′ MSL.

Two minutes after the U-11 took off the T-33 departed the same airfield on an IFR flight plan and a standard instrument departure. Shortly after takeoff, the T-33 was advised of traffic at one o'clock, about two miles. This information was acknowledged but neither T-Bird pilot had the traffic in sight, as they stated over the intercom to each other. Clearance was then received to climb to 5000 feet and this was followed by an IFF code change. The pilot in the front cockpit was flying the aircraft and the copilot was handling the radio and navigation equipment. Just prior to the collision the pilot made the IFF code change and his copilot was copying the climb clearance on his clipboard.

Although weather was reported VFR, an undefined haze condition existed. This plus the location of the sun, 120 degrees bearing and 25 degrees elevation, undoubtedly influenced inflight visibility outbound on the 137 degree departure radial.

Air traffic control was in accordance with directives. The traffic information given was in the nature of an advisory only and not a required function of ATC. The acknowledgment by the T-33 did not include a negative or positive sighting remark.

It all sounds pretty familiar, doesn't it? Turn out of traffic. Intercept that radial. "Traffic one o'clock at two." "Rog." (Probably a bug-smasher.) "Squawk, two-one ident." Little sun in the eyes. Visor down. "Climb to and maintain flight level two three zero." What the hell was that??

We really can't condemn these pilots as culpable of neglect or lack of alertness. The circumstances are all too frequently encountered. The direction of flight was in the direction of reduced visibility caused by sun and haze. Both pilots at various times had their heads in the cockpit to comply with ATC instructions. The climb and convergence angle coincided with blocking of vision by the canopy windscreen frame. The T-Bird had a high overtake rate over the light plane. Each of these items led to the accident.

But lest we forget, also familiar are the right-of-way rules and the responsibilities of pilots flying IFR and VFR.

"An aircraft overtaking another aircraft will give way."

"It is the crew's responsibility to maintain their own clearance from other aircraft when in visual flight conditions even though they are operating in accordance with IFR."

So while we cannot condemn we must request, nay, urge, maximum use of the eyeballs at all times, regardless of IFR or VFR, and an unrelenting search, especially until we hear those welcome words, "Previously reported traffic is no longer a factor."

P.S. There are enough clues above to detect a goof on the part of the U-11 which was not a factor in the accident. First troop to report it correctly to REX wins the title of VFR Pilot of the Month and the accompanying recommendation to fly O-1s in SEA. Any takers??? ★

WIND velocity profiles

Reprinted from Boeing Service News

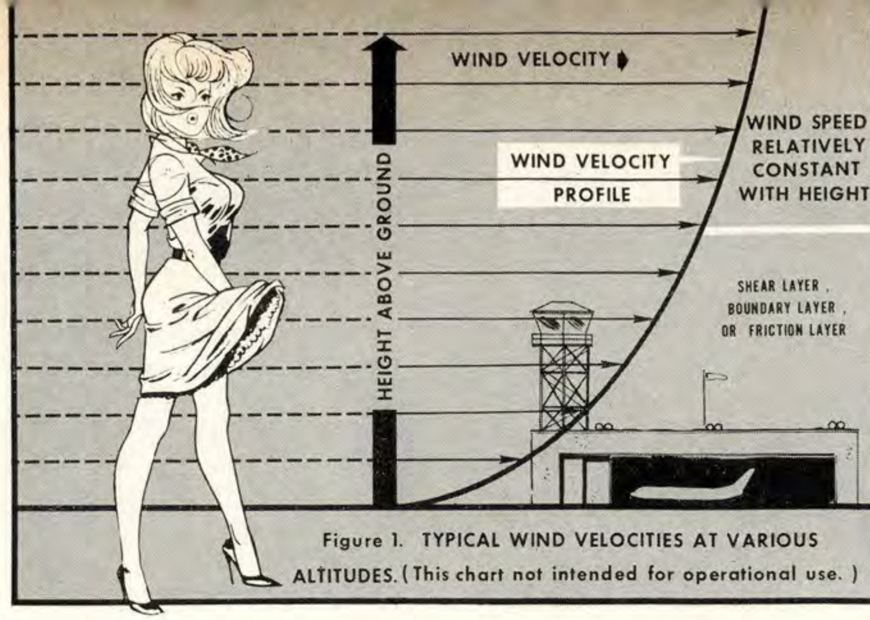


Figure 1. TYPICAL WIND VELOCITIES AT VARIOUS ALTITUDES. (This chart not intended for operational use.)

Since the introduction of emergency war operation downwind takeoffs, the wind velocity profile near the ground is of added significance to pilots. During climbout on an upwind takeoff, the increase in wind velocity with altitude provides a safety factor; but during a downwind takeoff, this increase in wind speed with altitude becomes a tail wind component that must be considered when determining the airplane climbout capability.

The winds aloft move under the influence of forces largely independent of ground conditions. At the surface the wind velocity is always zero with respect to the earth as shown in Figure 1. There is always a shear layer (or boundary or friction layer) at the surface. In this layer the wind velocity changes from zero to the velocity of the prevailing wind aloft. In Figure 1, the wind velocity at various heights is indicated by the horizontal arrows. The heavy line through the end of the arrows is known as the wind velocity profile. The boundary layer is thin with respect to the atmosphere but may be significantly thick with respect to aircraft operation. The height of the shear layer is usually estimated to be from 10 to 1000 feet, depending on prevailing conditions.

The wind profile near the ground depends on the terrain, the temperature lapse rate, the stability of the atmosphere, the time of day, the wind velocity. These factors interact in a complex way making the thickness of the shear layer and the velocity distribution very difficult to predict.

As a rule, wind velocities near the ground are higher during the day than at night, and the ratio of the wind velocity aloft to the wind velocity near the ground is much higher at night than during the day. This is because on a clear day vertical movement of the atmosphere, caused by ground heating by the sun, couples the winds aloft to those near the ground. When there is an overcast during the day (neutral condition), the wind velocity near the ground is somewhere between the velocity on a sunny day and the velocity at night.

Figure 2 illustrates the large variation in the wind velocity profile which could be encountered during climbout. A typical curve is shown for day, night, and neutral conditions. In each case, the reading at the standard anemometer height (14 feet) is divided into the wind velocity at greater heights over the ground to find the velocity ratio. The result is a family of curves of characteristic shape rather than curves of specific data.

The DAY curve shows a significant tailwind increase only during the first 50 to 60 feet of climb. The NEUTRAL curve shows a large change up to a height of perhaps 150 feet. The NIGHT curve shows an appreciable increase in the tailwind component right on up to 300 feet above the ground. All three curves indicate:

- An increase in tailwind can be expected on every downwind climbout.
- The greatest increase in the tailwind velocity occurs in approximately the first 100 feet of climb.
- The airspeed must be monitored very closely during the first several hundred feet of downwind climbout. ★

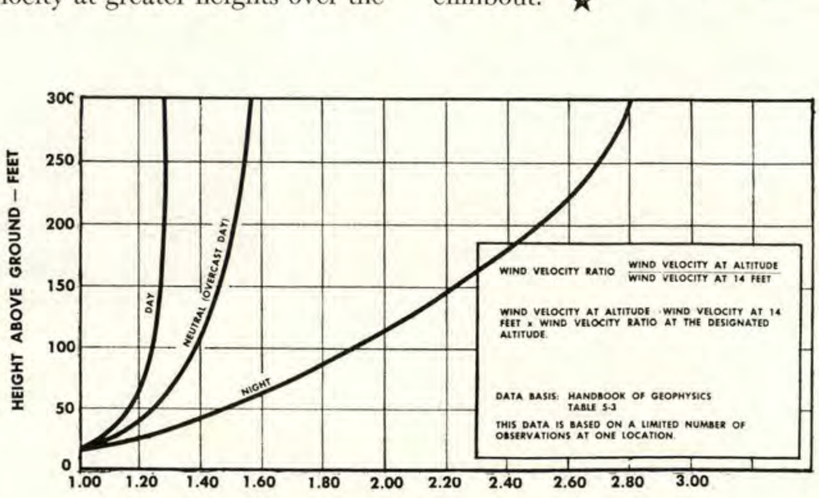
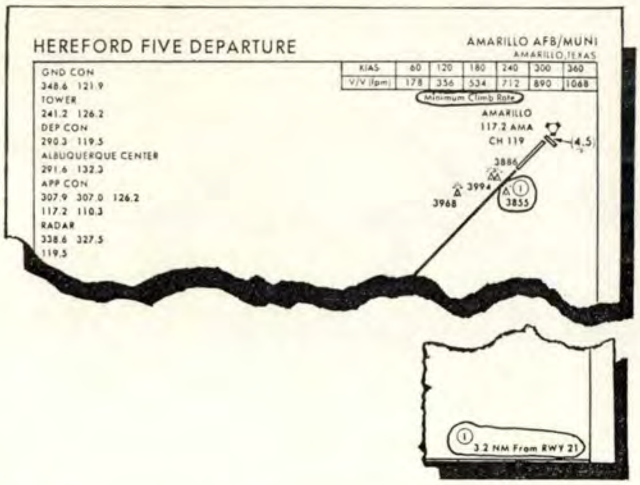


Figure 2. WIND VELOCITY PROFILE CURVES NEAR THE GROUND. (This chart is not intended for operational use.)

THE IPIS APPROACH

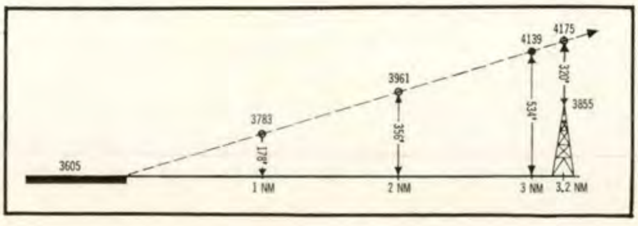
By the USAF Instrument Pilot Instructor School, (ATC) Randolph AFB, Texas



Q Concerning the above SID, what is the significance of the term "minimum climb rate," and how is it used?

A In order to fully understand the significance of minimum climb rates and their use in preflight planning, you should understand how they are established.

The minimum climb rate is derived from a minimum climb gradient based on the location and height of a controlling obstruction. Determination of the controlling obstruction is explained in SID criteria. The minimum climb gradient provides 100 feet clearance over this obstruction for each mile it is located from the end of the runway. In the above example the controlling obstruction is noted as the 3855-foot obstacle located 3.2 NM from the departure end of the runway. The required obstruction clearance is 3.2 NM x 100 or 320 feet. 320 feet added to 3855 feet MSL totals out to 4175 MSL, or 570 feet above field elevation. Therefore, the minimum climb gradient for the "Hereford Five" SID would look like this:



Now, to determine the vertical velocities required to reach 570 feet above field elevation at 3.2 NM is a fairly simple matter. Dividing 570 feet by 3.2 NM results in a gradient of 178 feet per NM. Therefore, at 60 knots (1 mi/min) the vertical velocity required is 178 FPM. At 120 knots (2 mi/min) it is 356 FPM, etc. (Refer to the minimum climb rate table for the "Hereford Five" SID.)

How can you use this information in your preflight planning? Since the minimum climb gradient begins at the departure end of the runway, any altitude you have as you pass over the end of the runway on takeoff is extra margin in your favor, provided you maintain the minimum vertical velocity. Also, notice how you can compute indicated altitude "check points" as you proceed out the initial climb path. For example, at 2 NM from the departure end of the runway the minimum indicated altitude should be field elevation plus the minimum climb rate specified for 2 mi/min (or 120 KIAS) from the minimum climb rate table (3605+356 =3961 at 2 NM).

Minimum climb rates are depicted to assist you in determining required aircraft performance. Use this information to insure a safe departure. ★

DEPARTURE ROUTE DESCRIPTION

Intercept and climb via AMARILLO VORTAC 213 radial to HEREFORD INTXN (AMARILLO 213 radial/LUBBOCK 332 radial) (45 Mile DME Fix on the AMARILLO 213 radial). (Cross HEREFORD INTXN at or above 14,500). Cross HEREFORD INTXN at Alt/Flight Level ____________.

LAS VEGAS TRANSITION—Via LAS VEGAS VORTAC 097 radial to LAS VEGAS.

ROSWELL TRANSITION—Via ROSWELL VORTAC 041 radial to ROSWELL.

HEREFORD FIVE DEPARTURE

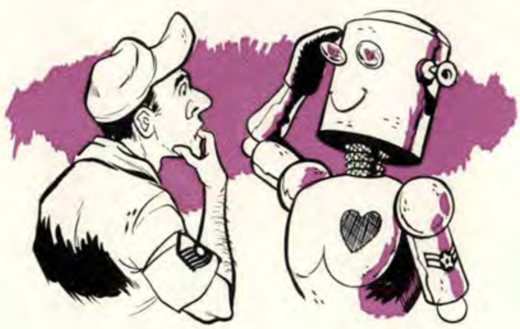
Rex Riley
CROSS COUNTRY NOTES

AERO CLUB L-17 was damaged when the pilot misjudged and the aircraft ran off the end into a wire fence and posts. Damage consisted of nicks in the prop and a dent in the leading edge of the right wing. Apparently the pilot, an experienced military pilot with a commercial license, flew a high, fast approach over obstacles into a 2300-foot strip with only half flaps, a perfect setup for a roll off the far end.

Aero clubs, generally, have been doing a good job and have improved their safety record tremendously during the past few years. Several recent accidents, however, indicate some laxity in supervision and, possibly, checkout standards. A serious violation of the reg has been the carrying of unauthorized passengers. While supervision may be a factor, this is really a personal matter and violation of this provision of AFR 215-2 indicates lack of personal discipline. Since aero clubs are a privilege, it behooves every member to protect that privilege, and gross violators should be dealt with appropriately.

SUPERVISORY SKILL is being put to a test these days, probably more so than at any other time in Air Force history. The fact that the manning documents balance, as far as bodies are concerned, does not mean that skill levels are always on the sunny side. This means closer supervision is required and that a lot of supervisors by title are going to find out if they really are in fact.

One problem that is always with us is that of the young, partially trained, semi-skilled young airman who is eager to do the job but just hasn't had the time and experience to become a pro. Time was when these youngsters could be pretty closely watched to be sure that their zeal didn't exceed their knowledge and judgment. But that was yesterday. Today a supervisor may find that he has an overabundance of three-level airmen, an acute shortage of seven levels, and some fives



that may or may not be sharp at their jobs, depending upon their past experience and the equality of supervision and training they have received. This means a lot of overtime for the boss, the accompanying fatigue and frustration with the possibility that tempers and tolerance may get a bit short. This eventually leads to mistakes, oversights, carelessness and, if acute, to even an I-don't-care attitude. The result is accidents, aircraft out of commission, injuries and deaths.

Unfortunately, we can't reach out and corral a big bunch of sharp supervisors. These are the real pros and it takes time for the development of the peculiar talent and skills that make a first class supervisor. We can't offer these men much relief but we can show them that we appreciate their abilities, their problems and their dedication that keeps them performing at top level. Commanders may be justified in raising hell when the job is not done or not done right, but they'll make a lot of mileage if they are also generous with the pats on the back for the good work that is done and the sacrifices that are made.

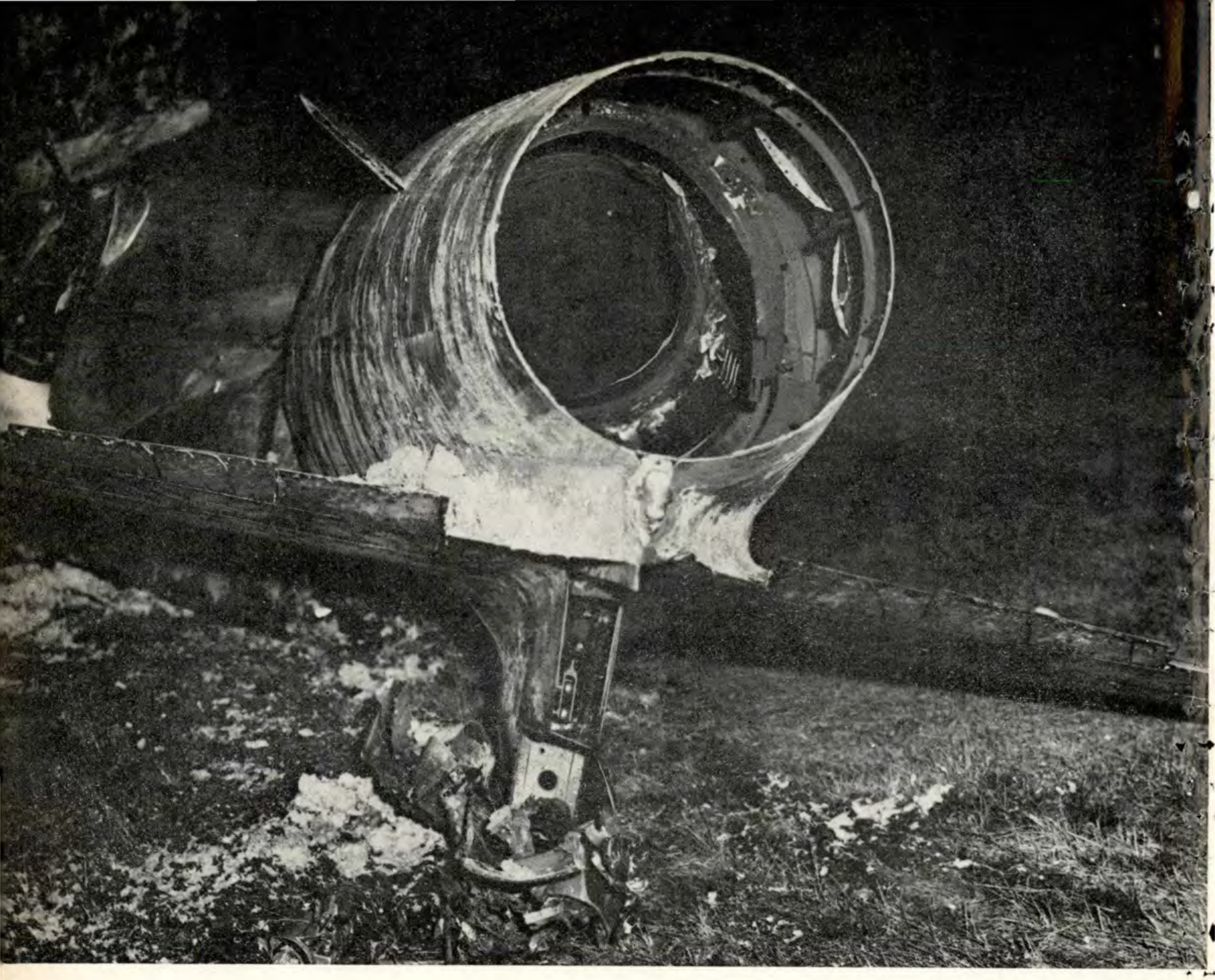
STOWAGE. Two recent incidents were caused by improper stowage of equipment in aircraft. Rex may be wrong, but it seems that during the past few months there have been quite a few such incidents in all commands. Those referenced were (1) a survival kit and an extra parachute stowed beside the seat rails. The seat safety pin streamer was lying across the kit and under the parachute. When the seat was lowered, the safety pin was pulled and the firing pin lever caught

the corner of the kit and fired the initiator. (2) A canvas nose cover for a B-52 was tied to an exposed expansion body bleed joint. The temperature of the bleed air was high enough to set the cover on fire.

Probably these incidents and others were caused by either ignorance or hurrying to get the job done. Anybody doing anything around an aircraft should know his business, and the job seldom requires so much speed that items can't be stowed properly.

LOW LEVEL ROUTES used by SAC are well defined, published and the times of use are published. Nevertheless, light aircraft frequently intrude, probably because of ignorance of the existence of the route on the part of the light plane pilot. Now, an OHR submitted by a B-52 crew reports that two fighter aircraft were guilty of this same thing. During the terrain avoidance part of the flight, the bomber crew said an F-100 passed overhead within 300 feet, going in the opposite direction. About four minutes later another F-100 passed close to the bomber. It also was going in the opposite direction.

Light aircraft flying through these routes are hazardous, but their speed is such that there is a margin of time for the bomber to alter its flight path to miss the light bird. Jet fighters are a different story. Flight planning should preclude intrusion into low level routes during times when they are in use. ★



Two lives for a fuel tank cap is . . . .

A HIGH PRICE TO PAY

That old jingle that goes, "For want of a nail . . .", is just as true today as when it was first coined. The example in mind does not concern a nail, but it does involve an item just as prosaic — a fuel tank cap. The result, two dead pilots and the loss of an aircraft.

The flight was a VFR night training mission in a T-33 for an IP and another pilot in the rear seat for instrument training. The preflight was conducted by the IP with two maintenance technicians. During the walk-around, the pilot had difficulty in removing the right tip tank cap; one of the maintenance men took over and checked and secured the cap. By the time he had completed this, he noticed the pilot leaving the vicinity of the left tip tank and assumed he had secured the left cap properly. The inspection was completed and the pilot climbed into the front seat of the aircraft.

After takeoff the aircraft proceeded to another base where a couple of GCA low approaches were made. Apparently the flight was normal to that point. The pilot then left the GCA pattern at that base and checked in with departure control for his own base stating that his tips weren't feeding and that he'd like to climb to a higher altitude to see if he could get them to feed.

Departure gave him permission for the higher altitude and the climb was made. The pilot then talked with the operations supervisor at home base, saying he had climbed to a higher altitude, rocked the wings, pulled negative "G," pulled the tip tank circuit breaker and operated the speed brakes to no avail. He had decided that he had a stuck float valve and would have to make a heavyweight landing.

When the ops supervisor asked the pilot if he wanted to get rid of his tips, the reply was that there were no control problems and that he would fly around a while to burn off internal fuel, then make the landing. One ILS approach was made, apparently by the pilot in the back seat. Then the pilot called for the barrier and initiated an ILS approach to a full stop landing.

As the aircraft passed mobile, the approach and flare looked perfectly normal to the mobile control officer, although all he could see were the lights of the aircraft. Over the runway, the pilot asked, "Mobile, are you on?" Just after the affirmative reply, the pilot transmitted, "can't hold . . ." The aircraft then nosed up, rolled left to inverted and crashed inverted 300 feet left of the center line and 3550 feet from the approach end.

Although an emergency had not been declared, crash equipment was standing by and the ensuing fire was under control almost immediately. Unfortunately, the pilots were killed during the crash.

Several items brought out in the accident investigation point to the cause of this accident. The primary cause was pilot factor on the part of the IP because he either failed to recognize a severe asymmetrical tip tank fuel condition, or, recognizing the condition, attempted a landing with the resultant loss of control. This appears to be a reasonable finding, but from another point of view, could it not be said that this is blaming a pilot not for causing an accident, but rather for not preventing one?

Looking back into the history of the aircraft, there were several write-ups in the 781A for tip tank caps. For example: A write-up said, "LH tip tank siphons during flight causing fuel imbalance." The note under corrective action was "Fuel cap was too loose."

Another: "Tip tank caps very hard to remove." Correction: "New caps not broken in."

Another: "Left tip tank fuel cap not seating." Correction: "Tip tank cap screw has to be tightened." And so on.

Obviously the IP, who was a flight examiner, member of the stan/eval board, and considered to be outstanding, did not consider the problem serious enough to abort the flight. Then, when he was asked about dropping his tips in flight, he demurred indicating that he had no control problems. However, examination of the wreckage indicated that full right aileron trim existed.

Investigators examine point of initial impact.

When the aircraft crashed, the condition of the tip tanks and the fire pattern revealed that the right tip was practically dry but that the left tank contained a considerable amount of fuel.

After this fatal accident, the bad fuel cap problem was solved so we won't belabor that, as such. But this

Fire was controlled almost immediately, but pilots were killed when aircraft crashed inverted.

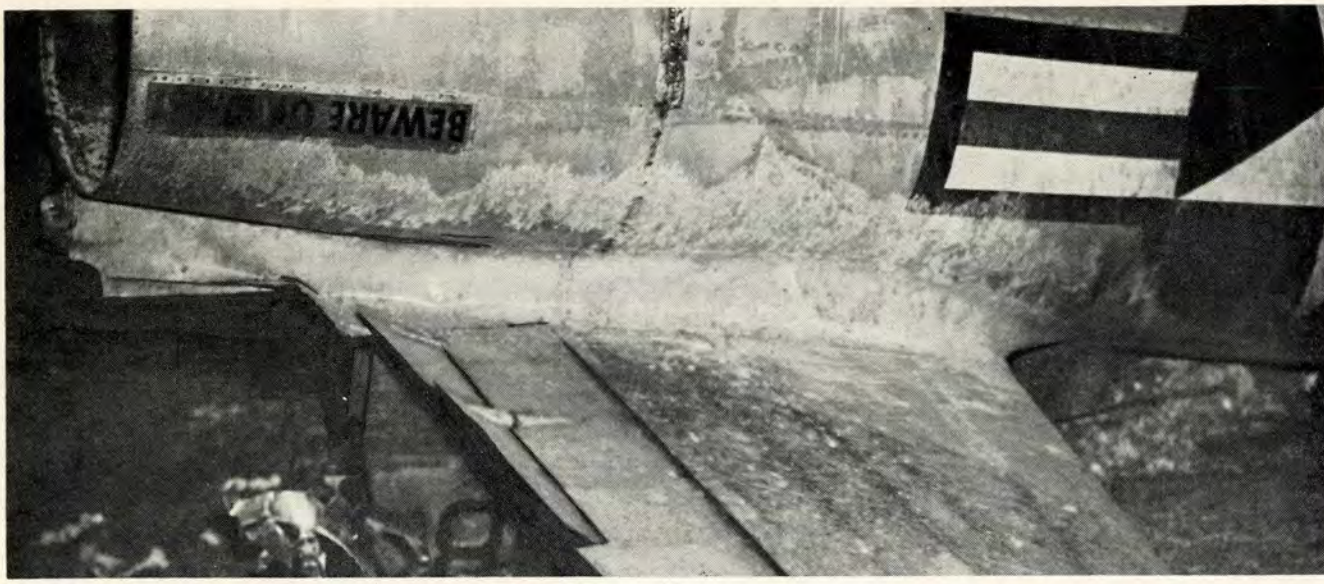


Photo shows horizontal stabilizer with elevator tab in full nose-up position.

accident is typical — if any can be called typical — of accidents that should have never occurred. Here's why:

A small amount of defective equipment got into the inventory—tip tank caps in this case. Although maintenance personnel at the base recognized the problem and worked on the caps, they were not able to get results on all of them. Caps were reordered but had not yet arrived prior to this flight. Units that had UR'd the caps received a reply from the AMA; those who had not submitted UR's were not advised.

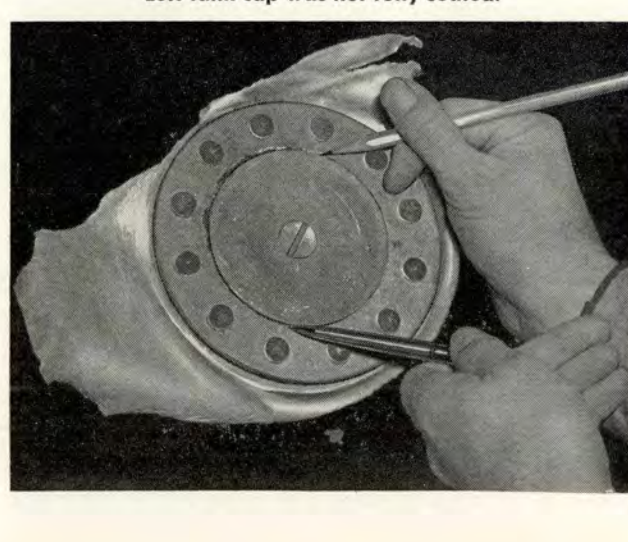
This, of course, does not relieve maintenance from the responsibility of assuring that the equipment is safe and will function correctly.

It is possible that the pilot didn't recognize an asymmetrical condition. He said he had no control problems, but one could speculate as to whether he realized that he had rolled in all the aileron trim he had. (The mobile control officer said the pilot reported checking the ailerons with a flashlight.) This may have kept the aircraft level in flight at higher speeds, but obviously didn't hack it at low speed with gear and flaps during the flare and the apparent attempt to go around.

In summary, what can be said about this accident? First, a minor piece of defective equipment set up a situation that could result in an accident. Then the pilot, for reasons we will never know, decided the aircraft was controllable (despite precautions in the Dash One), failed to drop his tips and attempted a landing. He paid a pretty high price for a bad guess. ★

Damage in left tip tank cap area.

Left tank cap was not fully seated.



OPERATIONAL HAZARD REPORTING
PILOT FACTOR

Lt Col Harold T. Stubbs, Directorate of Aerospace Safety

Our primary mission as Flight Safety Project Officers in the Directorate of Aerospace Safety is Accident Prevention. In our pursuit of the elusive zero accident rate, we look for trends which could develop into accidents if not properly checked. Materiel failures, procedural deficiencies, and after-the-fact hazards, which have resulted in accidents, are fairly easy to remedy through existing reports. A trend in human error called "pilot factor," unfortunately, is not easy to detect in advance of an accident.

We pilots, being human, do not like to point out or broadcast our mistakes and deficiencies. The fear of creating a bad impression on the boss sometimes overshadows the desire to help others from making the same mistake even though a remote possibility exists that an accident could result. After all, we know we sometimes make mistakes, but why point this out to the boss when ER's mean so much? That landing the other night with touchdown just short of the runway didn't damage anything so why tell anyone? It would only create trouble and paperwork—besides, "I've only done it twice before and I think I know what I've been doing wrong now."

As can be readily seen in this exaggerated (we hope) case, a trend has developed that requires immediate attention and correction. It is possible, of course, to correct this deficiency within the unit, but other organizations may need the information to correct a like deficiency which they don't know exists. The Operational Hazard Report (OHR) provides a vehicle for reporting human error incidents and still permits you to remain anonymous. It is true, in some cases, that your unit flight safety officer could pinpoint the individual by checking times, who flew in that environment, etc., if he wanted to do so. But remember, he doesn't want to destroy the value of the OHR.

The point is that we are not getting this type of information at present, and the job of detecting trends in this area is most difficult without it. The desired end result of our effort in this area is to further protect the combat potential of the USAF by saving lives and equipment. Unless you, as a pilot or crewmember, conscientiously use the OHR, our efforts are stymied and all of us are losers. ★

SMSgt Edward M. Parr, AFRes, San Fernando, Calif.

A pint-sized object that has become omni-present on the American scene is the aerosol dispensing container, also known as the "aerosol bomb." Just to see what kind of a BANG we get out of it, let's explore some of the more intriguing fire/safety features of these devices, which are now used for conveniently dispensing everything — literally — from foot powder to suds (soap-type suds, that is . . .)

THEIR CONTENTS

This is probably where one would expect the most obvious of the hazards to be found. Anyone (?) at all would be leery of such normally-risky materials as pressurized car engine starter, oil-base paints, or hibachi primer — after all, they're items that should be kept clear of burning matches and human mouths even when the stuff is found in its more familiar, unpressurized, liquid state. We would usually expect such wares to not lose any of their hazardous properties just because they come to us in attractively wrapped spray containers.

But, one may ask of the fire hazards of something like an aerosol of household bug-killer, "Isn't it just as safe as kerosene?" It's common knowledge that such sprays are mostly kerosene-base, and *everyone* knows that kerosene is much safer than, say, gasoline. So what's so dangerous about it, except maybe to mosquitoes?

True, kerosene may be safer than gasoline, until the kerosene is heated up to about 110°F, *or until kerosene is dispensed into the air in spray-droplet form.* Then, our old "safety solvent," kerosene, can become every bit as dangerous as gasoline! Maybe even more so, because most people seem to generally regard kerosene as always being safer.

Incidentally, that earlier point about what happens when kerosene-type solvents are heated above something in the neighborhood of 110°F explains why a number of Bar-B-Q'ers have been suddenly burned when they've tried priming their reluctant hibachi or picnic fire with the stuff, or with one of its close petroleum relatives. Under those conditions, they might just as well have tossed a ration of high octane onto the coals. Simply put, the moral here is not just DON'T, but rather NEVER!

If you're thinking that the hair spray which milady uses to set her burnished locks in place is a commodity apart from all of this, guess again and read the fine print which appears — hopefully — on the backside of most of these cannisters. Speaking of milady, what's she been using to pull the periodic, first-echelon maintenance on the interior of the family cook-oven? If it's something squooshed out of an aerosol "bomb" — and if the oven is the gas type, complete with pilot light — she'd best either go back to grandma's way of elbow-grease liberally mixed with water and soapsuds, or make darn sure that that pilot light is long gone and the oven stony cold before the aerosol is squirted. It might also be well to note here, in passing, that if any household chemical used for cleaning isn't cutting the mustard — or grease — quite as effortlessly as Madison Avenue ballyhooed it, under no circumstances should the little lady try to soup things up by stirring in some other kind of chemical to boot.

Household chemicals, used singly, are generally fairly uncomplicated materials. Two or more, mixed together, however, may produce completely unexpected and even possibly fatal reactions. The classic example of this was the conscientious housewife who was locked in battle with the stubborn water ring in the family commode. Since the nasty ring stoutly resisted one type of bowl cleaner, she stirred in a portion of a second chemical — with the first still in the water. The two different chemicals, mixed together, generated a quantity of a deadly gas, felling her.

In short, even the ancient Romans had a slogan for it: *Let the buyer beware!*

THE PUSH-OUTER

'Tis easy to see that anything which squirts when its button is punched must have something inside to provide the push. In aerosol dispensers, this is supplied by one kind of gas or another, generally referred to as the propellant. Such good stuff as butane or propane may be used. Since this same gas is often employed to make fork lift trucks go, or to provide the heat in remote-location heaters, its less desirable properties become readily apparent. In a word, it can explode; even if the liquid contents of the "bomb" might be something like a seemingly safe water-base substance.

The noncombustible gas Freon is sometimes used for a propellant, too. While this is certainly a safer arrangement than, say, butane, the true safety of these dispensers depends upon much more than just any single factor such as the nature of the propellant.

LIKE A BOILER WITHOUT A SAFETY VALVE . . .

None of us would relish having such a water heater about the house, but under the wrong circumstances an aerosol cannister can behave in just this way, regardless of the type of propellant and/or liquid which it contains. Here we have a sealed tin can under varying degrees of pressure, but no safety valve to go Pop! if the inside push starts to unexpectedly build up.

There are quite a few stories circulating around concerning what all of this can eventually lead up to. A rather choice yarn is the one about the fellow who, always prepared, started out across the Great American Desert on a hot summer day with a can of pressurized spare tire-inflater in the trunk of his dark blue auto. Toward the end of the afternoon, he heard a muffled Pow! in his aft quarters and stopped to see what had boomed. Raising the lid, he found a sizable dent in one side of the trunk. Seems that one end of the "bomb" had blown out due to the excessive, heat-caused pressure build-up, and the cannister had taken off like a projectile. He got a fringe benefit out of it all, though: The interior of the trunk was very nicely sealed against any future water leaks.

PRECAUTIONS

Like any other hazardous household item — chemicals, medicines (yes, even aspirin) — it almost goes without saying that something having the potential of these cannisters needs to be kept in a sturdy lock-up, well away from the curiosity of small children. A squirt of hairspray — no matter how accidentally—into sister's open eye is no joking matter.

Because of their sealed pressure characteristics, even so-called "empty" cannisters can be expected to explode violently if heated. So, don't toss them into incinerators, fireplaces, picnic fires, or piles of raked and burning leaves. Along this line, a recent fire report refers to an empty aerosol "bomb" which was thrown into an incinerator. When the cannister exploded, the basement door to the furnance was blown off, a first-floor chimney door was blown open, and material in the adjacent basement room ignited. Result: A fire doing $35,000 worth of damage.

If you are a warehouse or supply troop, make certain that none of these devices are being stored near heating pipes, in the direct rays of the sun, or in other unusually warm places. Further, keep stacked cases of aerosols piled low, to lessen the possibility of their toppling. If storage is in a warehouse equipped for forklift truck operations, cases of these items are best stored in a location away from main aisles of forklift traffic. Should the cases bear the Interstate Commerce Commission's red, diamond-shaped shipping label (seldom if ever found on individual cans, only case exteriors), this means that the contents are a flammable liquid and should be handled with the same care and observance to pertinent regs that would be called for by similar quantities of such materials as alcohol and gasoline.

All in all, these devices are neither 10 feet tall nor do they walk with seven-league strides. Handle them with the thought and respect due them for what they are — extra hazardous items — and the omnipresent aerosol "bomb" can be every bit as compatible with you and your continued well-being as any other labor-saving device found about the modern home, shop, office, or stockroom.

But, 'tis always truly spoken: Let the buyer beware! ★

The life raft was designed to be your friend in need; but inadvertent inflation can make it your deadly enemy. There's no room in a tight cockpit for a . . .

RAFT ON THE LOOSE

Maj George C. Braue, Life Science Division

Within one week there were two incidents in which life rafts inflated in cockpits during flight. Both incidents are briefed here to furnish you, the users (aircrew members) and those of you who are responsible for maintenance of survival kits and rafts, the consequences of a RAFT ON THE LOOSE. Read first, be thankful it wasn't you, and then let's go over some lessons learned.

F-5C. At approximately a 4½ G, 450K pullout passing through level flight, the pilot felt a thump and the survival kit pushed him up a few inches. The aircraft was then between 2000-3000 feet, slightly nose high. The life raft forced itself out the left side of the survival kit causing the pilot's left leg to come up to the instrument panel. It then took up the space between the stick and the left console forcing the stick to the right. This caused approximately 6 to 7 consecutive rolls to the right. The pilot was passing through broken clouds between 1500 and 4000 feet and was unable to locate the altimeter or visual references on the ground. Ejection was attempted but the right handle would not raise due to the force of the life raft on the left handle. The aircraft had slowed considerably and the pilot saw the ground and 4000 feet on the altimeter. He took his survival knife from his right "G" suit pocket, punctured the raft, then stowed the deflated raft under his left leg and down under the seat, and returned to his flight position. The pilot estimated this entire incident took place in a space of between five and ten seconds.

The probable cause of this incident was that the over-center mechanism of the valve on the dinghy inflate bottle had "tripped" to the inflate position. The handle and cable for normal operation were in place and had not caused the valve to trip. There is no capability for "G" loading alone to trip a properly positioned valve; therefore, the suspected cause factor is that the valve was partially "uncocked" either from installation or from something inside the kit falling against it after installation.

A one-time inspection of all other F-5 seat kits was accomplished with no discrepancies noted. Also, a "dinghy" knife has been installed on the instrument panel visor to facilitate puncturing of inadvertently inflated dinghys.

Give you the sweats, friend? Then read this next one for the pièce de résistance and see why we are mighty concerned.

F-106. Approximately three minutes after takeoff, after executing a climbing right turn at 450 knots, with a pitch attitude of approximately 20 degrees nose up, the pilot felt a sharp explosion. He was immediately forced against the top of the canopy and the aircraft pitched forward into an approximately 20-degree nose low attitude. The pilot was unable to reach the stick, and immediately commenced the ejection sequence. As he reached for the handle, there was another explosion. He then settled back into the aircraft seat, alighting canted slightly to the right. He was able to control the aircraft and landed uneventfully. The pilot realized only after he had commenced the ejection sequence that his life raft had inflated and subsequently burst.

During analysis of the system, thumb screw, P/N 900520-1, was found to be screwed completely into the bar that holds it. This prevented the ball and roller on the CO_2 valve safety unit assembly, P/N F900476-1, from seating. In this condition the CO_2 bottle could very easily have been fired by minor vibration. The bottle slides back and forth slightly in its mount, and this sliding is normal; however, under the conditions described above, it would be enough to fire the bottle. The set screw holding the thumb screw was loose, and the survival kit container was packed in a rather disorderly manner which made packing of the raft uneven and placed stress on the fitting between the raft and the bottle, which may have helped to unseat the inflation valve.

All rafts should be inspected to ensure proper thumb screw clearance and this incident should be given the widest dissemination possible in order to prevent recurrence.

Instead of being available to save a life in an emergency, the raft became an instrument of an emergency, nearly causing the loss of life and a loss of an aircraft. Why? Apparently due to faulty installation of the CO_2 cylinder and its actuating mechanism.

Inadvertent life raft actuation appears to run in cycles. The personnel responsible for the maintenance and inspection of survival kits and the installation of life rafts must return to strict adherence to T.O. procedures and instructions.

Supervisors must provide closer surveillance of work performance. Personal equipment technicians' functions are just as crucial as those of specialists involved in the maintenance of the aircraft itself. Witness these two incidents: two lives, two aircraft, redeemed only by the grace of good fortune. A good question to ask oneself: Could this happen in my shop? Better yet, a more personal question: Could this happen to a kit I packed?

To the aircrew there should be many lessons derived from these two incidents. First of all, it can happen and not only that, it can happen at any time. Unfortunately, we haven't been able to "Murphy" proof the raft inflation system. Seems like Murphy slips in to prevent actuation when we need it, and, just as bad, causes actuation when we least need it. As noted in the F-106 incident, it takes a while to recognize the problem. We hope that the publication of these incidents may alert you to what occurs in inadvertent raft inflation.

Secondly, we note that the raft may jam or interfere with the controls; however, we can't predict what reaction will occur to raft pressure on the controls. In one, a rolling action; the other, a dive ensued.

Thirdly, ejection may be impossible due to inability to reach the ejection controls. This is the first case where we have had described the difficulties of the F-5 pilot in that the raft held the handles down. A little imagination can be used to foresee other problems, such as raft covering the D-ring or the seat handle.

Finally, we can again see the need for some available means of puncturing the raft if this should occur. We can remember an exercise in "Pig Sticker" or Raft Puncture Device positioning undertaken back in the F-86 days. Pig stickers were taped to the stick until a volunteer fired a raft in the cockpit on the ground for demonstration purposes. Before he turned purple, it was noted he could no more reach the stick than he could hold a martini, for he was crammed up into the canopy under the instrument panel shield. Some sort of device should be placed either on the man or high in the aircraft to be readily reached when the pilot is forced up into the canopy. The F-5 pilot was unique in that he could reach his "G" suit pocket and knife. Incidentally, we know of cases where a pencil was used to do the job.

A bright spot may be on the horizon as the Life Support SPO brings out a newly designed inflation assembly for life rafts called the FLU-2A/P. This new light weight bottle has a different actuation mechanism that can be activated from any direction of pull, thus eliminating some of our failures to inflate. It appears to be less complicated and less vulnerable to activation by shifting in the kit. Heard this story before? Hope springs eternal. ★

NEW FACES

New assignments in the Directorate of Aerospace Safety include Col James G. Fussell, who has taken over as Chief of the Flight Safety Division, and Col James P. Hagerstrom, Chief of Fighter Branch.

There are also three new project officers whose pictures, assignments, addresses and phone numbers are supplied so that they may be reached directly by those of you who may need their assistance.

Tactical Section

AFIAS-F-2B
Ext. 6778, 3886, 2277

Maj Michael J. Filliman
F-104

Maj Robert M. Bond
F-105, F-84

Transport Section

AFIAS-F-1B
Ext. 6284, 6258

Lt Col Murray Marks
CV-2, CV-7, C-47, C-54
C-121, C-46

Missilanea

DON'T LOOK UP! — Airman Smith was not enthusiastic about assisting Sgt Jones in running pressure checks at the base of the missile gantry. It was a hot sunny day and he was perspiring under his hard hat. He probably wished he were fishing at the lake instead of working at the space launch complex. He may have been thinking about a big bass on the end of his line when he heard someone above him in the gantry, shout "Look out below!" Airman Smith looked up to see who shouted, and WHAMMO!! the lights went out. Later, when he awoke in the hospital, Airman Smith was informed that when he looked up to see who had shouted, a screwdriver (dropped from above) entered his mouth and pierced his tongue and lower jaw. Fortunately it missed his eyes and other more vulnerable areas.

You may say, "That could never happen to me because I don't work in a gantry and I always wear my hard hat." You could be dead wrong. A hard hat does not protect the face of a worker when he looks up. If you are down in a missile silo, under the edge of a building, or near a telephone pole, you are in a similar position. The point is, when you work where other people are above you, try to stay under protection. If this is impossible, pause a moment before looking up when you hear a shout. It may save you from injury — or even save your life.

Maj D. E. Cook
Directorate of Aerospace Safety

TIN EAR. The contract for the purchase of head sets for use with Titan II breathing equipment has been finalized. The delivery date is specified as 31 October 1966. TCTO 21M-LGM25C-699, to accomplish the modification, will be distributed concurrently with hardware delivery.

This very significant advance in safety/emergency equipment is the result of a great deal of effort and team work expended by personnel of the Directorate of Materiel and the Safety Division, SAC; Titan Tech Services, OOAMA; Electronics Branch of Service Engineering Division, SMAMA; and the Inventory Management Division, WRAMA.

Special mention is made, however, of the contributions made by 1st Strategic Air Division, Vandenberg AFB. Major Herman F. Profit, Project Test Officer, with the assistance of highly qualified communications, operations, safety, and contractor personnel, proved the feasibility and practicality of this modification.

Lt Col Kearn H. Hinchman
Directorate of Aerospace Safety

WANTED: TALLER CREW CHIEFS. The night was dark and cloudy. Suddenly, the quiet was shattered and another alert force exercise was underway. The B-52 crew chief hurried to get his aircraft ready for the operation. Quickly he moved to his AGM-28 missiles. While removing the pitot probe covers, he pulled downward, bending not one but each of the probes on both missiles. Scratch two Hound Dogs for the evening exercise!

Personnel Error: The pitot probe is approximately eight feet above ground and must be removed by pulling it almost straight forward—not down.

Since all of our crew chiefs aren't at least six feet tall, a new pitot cover is being designed. This will allow our short crew chiefs easy and rapid probe cover removal by pulling in any direction. ★

Maj E. D. Jenkins
Directorate of Aerospace Safety

AER BITS

F-105 FOD — The aircraft was impounded for investigation of rapid stick movements and freezing of the stick with the stab aug engaged. A quarter inch drill bit and spacer were found in the aft section of the aft stick well. Scratch marks in the well and paint on the drill bit indicated that the bit lodged between the stick linkage and the well floor in such a way that stick freezing could occur.

A-1E NIGHT FORCED LANDING— The student pilot was on a night local area training flight when engine power suddenly advanced to 56 in. MAP and stabilized. Throttle movement had no effect on engine power. Knowing that he could not land the aircraft at this high power setting, the pilot climbed to altitude over the home field and shut down the engine. He then set up a forced landing pattern and successfully landed the aircraft without further incident. Investigation revealed that the MAP regulator diaphragm had failed.

This pilot knew his aircraft systems, basic aircraft performance and emergency procedures from A to Z. His skill and courage saved a sorely needed combat aircraft and he deserves a pat on the back for doing a job.

Maj. Frank J. Tomlinson
Directorate of Aerospace Safety

AFTER A PRACTICE INTERCEPT mission was completed, the pilot of an F-89 cancelled IFR to recover VFR. On the way back to the base he made two passes over his parents' home to impress his brother who had just returned from Vietnam. As he pulled up after the second pass, the right wing failed and the aircraft disintegrated in the air. The pilot ejected okay, but the RO was fatally injured by the resulting explosion which hurled him from the aircraft.

The final report is not complete but it appears that the wing was over-stressed. You old '89 drivers will remember the problems the bird had back in the early '50s. The wing was beefed-up but critical overload restrictions were put on, especially at low altitude. Age certainly hasn't improved the situation, as it hasn't for any of our other aircraft that are still flying well beyond their life expectancy.

We might make an analogy of these aircraft to some of our 40-ish year old officers. We are okay as long as we remember we are 40-ish, but when we forget and try to act like 21-year-olds, we start having materiel failures. These old aircraft will function okay too if we treat them with the respect their age dictates.

Disregarding directives and restrictions is certainly not respect. It also puts the rest of the crew in a difficult situation. In this case a deadly one.

Maj. Don R. O'Connell,
Directorate of Aerospace Safety

THE ACCOMPANYING PHOTO tells a story by itself, but there are a few details of this fiasco that the picture doesn't explain. To be brief, the C-123 whose mangled tail appears in the photo was towed into a hangar through a door 47 feet high. The trouble occurred when another tow crew attempted to move the aircraft out through a 30-foot door. The C-123 stabilizer is 34½ feet tall.

Actually this wasn't a towing crew; rather, it was a group of men acting as a tow crew. A couple of the men were members of the C-123 crew; they thought someone else was responsible for the movement. The airman driving the Coleman was qualified as a driver but not as a towing operations supervisor, so he thought someone else was in charge. There were some other airmen and a civilian in the act, all thinking that one of the others was the boss.

To complicate matters, a sign by the hangar door operating switches gave the clearance and stated that certain aircraft could not be accommodated by the door. The C-123 was not listed.

Estimated cost of repairing the aircraft was in excess of $3,000—not to mention downtime.

HAZARD OF ELECTRO-EXPLOSIVE DEVICES—All transmitters of radio, television and radar create a field of electro-magnetic energy in the space surrounding their antennas. The energy transmitted can be received by another antenna or configuration of antennas. This configuration can be the initiator bridgewire of an electro-explosive device (EED) which acts as a receiving antenna. The configuration of the wire, if just right and power density is strong enough, could pick up enough current to heat the bridgewire and ignite the primer mix. Objects around an explosive device can act as reflectors or directors and increase the energy to the receiving antenna. Maximum current received will occur when EED lead-in wires are approximately straight, their combined length being one-half the transmitted wave length or odd multiple thereof, and with the bridgewire forming the center of the load.

AFM 127-100, Paragraph 0625.5 warns personnel to take precautions when handling electro-explosive devices so as to not form a resonant dipole or loop antenna.

The number of reported cases of RF energy firing explosive devices are few. To fire an EED it would be necessary for the initiator or the lead-in wires connected to it to be in the field of radiation where the power density would be sufficient to cause heating of the bridgewire; the frequency being transmitted would be the resonant frequency of both the lead-in wires and the initiator, for maximum pickup of energy.

Since initiation by RF energy would be difficult to detect, very few cases have been reported. RF incidents could have occurred for which the conclusion was unknown.

To eliminate this potential hazard of inadvertent initiation of electro-explosive devices by radio frequency energy, more attention is being given to the selection of these devices. The trend of explosive design has been to produce more sensitive explosive initiators. The more electrically sensitive the explosive unit, the smaller the amount of energy required for its initiation. Engineers are at last acknowledging the fact that the hazard is real and are working to develop preven-

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AERO BITS

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tive measures to eliminate it. One preventive measure is to ensure that all electro-explosive initiators are able to withstand a minimum no-fire current of 1.0 amp or 1 watt-dc, whichever results in the maximum energy dissipated by the bridge-wire for five minutes minimum without firing or dudding.

Personnel should be cognizant of the hazard associated with RF transmitters and heed the safety precautions in AFM-127-100 while handling electro-explosive devices.

Alvin G. Laird
Electronics Engineer
Explosives Safety Div.
2705 Airmunitions Wg, OOAMA
Hill AFB, Utah

OLD OR NEW MODEL. Can you tell the old model CRU-60/P manufactured prior to 1 November 65 from the new and improved model manufactured since 1 January 66? Same company names appear on them but there are many improvements. OCAMA is revising Tech Order 15X5-4-1-101 to condemn Gilco connectors received prior to 1 November 65.

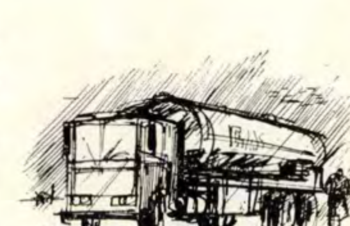
The hose on the new model Gilco is nearly the same color as the oxygen mask hose. The hose clamps are of stainless steel. Turn it over and the back plate should not have a teardrop slot. The female port on both models have been extended one-half inch to prevent shoulder harness hang-up. Now you know the new from the old. It pays to stay up to date.

Maj. George C. Braue
Life Sciences Division

FUNNY FUEL. Shortly after refueling at a civil airport, a U-3 was started up and taxied out for runup prior to takeoff. While the crew was copying the ATC clearance the right engine quit and could not be restarted. Then the left engine began to run rough and was shut down. Reason: Both main fuel tanks and fuel lines contained approximately 50 per cent water and 50 per cent fuel.

Later inspection of the operator's fuel servicing system found it satisfactory. However, the operator said that on the day the aircraft was serviced the drain holes in the walkway on top of the refueling unit were stopped up. This allowed water to stand in the enclosed walkway and some entered the tank around the manhole cover. The night before there had been a heavy rain.

If this crew had not been delayed by the ATC clearance there could very well have been a serious accident. It is recommended that crews of aircraft serviced with fuel at other than military bases make a fuel check for contamination. Preferably this check should not be made for at least an hour after servicing. ★



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WELL DONE

LT COLONEL EDWARD C. HECKMAN, JR

4780 AIR DEFENSE WING, PERRIN AFB, TEXAS

Lt Colonel Edward C. Heckman, Jr., flying a T-33, was acting as a high altitude traget for a TF-102A on a student training mission. Approximately 10 minutes after level-off at 39,000 feet, Colonel Heckman felt an explosion in the aft section of the aircraft, accompanied by a loss of engine RPM and EGT. He immediately activated the gangstart system, but the RPM and EGT continued to decay to zero. Realizing that further attempts to start the engine would be futile, he turned off the gangstart switch and stopcocked the throttle. He then declared an emergency and turned off all electrical equipment except the UHF radio. The GCI controller gave him an immediate vector toward Perrin. The TF-102 intercepted the T-33 and reported that there was no fire or major aircraft damage. While passing 28,000 feet, it became evident that it would be impossible to glide to Perrin. The controller advised him that Paris, Texas, was approximately 30 miles away and had a 4500-foot runway available. Colonel Heckman elected to attempt a flameout landing and requested that GCI vector him toward Paris and check to see that the runway lights were turned on because of the impending darkness. As he continued his descent, the canopy and windscreen frosted over, forcing him to continually divert his attention to scraping the canopy to improve visibility.

Colonel Heckman lowered the landing gear by the emergency system at 6000 feet and completed a normal flameout pattern. Touchdown was made approximately 300 feet from the approach end of the runway at 120 knots. Colonel Heckman utilized maximum braking and opened the canopy at approximately 80 knots, but was unable to stop on the runway without blowing the tires. The aircraft stopped after traveling one foot into the grass at the end of the runway. Colonel Heckman's thorough knowledge of the aircraft systems and ability to cope with the situation enabled him to successfully land the aircraft on a marginal runway under very unfavorable conditions caused by impending darkness and reduced cockpit visibility. WELL DONE! ★

DON'T BLOW YOUR

HOTHEADS MAKE MISHAPS