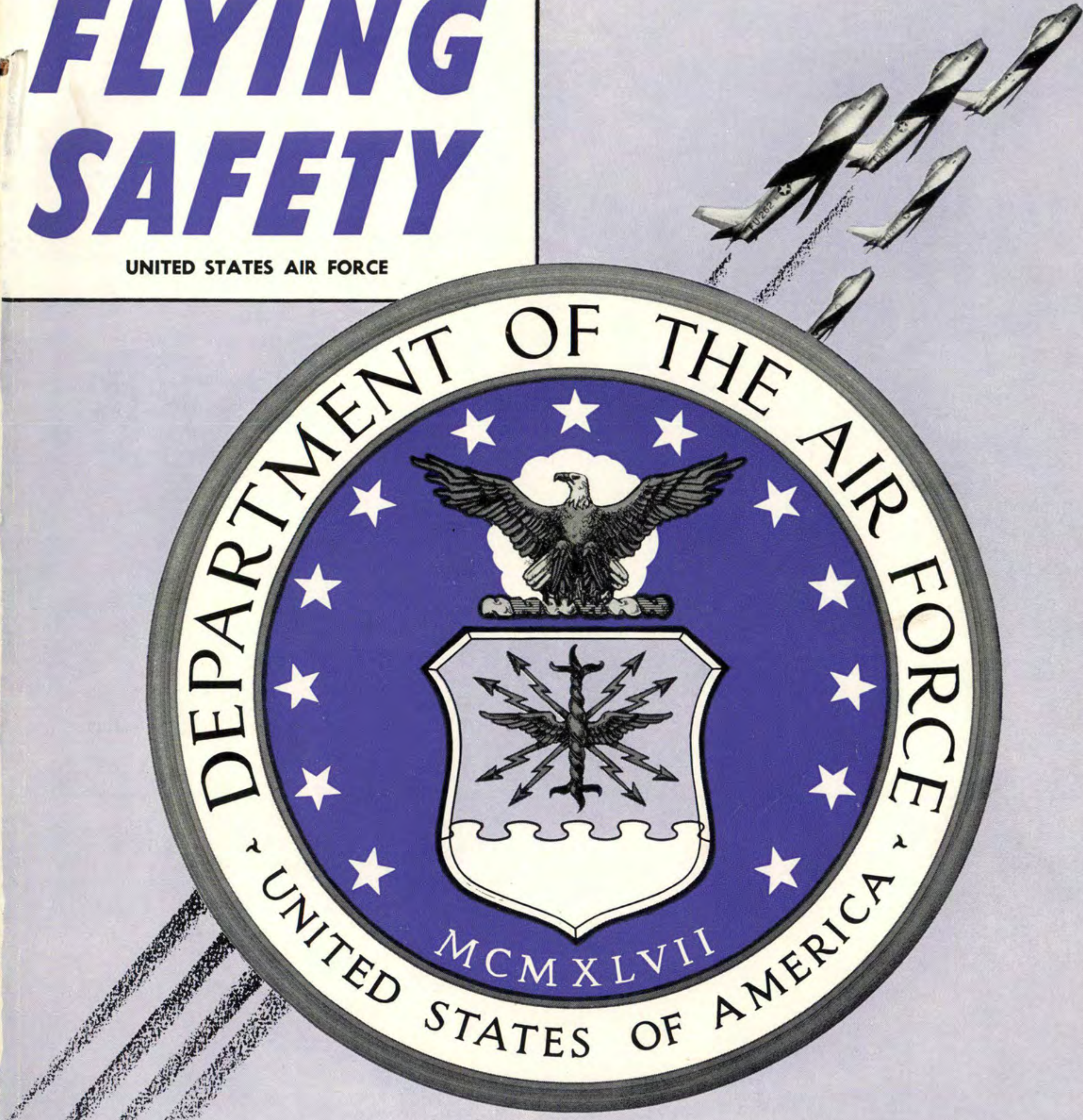
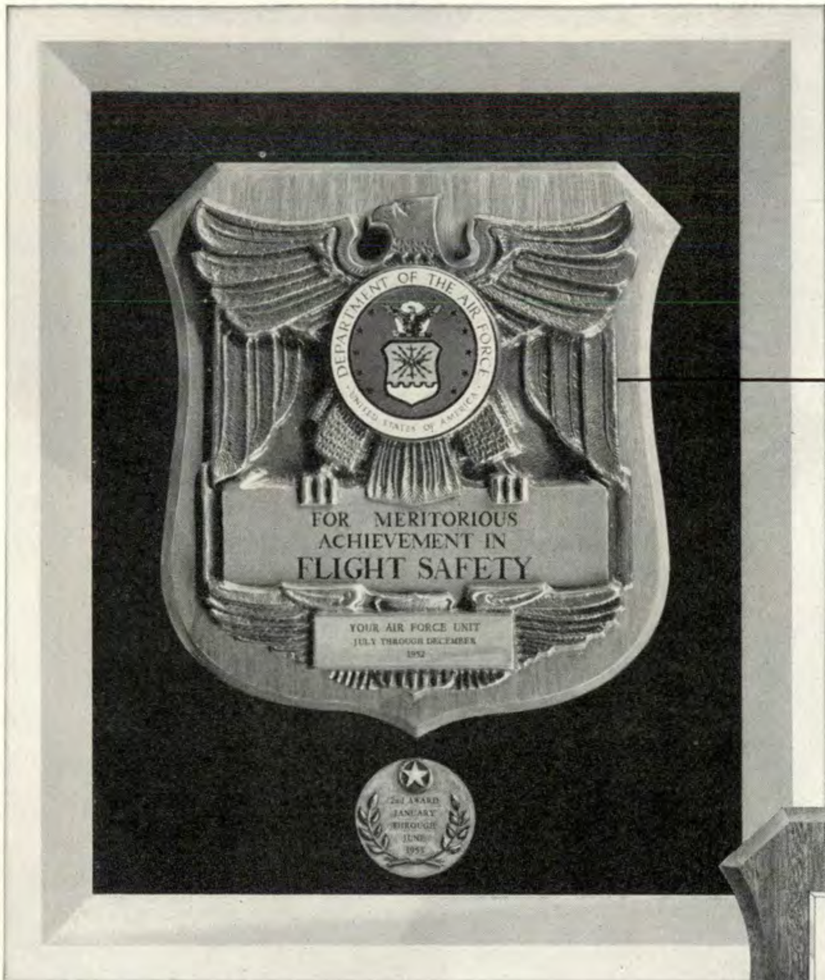
FLYING SAFETY

UNITED STATES AIR FORCE

MAY 1953





the
NEW

the
OLD

Pictured above is the new Flying Safety Award Plaque, soon to be presented to those Air Force bases exhibiting outstanding flight safety records.

A departure from tradition will be the medallion, shown at the left. This will be awarded in lieu of a second plaque, when the same base comes up again for an award . . . sort of a cluster to the original "medal."

VOL. 9 No. 5 MAY 1953

FLYING SAFETY

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CONTENTS

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First FSO Class—Here is the first class of flying safety officers to attend the USAF School for FSO's at the University of Southern California:

Back Row: Maj. J. M. Hall, Jr., Kirtland AFB, ARDC; Capt. W. B. Forbes, Kelly AFB, MATS; Capt. C. N. Wahl, Foster AFB, ATRC; Capt. J. H. Walther, Elmendorf AFB, AAC; Capt. D. E. Carter, Donaldson AFB, TAC; Capt. L. F. Droll, Baltimore, Md., ARDC; Capt. W. H. Maxwell, Langley AFB, TAC; Maj. E. H. Bentzer, Luke AFB, ATRC; Capt. R. R. Thomas, Bolling AFB, CAP; Maj. D. E. Fittor, Stewart AFB, ADC; Capt. D. J. Perry, Hunter AFB, SAC.

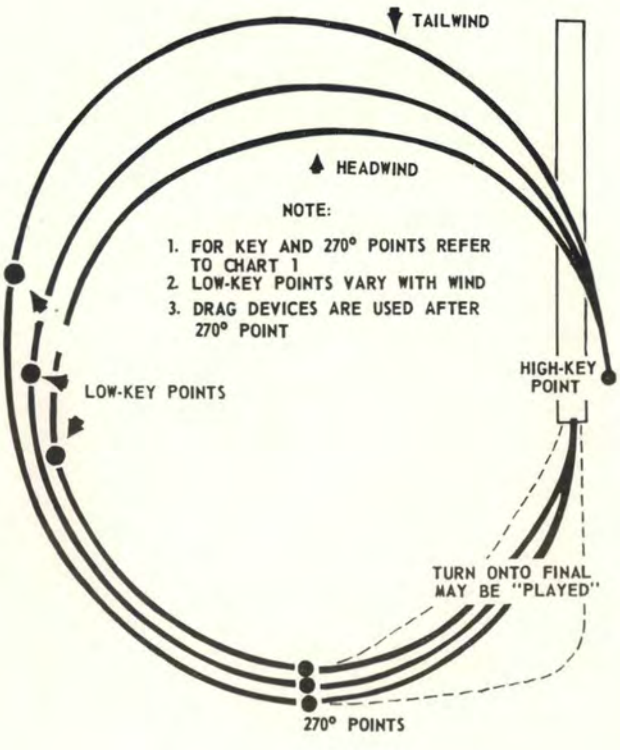
Second Row: Capt. J. W. Gunvordahl, Scott AFB, ATRC; Capt. T. E. Anderson, Yuma County Airport, ADC; Capt. C. N. Casteel, Maxwell AFB, AU; Capt. F. G. Nixon, Wright-Patterson AFB, AMC; Capt. P. Van Schuyler, Travis AFB, SAC.

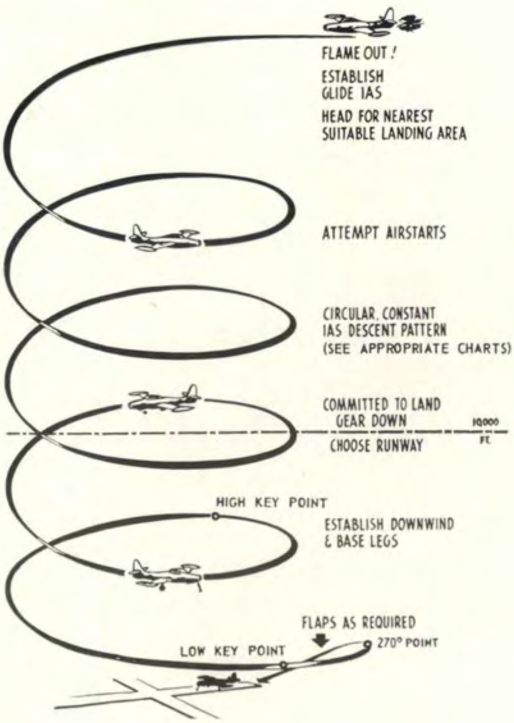
Front Row: Capt. H. B. Kinison, Washington, D. C. Hq. Command; Capt. J. J. Reichenbach, Donaldson AFB, TAC; Capt. J. S. Keel, Palm Beach Int'l Arpt., MATS; Capt. B. L. Davidson, Ladd AFB, AAC.

This Month—The flame-out landing yarn on page 2 is the result of many months of research by ARDC and "Steve" Stevens of the D/FSR Fighter Branch. Check this one for size, you jet jockeys. The full length feature on lightning strikes by Mr. Joseph C. Lingle, Wright Air Development Center, page 8, is authoritative handling of a technical and extremely important subject. Capt. Jack Moore deftly covers the problem of T-33 spins on page 14, and Lieut. Bill Johnston's tale of the "hard hat" on page 18 should be read by one and all. You should read and remember the Form 1-A story on page 25, because operations officers are screaming about countless errors and careless entries by pilots who should know better.

FLYING A FLAMEOUT

Scientific research and experiments with simulated flameout landings have resulted in revised techniques for deadstick landings in jet aircraft.





By Major Robert M. Stevens, Fighter Branch, D/FSR

EVER since the first pilot took off in his spit-and-paper kite, the problem of deadstick landings has been throbbing in the recesses of his mind. In the old days of the Spad, every landing was, for all general purposes, a deadstick . . . it had to be . . . that 90-horse Gnome Rotary had no throttle, and to make a landing you just cut the mag switch and blipped her on in to a walk-away landing.

Came the era of the carburetor, and the intrepid aeronaut still kept glancing around for a landing area, just in case his mill quit. And now, with jet propelled airplanes he still keeps his neck on a swivel and plans what he will do if he loses his fire. About the only *genus aviator* who doesn't worry about deadstick landings is the glider pilot, and he wouldn't know what to do with a throttle if he had one.

In order to further the science of putting down a jet job stone cold dead in de market, the Directorate of Flight Safety Research requested Air Research and Development Command to run a series of simulated flame-out landings in various types of jet aircraft. The results of these tests were described in the August, 1951, issue of FLYING SAFETY, and a detailed report was made on the findings, conclusions and recommendations in connection with the tests. These tests were based on research accomplished by the Directorate of Flight Safety Research in 1951 and were published together in a booklet titled "Jet Fighter Forced Landings." The Chief of Staff, USAF, recognized the importance of this training requirement and in October directed all major commands to initiate a simulated forced landing program.

A basis for the claim that this research has paid off in terms of aircraft dollars saved, is the letters received from all major USAF commands, outlining the number of successful (minor or no damage) forced landings accomplished in each command during the calendar year 1951.

These figures, coupled with data research by the Directorate's Records and Statistics Division, indicate that the U. S. Air Force-wide "practice" or simulated flame-out landing program has been extremely successful.

Rate Decreases

Comparing two periods, the first from 1 November 1950 to 31 October 1951, and the second from 1 November 1951 to 31 October 1952, it was proven that the accident rate in this category decreased 29 per cent in the second period, as compared with the first period. This point is further emphasized by the fact that although total jet flying hours increased 48 per cent in the second period, the dollar loss increased only 11 per cent, for an estimated saving of several million dollars.

Because of the 175 successful forced landings, during both periods, as reported by the major commands and the Directorate's records, the savings in airframe costs alone is estimated at nearly 20 million dollars.

In order to bring all USAF major commands up to date on Project Flameout, a pamphlet is being prepared for early distribution, detailing the various changes and improvements in Section Three of the original study on Jet Flame-out Landings.

The addition will bring up to date all of the statistics and flight test data involving jet fighter forced landings in the latest models and will present the proper techniques to be employed in making actual flame-out landings, as well as serving for a basis of study and training for jet pilots. It is imperative that training officers in all major commands be familiar with the improvements in the original study, and that they incorporate these changes in all training programs under their jurisdiction.

This study of jet flame-outs is not static. It is set up on a continuing basis by Air Research and Development Command, in order to obtain ultimate information on jet flame-out landings under all conditions in present and future jet fighter types. In addition, the Directorate of Flight Safety Research continues to study and recommend new techniques, based on thorough analysis of jet fighter accidents, and this information will be disseminated to pilots through Pilots' Handbooks and other printed media.

Additional flight tests were conducted at Edwards Air Force Base in

Pattern Altitude Variations

A/C Type	*High Key Alt.—Ft.*	*Low Key Alt.—Ft.*	*270 Deg. Point Alt.—Ft.*	*Corresponding Rates of Turn Deg./Sec.*
F-84G	3500- 7500	1700-3700	900-1700	4 - 2
F-86E	4000- 8000	2000-4000	1000-2000	4.5-2
F-86D	4500- 8500	2200-4200	1000-2000	4.0-2
*F-94C	8500-11500	4200-5800	2000-3000	2 - 1.5

**The F-94C pattern is designed around the handling qualities of the airplane without boost to be entirely safe in the event of boost failure in the pattern.*

Flameout Simulation Data
(Boost Off, Except for the F-94C, Speed Brakes Out)

Aircraft Type	*F-84G*	*F-86E*	*F-86D*	*F-94C*
Best Glide IAS—Knots (Gr. Up)	190	185	185	185
Avg. Rate of Desc. 25-12,000 ft. (Gr. Up)	1,650	1,850	2,200	1,900
Avg. Power—RPM-%, 25-12,000 ft.	65	72	79	79
Best Glide IAS—Knots (Gr. Dn.)	180	185	185	180
Avg. Power — RPM-%, 15,000'-SL (Gr. Dn.)	58	69	74	69
Rec. Alt. for Lowering Gr. (Ft. Abv. Grnd.)	12,000	12,000	12,000	15,000
Rec. Rate of Turn—deg./sec.	3	3	3	1.5
*Best Final IAS—Knots	150	150	150	160
*Rec. Touchdown IAS—Knots	120	130	135	120
Fuel Consumed, 25,000 ft.-SL. lbs.	100	235	165	205

**Assuming no wind and approximately 600 lbs. of fuel remaining.*

1952 to determine the best possible procedures in flame-out landings for F-84G, F-86E, F-86D, and F-94C aircraft.

In the analysis of this information it was discovered that certain basic changes would improve the previously recommended landing patterns. The major change in the original study is the modernization of the circular (360-over-head) landing pattern and the readjustment of key point altitudes as shown on the accompanying charts.

New F-86 Proven

In addition, the revised Edwards AFB test report states that it has now been proven that the hydraulic irreversible "normal" flight control system on F-86E and F-86D airplanes is fully operable with the power provided by a windmilling engine. Another significant finding of the later tests is that landing flaps on F-86E and F-86D airplanes can be used on final approach as a result of the new inter-connected flap design.

Improvement of the pattern used in the early flame-out landing study was recommended by test pilots at Edwards AFB. This revision calls for three pattern points, with corresponding altitudes, rather than the two key points used in the original tests.

The first or "High-Key" point remains in the same geographical pattern location and is established on the initial approach at a specified airspeed and altitude with gear down and locked. At this "High-Key" point a specific and constant rate-of-turn should be started, and maintained until the 180-degree, or downwind point is achieved. Here is the point where decision must be made by the pilot, and depending on the prevailing wind, the pattern must be "played" from this point. Because this point (the 180-degree point) is a point of decision and is the spot where the pilot must make his first evaluation of his ability to hit properly the runway, it is now known as the "Low-Key" point.

The last significant altitude is at the 270-degree (base leg) point. From this point to touchdown, a successful landing is effected through the proper use of flaps, speed brakes, and if necessary, controlled side-slips and fishtails. (Consult the Dash One Handbook for flight restrictions on your aircraft.)

The aiming points on the runway remain unchanged. For a headwind condition, shoot for the midpoint of the runway; if a tailwind prevails, shoot for the first third of the runway.

Actual Flameout Data

Aircraft Type	*F-84G*	*F-86E*	*F-86D*	*F-94C*
High-Key Altitude—Ft.	5,500	6,000	6,500	10,000
Low-Key Altitude—Ft.	2,500	3,000	3,500	5,000
Base (270 deg. pt.) Leg. Alt.—Ft.	1,300	1,500	1,500	2,500
Best Glide IAS—K. (Gr. Dn.)	180	185	185	175
Rate of Desc.—Ft./Min. (Gr. Dn.)	2,150	2,800	3,050	2,600
Rec. Rate of Turn (Gr. Dn.) deg./sec.	3	3	3	1.5
*Rec. Final IAS—Knots	150	150	150	160
*Rec. IAS at Touchdown—K.	120	130	135	120
Best Glide IAS—K. (Gr. Up)	190	185	185	185
Rate of Desc.—Ft./Min. (Gr. Up)	1,600	1,850	2,100	1,900
**Rec. Rate of Turn deg./sec. (Gr. Up)	3	3	3	1.5
***Rec. Alt. for Lowering Gr. Nor. Sys.—Ft.	12,000	12,000	12,000	15,000
Approx. Pattern Radius—N.Mi.	1	1	1	2
Avg. Windmill RPM Below Hi-Key-%	12.5	13	13.5	7
Avg. Test Time fr. Hi-Key to T.O.	2.2	1.7	1.8	3.3
Avg. Time for Gr. to Lock Dn.—secs.	25	15	27	19

**Assuming no wind and approximately 600 lbs. of fuel remaining.*

***Completely elastic depending on position and altitude.*

****Only if the field is definitely within gliding distance.*
Rates of descent were taken at 15,000 ft. with gear up and 5,000 ft. with the gear down.

Landing Differences

At this point, the difference between emergency and forced landings should be emphasized. It has been decided that the following descriptions of a "forced" and an "emergency" landing will hold good.

An emergency landing is a precautionary landing made at the pilot's desire, and under conditions where he has control of power and flight controls.

A forced landing is a landing under conditions where loss of power control and/or partial loss of flight controls precludes further flight.

A word about canopies. It is important that all canopies be jettisoned in setting up the airplane for a forced landing. In emergency landings, sliding canopies should be opened and the jettisoning of clamshell canopies be left to the pilot's discretion.

A recent accident involving the forced landing of an F-94 makes the point. Here the pilot made a forced landing at a base where fire and crash equipment were available. He missed his approach and crash landed off the runway. Fire was present in the aircraft. Both occupants were alive, but the canopy jammed shut. Fatal injuries resulted, not from the landing, but from the resultant fumes and smoke, which caused suffocation. Had the pilot jettisoned his canopy, a quick evacuation of the crew would have been assured.

Here is another moot point which you F-86E, D, and F jockeys had better paste in your P-1 helmet. Comes a turbine seizure (and you will know it when you get complete *but complete* loss of RPM), get ready to go over the side, buddy, unless you are over an established airfield at a fairly low altitude, and you are sure that you can make the field. Why? Because in the F-86E, F, and D models, without engine windmilling, your alternate flight control is dependent on the battery, and this battery may last only a few minutes.

Another point along this line: With a seized turbine, your rate of sink increases about 35 per cent. To illustrate, the rate of sink for an F-86A, clean, R/D, above 12,000 feet is 1600 feet per minute. This same airplane, with a seized turbine, under the same conditions, increases its rate of sink from 1600 feet per minute to 2150 feet per minute.

Suited FOR SAFETY

THE AIR FORCE'S T-1 ALTITUDE SUIT HAS BEEN TESTED MORE THAN 700 TIMES ABOVE 63,000 FEET

Suit on left was worn by Maj. Chuck Yeager when he cracked the sonic barrier. Other suit is present model.

THE U. S. AIR FORCE'S T-1 altitude suit assembly was developed to meet requirements for practical, life-saving, emergency equipment for airmen who fly today's high performance aircraft at extremely high altitudes.

Intensive Work

More than seven years of intensive team research were spent on the project by the Aero Medical Laboratory of the Air Research and Development Command's Wright Air Development Center.

Successfully tested to 106,000 feet in altitude chambers, the T-1 has been worn in high altitude test flights for the past five years. It already has saved several lives and aircraft worth approximately 18 million dollars.

In 1947, Major Charles Yeager, wearing the early model of the T-1, flew the Bell X-1 research plane faster than sound for the first time. Then, in 1950, Lt. Col. Frank K. Everest, wearing the T-1, and flying the X-1 to extreme altitude, lost cabin pressure accidentally. His suit operated automatically, giving him protection until he could reach a safe altitude. In 1951, Mr. William Bridgeman, flying the Navy's Douglas D-588-11, wore the T-1 while establishing the record human flight altitude of 79,000 feet.

The T-1 High Altitude suit has been tested more than 700 times.

700 Tests

Military and civilian scientists back at the Aero Med Lab have conducted more than 700 tests on the suit at simulated altitudes above 63,000 feet. On three occasions, tests have been conducted with the suit at a simulated altitude of 106,000 feet, which represents a 99 per cent vacuum.

In addition to fulfilling initial protective requirements, the suit also combines in one "package": anti "G" or blackout protection, communication equipment, oxygen valves and regulators, protective helmet, protective visor (with defrosters) and oxygen bailout cylinder.

Helmet Tested

It is interesting to note that the helmet part of the assembly has successfully undergone windblast tests conducted at mach 0.998 (s.l.), or approximately 725 MPH.

The men who worked on the development of the T-1 suit are rightfully proud of their handiwork, but there's one thing they don't like to hear. When you're in the Aero Med Lab, it's not safe to refer to the suit as a "Buck Rogers Space Suit." Just call it the T-1, and let it go at that. ●

THAT PERILOUS PROPWASH

Smaller aircraft which elect to follow their larger brethren too closely on takeoff and landing often find that they are borrowing more trouble than they can safely handle.

THIS story is directed to you people who have a tendency to lock on to a landing transport airplane and follow it too closely around the landing pattern; to those of you who tail in too close to a landing airplane on final, and to you who take off too closely behind four-engine aircraft.

Propwash, called "big plane turbulence" by researchers, can, and does play hob with smaller aircraft landing and taking off too closely behind multi-engine airplanes.

Figures show that four-engine transports set up the highest propellor turbulence. This turbulence has been severe enough to cause major accidents not only to light planes, but to following aircraft as heavy as C-60, B-26, C-45, and C-47's.

With the increase in jet fighter traffic, it is increasingly important that both follower and followee be cognizant of propwash hazards, because jet fighters can be placed in the "light airplane" class.

Laboratory and field tests show that an airplane landing, taxiing or taking off creates what are known as "wing tip vortices," or swirls of moving air rolling back off the wingtips at varying velocities, depending on the speed of the aircraft. These vortices are funnel-shaped, of comparatively small diameter at the trailing edge of the wing itself, and spreading into a wide cone, that gradually dissipates several hundred feet behind the aircraft. Naturally, the force of the turbulence caused by the air flow over the wing tips dissipates as the vortex grows wider. Propeller wash is found in varying intensities below the belly of the airplane, usually a little to the right of center.

In flying cargo glider tows, it has been found that in flying down through the propwash of a C-47, turbulence in level flight was encountered from about ten feet below the horizontal stabilizer of the towing aircraft to about thirty feet below the towing aircraft; and was of highest intensity at about twenty feet to the right, and below, the C-47 rudder plane. Propwash was encountered from 150 to 350 feet behind the towing airplane, often of such intensity, that full opposite aileron and rudder were necessary to preclude the glider from completely rolling on the axis of the towline.

Here are some actual examples of accidents and near accidents caused by propeller turbulence, in the words of the pilots themselves.

No Warning

Says a pilot, "I took off from Zurich Airport. It was a beautiful calm evening, no wind stirring. About a minute ahead of me, a four-engine transport had also taken off, but when the tower cleared me, the transport was out of my field of vision. My takeoff was smooth, and I had flaps and gear up, when *without the slightest warning*, my airplane went into a vertical bank. Applying full aileron, I brought the ship level, but at once the same thing happened again. I applied full aileron again, but a third time the airplane went into a vertical bank. By this time my altitude was 90 feet, and I was approaching the end of the runway, and an obstruction loomed ahead. I thought there was some mechanical defect on the controls, so I cut the gas and made a belly landing at the edge of the airport." This pilot had about 2000 hours, much of it in Alpine turbulence, but he had never encountered this type of roughness, where there was no warning whatsoever. There was no noticeable gust or turbulence. At a 90-knot climb-out the airplane suddenly went out of control for no apparent reason.

Says a B-17 pilot, "I was making a routine night landing, spaced approximately one mile behind another landing B-17, when I encountered propwash at about 100 feet altitude, about 100 yards short of the landing runway. The turbulence was so severe that I had to abort the landing, and make a go-around. My airplane was thrown into a nearly vertical bank. and I had to give it full opposite rudder and aileron for what seemed several seconds, before positive control was obtained. I feel that the aircraft surely would have been damaged if I had attempted to make a landing in this low altitude turbulence."

An invitation to a major accident—failing to get proper spacing in the pattern when following another aircraft.

Here is what happened to the pilot of a Lockheed Lodestar (C-60), which is hardly in the lightplane category. Says the pilot, "In one particular instance, during a landing at Washington National Airport, I was coming in at approximately 1000 feet behind a C-47, at an altitude of about 200 feet. During this approach, I got into the propwash of the C-47, and my airplane was thrown into a 60-70 degree bank. I managed to straighten out the airplane, but this propwash came very close to upsetting me completely, and causing a major accident.

The pilot of a C-47 reported, "We were about to leave Chicago Municipal. After we completed our check, the tower granted permission to take off. We did so just as a "Connie" ahead of us became airborne. It took both the copilot and myself with every thing we had, to keep the C-47 from doing a complete roll. We had to use full travel from right to left aileron."

Cited above are only a few of the many actual instances where propwash has become a definite flight hazard in the takeoff and landing phases of flight. This hazard is caused basically by the wing tip vortices and the swirl of the propeller wash.

Emphasis on Spacing

With airport traffic, both military and civilian, on the increase; with transport and cargo aircraft growing larger and larger, and with jet fighter activity in the vicinity of busy airports a factor which must be recognized, the importance of aircraft spacing cannot be too strongly emphasized.

Here are some recommendations which should be followed by pilots landing behind large airplanes:

- Don't tail in too closely behind the airplane in front of you. Be conservative, and allow plenty of space between aircraft.
- If possible, make your approach and landing on the upwind side of the runway, to allow turbulence to drift away from the actual runway landing path.
- When you enter an area just vacated by another airplane, maintain adequate flying speed, well above the stalling speed for your airplane.
- Above all . . . be alert and be prepared for turbulence when you are in a congested traffic pattern.

Lightning strikes....

By Joseph C. Lingle, Wright Air Development Center

ANY aircraft flying at any altitude at any speed in any locality, under certain atmospheric conditions, can be struck by lightning. Such strikes can cause extensive damage to the aircraft and possible injury to flying personnel.

Many of the mysteries of atmospheric electricity have been solved, but in designing and building today's aircraft with ever-increasing emphasis on greater speeds and higher altitudes, a solution of any unsolved mysteries is essential if protective measures are to be effective.

Even to define or explain lightning is difficult. Webster defines it as "The flashing of light produced by a discharge of atmospheric electricity from one cloud to another or from a cloud to the earth."

In thunder clouds the vertical air movements may result in a positive or negative electric charge accumulations or areas. These particles accumulate or build up to a point beyond which the air can no longer act as an insulator. It is at this point that the accumulated charges tend to move in the direction of greatest electric stress resulting in a violent electric discharge accompanied by a blinding flash with a loud noise which we commonly recognize as lightning.

Few of us realize that there is an average of 44,000 thunderstorms in the world every day or 1,000 thunderstorms over the earth at any given instant and that from these, 100 lightning discharges will be released each second. Also, lightning discharges which follow the path of least resistance may pass from one cloud to another cloud, from one cloud to the ground, from one portion of a cloud to another portion of the same cloud or from a cloud to clear sky.

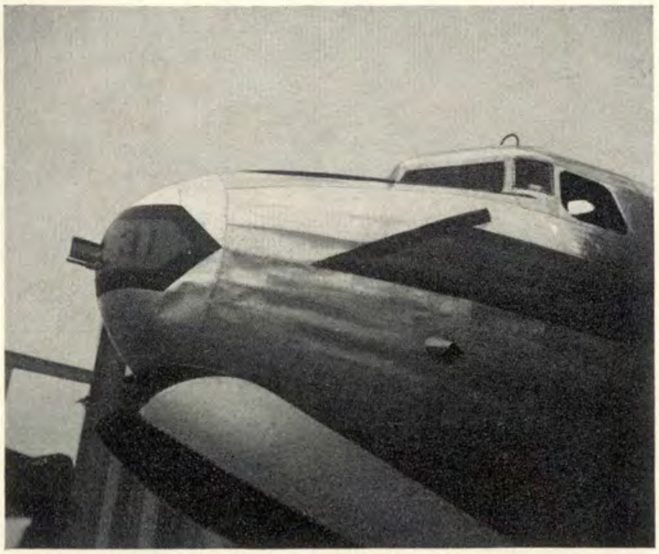
Discharges Are Erratic

The discharges themselves often progress in very random or zig-zag fashion as their probing tips produce high electrical stress in directions that had not been stressed before. These discharges may wander for miles without necessarily going either to the ground or to another cloud, therefore a strike may occur to aircraft even outside a thundercloud and the discharges that an airplane may intercept can vary widely from heavy strikes down to very small streamers sometimes referred to as static-discharges.

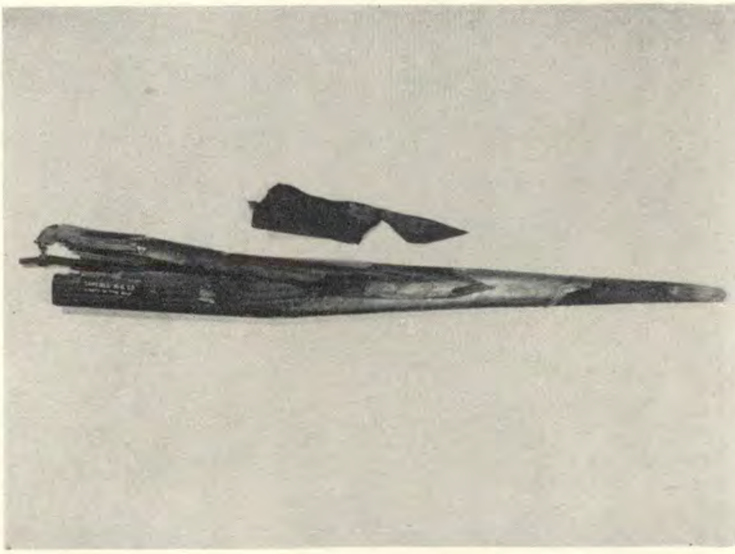
A review of some 200 reports filed by pilots of the USAF, Navy, Army and commercial airlines who have experienced lightning strikes discloses the effects of discharges to the aircraft. It is quite clear, as you will see from several excerpts of these reports, that lightning is certainly a major factor that requires adequate protective measures.

On May 5, 1952, a C-45, flying over

This damage was incurred during a violent thunderstorm.



VHF antenna on an airplane can act as a lightning rod.



western Montana at 11,000 feet at an airspeed of 140 and an air temperature of 10°C., suffered a strike. The following is a report of the damage done to the electronic equipment:

- Antenna mast burned and splintered.
- VHF transmitter and receiver damaged.
- Low frequency antenna relay and antenna burned off.
- Sense antenna destroyed.
- Compass receiver inoperative.
- Voltage regulator burned out.
- Both batteries dead.
- Right magneto in right engine faulty.
- Air frame damaged.

On July 28, 1952, a pilot of a BT-13A flying over Poston, Arizona, was struck by lightning. This is the pilot's report: "While flying along about 600 feet over the desert looking for a lost plane, there was a little rain shower to my right wing and some flash lightning. Then, all of a sudden a flash burst in on my right wing—that was all I remember till I came to. The plane hit the ground and knocked the engine out. Some people don't believe that lightning will hit you in a plane, but I have proof of it on my back—three big burns about 12 inches long. The plane was a total loss."

On a routine flight from Quonset Point to Argentia, Newfoundland, a P2V-4 encountered some rough weather. Stormy flying in this area is nothing new, but when a jolting flash shook the airplane and sent sparks flying all over the sky, the crew knew they had been hit by lightning. The aircraft completed its flight but when it reached its base, it was found that all steel parts, such as propellers, engines, oleos, retract pistons, control cables, nose guns and even armor plate were highly magnetized. The charge was so great that when checking the airplane it was found that washers, screw drivers and other parts would hang unassisted from affected parts.

A C-47 at Lancaster Airways Intersection on May 18, 1950, was flying at 9,000 feet when struck by lightning. The ADF belly antenna was melted, the de-icing motor was fused, two holes were burned in the alcohol supply line, permitting fluid to saturate spun glass insulation around the heater duct which was instantly ignited, and the right elevator was damaged.

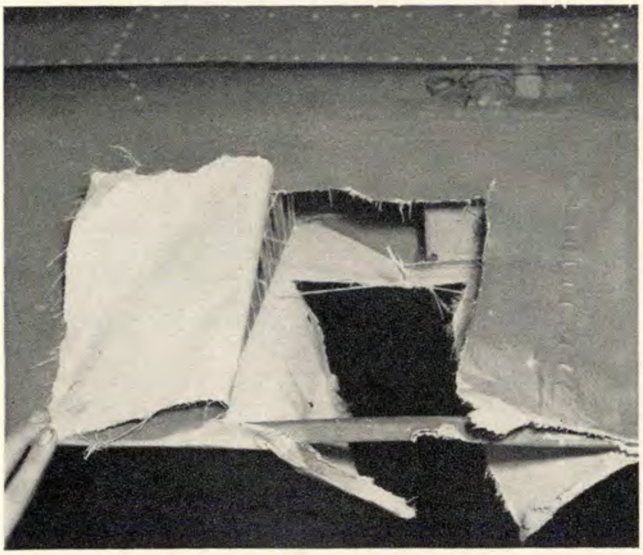
On February 4, 1952, an air carrier reported "Lightning strikes on nose of aircraft at 1503 EST—OAT −5°C. in precipitation, on instruments, altitude 10,000 feet. Noticeable static buildup prior to strike. Concussion of discharge and flash seen and felt in cockpit. Flash and report heard in cabin. Magnetic compass approximately 50° in error, apparently on account of lightning strike. Aircraft terminated Cleveland on account of lightning damage."

Major Strike Damage

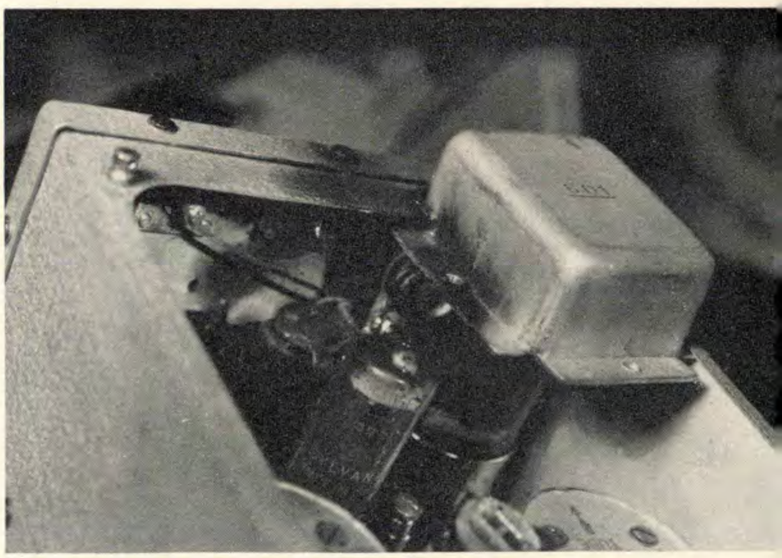
The following damage was recorded after inspection by maintenance personnel:

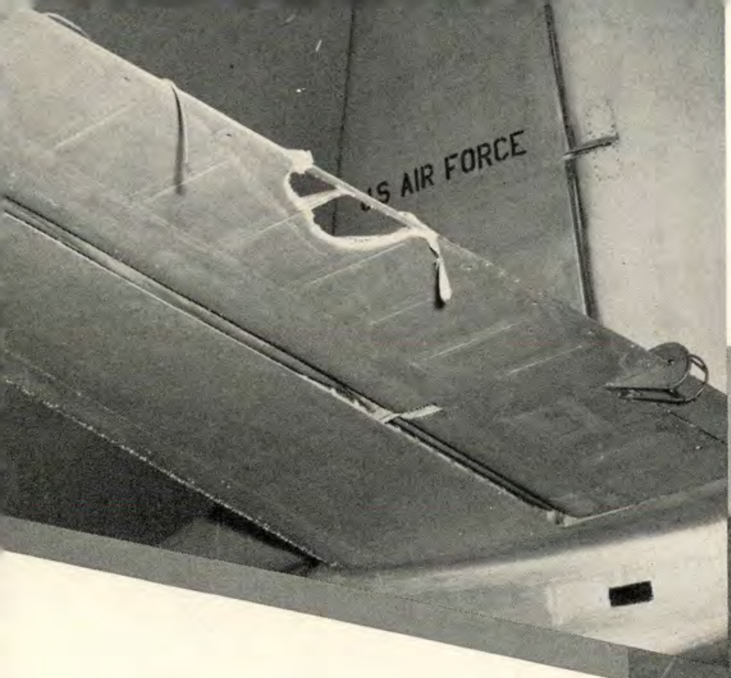
"Right nosegear door had 3/8 inch hole and paint burn for an area, approximately three feet long and two feet wide. Door bent and buckled in several places. Pulled rivets on trailing edge. Left door had scorched area two and one-half feet long by one foot wide with no apparent physical damage. Right pitot mast had several pit marks at the lower base. Right side of fuselage at Station 14 at eight o'clock position (facing plane) had 1/8 inch hole. Right side above nose door covered with raised pimples. Right elevator trailing edge, aft of top hinge, burned through and approximately twelve rivets were popped on both top and bottom. Hinge bracket and elevator (outer tip) were warped and burned. Magnetic Compass off

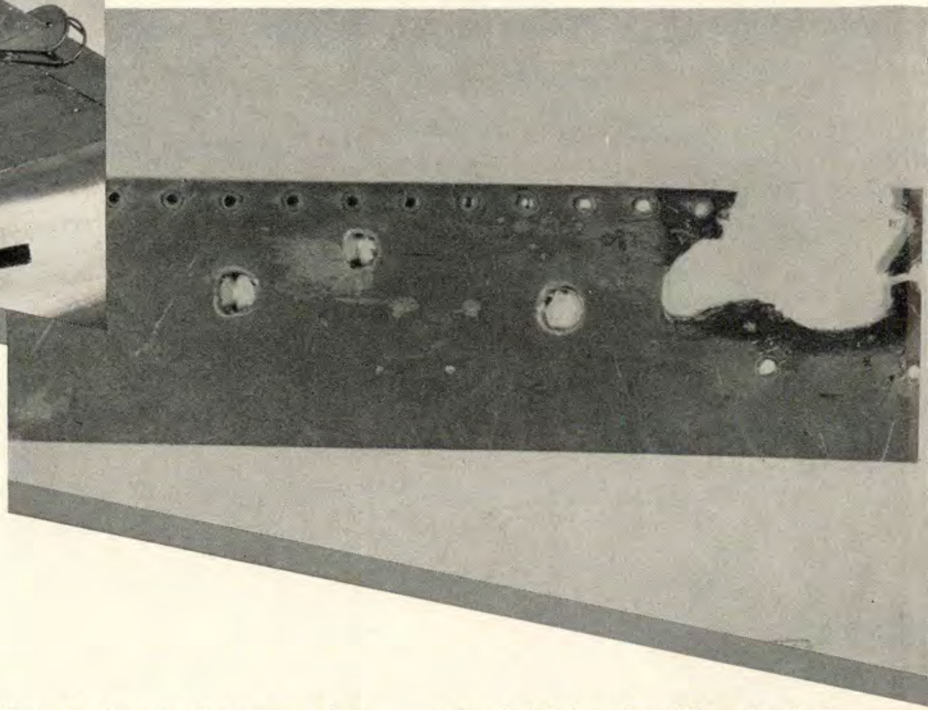
A Georgia thunderstorm caused this aileron damage.



This VHF transmitter was damaged by lightning.







A bolt of lightning burned this sizeable hole in the left elevator of a B-26 (left) while the close-up view (below) shows a section of skin from a storm damaged C-45.

50°. Nosegear assembly magnetically charged. Aft radio altimeter antenna had hole burned on rear tip."

The Magnetic Compass could not be "swung" to correction by the Cleveland station personnel because of the magnetic charge in the nose gear structure. By special handling this airplane was routed to San Francisco for assistance by the Engineering Department in making the correction to the Magnetic Compass System.

A DC-6 flying over Matawan, New Jersey, on March 13, 1952, at 6500 feet, airspeed of 180, air temperature −13°, suffered a strike. Upon inspection, numerous holes from a quarter size to a pin head size were found on the left nose of the aircraft. Also, plastic cone cover, bulbcover and wire clip retainers on the extreme end of tail cone were blown off. Holes also were noted in aft end of tail cone. The pilot reported a loud concussion accompanied by a ball of fire on the left side of the nose of the aircraft. A loud noise was heard in the cabin and fire was noted over the left wing of the aircraft in the vicinity of No. 1 engine. The odor of ozone was noted immediately after the discharge.

Another DC-6 flying between Tyler, Texas, and Shreveport, Louisiana, at 15,000 feet was struck on the nose and right wing, filling the cockpit with smoke.

Lightning passed over the pilot's lap and struck the flight engineer on the left hand, causing shock and small burn on his wrist.

Wires leading in from top of antenna, burned to powder. Both transmitter and receiver on high frequency burned out. Flight engineer's hat in radio rack was full of small holes.

Confusion Factor

In the opinion of leading authorities, fatal accidents could occur as a result of a severe lightning strike which might not damage the aircraft nor injure personnel but which might confuse the crew, causing them to lose control.

Confusion is one of the greatest causes of pilot error and unquestionably, lightning could have a confusing effect on a pilot.

Mr. L. P. Harrison of the U. S. Weather Bureau, in his Technical Note, "Lightning Discharges on Aircraft and Associated Meteorological Conditions," for the National Advisory Committee for Aeronautics, states that the effects on pilots of atmospheric electrical discharges to aircraft may be divided as follows: Visual, Aural, Electrical, and Psychological.

Visually, the discharge generally takes the character of a blinding flash the effect of which is usually of rather brief duration. When the flash occurs, there is usually a blindness lasting from a few seconds to as long as three minutes. The more severe effects are during the hours of darkness. The most severe case reported involved a copilot who was unable to see for eight minutes after the discharge although the pilot of the same aircraft had normal vision 10 seconds after the discharge.

In the aural aspect, the lightning discharge usually is accompanied by a sound. Pilots have described this noise as follows: dull thump; snapping sound; sharp crack; like an explosion; violent noise; deafening crash of thunder.

The sound ordinarily does not seem to cause more than a momentary loss of hearing, some confusion by the bright flash and other psychologically disturbing factors attending the discharge.

Illustrative of the most extreme effect reported as due to the thunder, is the following excerpt taken from remarks made by a passenger on an airplane. "About 15 minutes out, the plane passed through a very violent weather front encountering severe rain and sleet. Immediately upon passing through the front area and after the rain and sleet had stopped, fire streaks approximately eight inches long were observed in the propellor disk areas at about the propellor tip radius. This condition was observed on the right propellor while another passenger who was sitting on the left side of the airplane, noted the same condition on the left propellor. About one minute after this discharge of St. Elmo's Fire, a violent electrical discharge took place from the airplane to the surrounding atmosphere. A large ball of white fire approximately six to eight feet in diameter appeared to envelop the right engine nacelle and engine propellor unit. At the instant this fire appeared, there was a resounding crash which deadened the hearing senses.

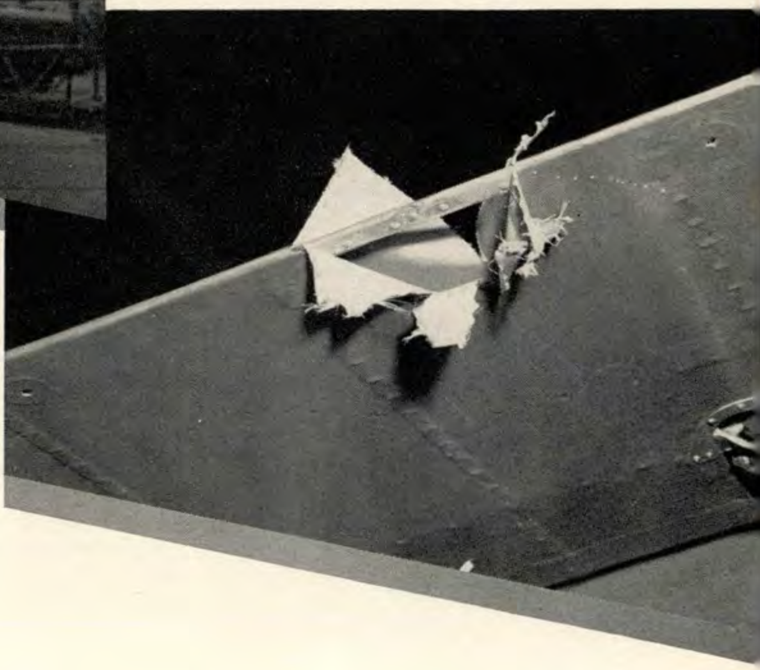
"Immediately after the discharge and noise, everything seemed to stand still, and there was a lull, uninterrupted by noise. This, I believe, was due to my sense of sight and sense of hearing being temporarily impaired, and not due to any actual stoppage of airplane engines. I believe that the engines continued to operate normally during this lull and immediately I regained my full equilibrium and noticed that the pilot had turned back. The passenger told me that he had noticed the same sort of discharge at the left wingtip of the airplane and that he experienced the same feeling as I had, with respect to senses."

Current Surge on Radio

Another effect on the hearing can result from a very sharp click in the earphones due to the surge of current in the radio circuit when the antenna or radio forms part of the discharge path. It is thus possible to receive acoustical shock if the earphones are closely fitted, the saturation characteristics of the vacuum tubes in the radio receiving set are not such as to limit greatly the intensity of acoustic disturbances produced electromagnetically in the head receivers, and the earphones do not have a suitable stop to prevent excess motion of the diaphragm caused by the discharge (current surge). Suddenly released pressure above a certain value produced in the ear canal by the abrupt metallic earphone click can be uncomfortably loud, accompanied by momentary dizziness and ringing in the ears. In extreme cases, unconsciousness may result. This seems to have happened in one or two cases.

In one other instance the pilot reported that his ears hurt for 15 or 20 minutes, probably because he had the earphones on at the time of the discharge. Wearing a headset close to the ears when circumstances indicate a discharge may be imminent is therefore considered inadvisable. Earphones with appropriate protective features are desirable.

Electrically, pilots have reported seeing sparks inside the cockpit on a few occasions, but in no case was any serious harmful effect indicated where an all metal aircraft with all metallic parts bonded was involved. One pilot reported he felt shock on hands and feet in a blinding flash on the aircraft's nose in front of the



While most lightning strikes are made on slow-moving aircraft, fighters aren't immune as this picture of an F-86 will show (above). Lightning strikes a C-47, damaging the left aileron (right) and burning the static eliminator.

left cockpit window. One engine stopped for a few seconds. No apparent damage was noticed afterwards. Another report states that the flight engineer had his hand resting on the captain's seat, and after the incident discovered the hair had been singed from the back of his hands.

Psychological effects are not always caused by the lightning and thunder. Sometimes they result from the severe characteristics of thunderstorms in which the lightning may be encountered. Thus when an aircraft flying at considerable speed enters an extremely turbulent region within a strongly developed thunderstorm, momentary panic may seize the persons on board, in view of the conditions experienced.

For a very brief time the airplane then may undergo violent rolling, pitching, and yawing motions, accompanied by severe jarring and rocking of the craft and its controls, in addition to violent airspeed fluctuations and irregular accelerations, all of which are attended by noises of unfamiliar character and varying intensity. Usually, the space in which such severe turbulence occurs is narrow. The brilliant flash of the discharge, the usually accompanying loud noise, and the concussion, generally frighten the pilot for an instant and produce momentary confusion. He becomes startled and his reactions are slow and faulty for a short time interval. If the flash occurs at night and the temporary blinding effect is severe, the pilot is under the handicap of not being able to see his instruments or controls for a brief period.

A terrific jolt of lightning damaged the nose of this B-17. The center section is bulletproof glass. All antennas were burned off.

In addition to structural damage, lightning can so magnetize an airplane that compasses will become inoperative.

Recommended Procedures

The following flight procedures are recommended to avoid lightning strikes and to alleviate harmful effects:

- Avoid flight through large or towering cumulus and cumulonimbus clouds, especially at levels where the temperature is from −7°C. to +5°C.
- Avoid flight within 2500 feet of cumulonimbus clouds, especially when they have given manifestations of thunderstorm activity.
- Avoid flight through moderate or heavy rain and/or snow, sleet, hail or ice crystals especially at levels where the temperature is from −7°C. to +5°C., particularly if the precipitation is from cumuliform clouds.
- If the precipitation static and/or corona discharge (St. Elmo's fire) is moderate to severe, and there is evidence from the temperature, cloud and precipitation conditions that the aircraft is in a zone of strong potential gradient, reduce speed somewhat and seek a lower level where temperatures above +5°C. prevail, or leave the given cloud and precipitation conditions.
- If existing conditions are favorable for a discharge, be sure the antenna is grounded. The trailing antenna, if used, should be reeled in.
- If the signs are sure that a discharge might be expected, have the cockpit lights turned up full bright and keep the eyes focused on the instrument panel. Wearing opaque glasses, sun glasses or a long visor which shields the eyes from any lightning flash that might be seen through the windows is also recommended.
- The auto-pilot should be set up with the servo controls turned down so that it can be immediately en-

gaged in the event the crew is temporarily blinded.

- If signs are such that a discharge might be imminent, do not hold headphones too close to the ears. This will tend to prevent acoustic shock.

The above rules are certainly logical when an aircraft is unprotected for lightning. Professor M. M. Newman, Director of the Lightning and Transients Research Institute, has commented that if airplanes are to fly in regular service, they cannot very well keep avoiding likely discharges or dispense with communication by grounding antenna, and therefore much of the measures for safety should be incorporated into the aircraft itself. Prof. Newman stressed that as far as lightning itself is concerned the all-metal aircraft inherently forms a safe discharge current diverting path around occupants and equipment in the interior.

By proper protection that can be provided by the plane manufacturer, hazards such as lightning entering inside along the antenna, illustrated in the earlier pilot's reports, can be eliminated. Actually, modern aircraft can be made completely safe from lightning and that lightning areas will then need be avoided only because of related turbulence.

In most instances the effects of lightning strikes on aircraft are not serious, in the true sense of the word, but they are always expensive. When an aircraft is struck by lightning it must be taken out of service. All communication and navigation equipment must be re-calibrated. Maintenance checks are necessary and any damage must be repaired or parts replaced. This all adds up to loss of valuable flying time and increased maintenance costs.

Accurate reports of instances of lightning strikes filed by pilots, is the main source of information on this subject. The importance of these reports cannot be overly emphasized. For example, such reports have supplied in the past and will continue to supply in the future the information necessary to design and equip aircraft to defend it completely against lightning.

The Air Force is working with designers and manufacturers in a series of tests to determine a defense against lightning.

From pilot reports definite facts have been disclosed. They have shown that aircraft have been struck by lightning on the ground and at altitudes from 200 feet to 45,000 feet. The altitude range, wherein strikes have occurred most frequently, is from 6,000 feet to 11,000 feet above sea level, and 4,000 feet to 9,000 feet above ground. From these same reports there is strong evidence to support the theory that large aircraft encounter more strikes than do the smaller.

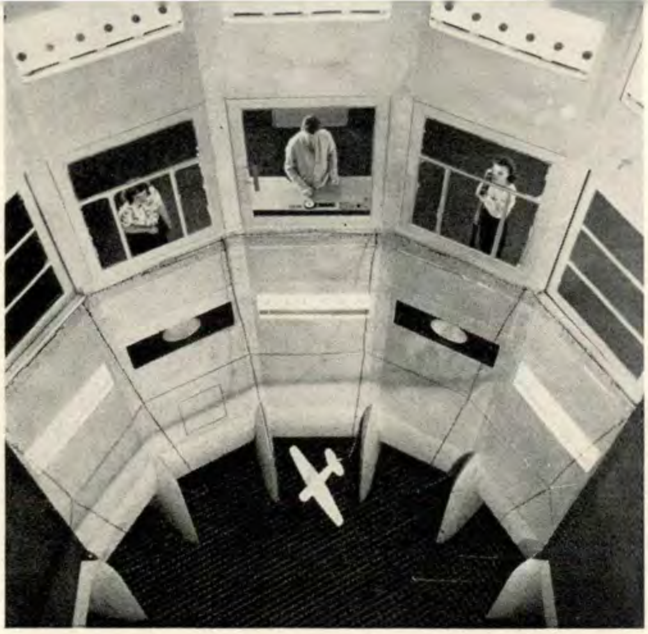
A majority of the strikes reported occurred when the temperature was near the freezing level or in the range of +2°C. to −3°C., air temperature.

Most strikes have been reported in the spring and autumn, between noon and 1800 hours. However, strikes have been reported during every month of the year. Strikes usually occur when the aircraft is flying through or in the vicinity of thunderclouds. Lightning has no favorites in types of aircraft it will strike.

Impossible to Prevent

Although it is impossible to prevent lightning strikes the all-metal bonded aircraft is inherently protected from lightning damage by the conductivity of its aluminum skin. Thus the only points of entry to the aircraft by a lightning strike are through antennas and on plastic surfaces such as canopies and domes.

An associated problem in thunderstorm flying is the effect on radio communication. Each lightning strike within 100 miles or so of the aircraft produces a strong burst of "crash static." Corona, or "St. Elmo's fire," produces a continuous squealing, hissing sound in the headphones which marks desired signals. The ADF needle of the radio compass should never be relied upon in these circumstances, and range signals should be identified by the tone in the headphones, if identification is possible. As this problem of "static" is as complex as the problem of lightning hazards it can only be briefly mentioned here and given the more comprehensive treatment it deserves in a separate article.



Before actual spin tests are made, experts run lab checks on various single-engine aircraft design configurations.

Spin-testin

The experts say spin recove depend on two factors—corre

IN recent months the T-33 has become the subject of discussion in many of the inevitable hangar flying sessions prevalent whenever two or more Air Force pilots congregate. Speculation has centered around the spin characteristics of the aircraft, particularly as to what constitutes the proper recovery technique.

The aircraft manufacturer, under Air Force contract, ran a series of spin tests and is in the process of rewriting the Dash One Handbook on certain phases of the T-33. So far, approximately 80 spins have been performed and test pilots state that, "Under favorable conditions, the T-33 spins consistently well and recovers easily if the proper techniques are used."

Favorable conditions boil down to just one thing: proper configuration. Intentional spins are and have been prohibited in the T-33; but if a pilot enters a spin inadvertently, he should attempt to get proper configuration at once. The most favorable configuration, as recommended by factory pilots is:

- Tip tanks installed but empty.
- Throttle in idle position.
- Guns and ammunition installed (or equivalent weight in ballast).
- Ailerons in neutral.
- Gear and flaps retracted.
- Elevator up travel limited at 20 degrees.

In discussing the configuration in detail, test pilots pointed out the importance of empty tip tanks. They recommended that manuevers which might cause the aircraft to approach the stalling point and induce an inadvertent spin be practiced after the tips were emptied. It was stressed that fuel in the tip tanks has an adverse effect on spins and spin recovery. In any spin that develops—either a normal, erect spin or an inverted spin—if there is no response toward recovery, the tanks should be jettisoned if they contain fuel. However, if the tanks are empty, it is desirable to retain them as they will be beneficial to the recovery rather than detrimental.

Retarding the throttle and keeping the ailerons neutral are SOP for most aircraft spin recoveries; use of either only aggravates the spin condition.

Gear and flaps in the extended position also aggravate a spin in the T-33. A pilot should retract both as soon as possible to aid his recovery.

The elevator up-travel limit of 20 degrees is required by tech order for the T-33. The 20-degree limit has been determined as the best setting for recovery by the spin tests.

Ballast Needed

It was determined by the spin tests that either guns and ammunition should be installed or a ballast of from 300 to 330 pounds will be necessary for proper spin recovery. All aircraft which are picked up at the factory for delivery have 300 pounds of ballast added. Test pilots also recommend that no maneuver that could possibly cause an inadvertent spin be performed after ammunition has been fired.

In a normal spin, the nose of the aircraft will oscillate between a nose low position and one in which it rises to, or near the horizon. The recovery should be accomplished when the nose is low, below the horizon and not when it swings high in the oscillation.

With one extremely important exception, spin recovery is much the same as in most aircraft. The throttle should be in idle position with the ailerons held in neutral but with the stick held *aft.* A smooth pressure is applied to the rudder against the spin, to slightly less than full travel. Finally, back pressure on the stick is released, *after* spin rotation has stopped.

The stick must be held aft till the rotation stops; popping it or an abrupt, full forward motion will probably throw the aircraft into an inverted spin.

The importance of allowing the airspeed to build up after recovery was emphasized by test pilot Tony Le Vier. He commented, "Once rotation is stopped you have no sweat. Just ease off the back pressure and allow plenty of time for the airspeed to build up to a point of safety.

"Leveling out and bringing the stick back too soon, without giving

the T-33

ry characteristics in the T-33
ct technique, proper configuration.

According to factory test pilots, proper spin recovery can only be effected when the tip tanks are empty.

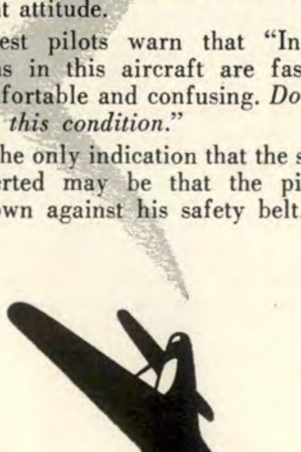
the aircraft a chance to attain an airspeed well above stalling can easily result in a secondary spin."

Inadvertent spins result from aggravating a stall condition. Pilots are warned that when practicing stalls or gliding turns, recovery should be made upon receiving an initial stall indication rather than awaiting complete loss of control.

Inverted spins may occur if the aircraft is stalled in an inverted position while doing an acrobatic maneuver or by pushing the stick forward abruptly during recovery from a normal spin. In the latter case the inverted spin will start from an upright attitude.

Test pilots warn that "Inverted spins in this aircraft are fast, uncomfortable and confusing. *Don't invite this condition.*"

The only indication that the spin is inverted may be that the pilot is thrown against his safety belt. It is important that he recognizes this condition because the T-33 may be spinning inverted and still give the impression that it is in a normal, erect spin. Test pilots stated that several times during spin tests they became confused and had trouble getting orientated due to unusual attitude.



Inverted Spin Recovery

Recovery from an inverted spin follows the same procedure as outlined for normal spin recovery. Get the most favorable aircraft configuration: tip tanks empty, gear and flaps retracted, ailerons neutral and throttle in idle. If fuel remains in the tip tanks, they must be jettisoned at once.

Effect the recovery by checking the throttle in idle position, holding the ailerons in neutral, bringing the stick *aft* and applying rudder pressure against the spin until rotation is stopped. When rotation is stopped, keep the stick *aft* until the nose is well down and safe flying speed is attained. Recovery in an inverted position with the stick aft may mean that at least a partial split-S will be performed.

Frequently, in an inverted spin, after the stick is brought aft and rudder is applied at the top of an oscillation, the aircraft will come over from an inverted spin into a normal, erect spin. If this happens, use the standard spin recovery.

Out of Control

On several occasions, while running the spin tests, the T-33 has entered a violent maneuver described by the company pilots as an "out of control" condition. The gyrations are violent, erratic and do not follow any particular pattern. At first, the pilot may have considerable difficulty in keeping abreast of the changes in aircraft attitude. It can best be described as somewhere between a pitching motion and tumbling. After the aircraft has fallen about 2000 feet or more it will settle down and progress into either a normal or an inverted spin.

Research disclosed that the aircraft entered into this "out of control" condition out of a stall, with the gear and flaps extended. However, it has only occurred after the stall was aggravated; that it, one in which the stick is held back on the stop after the T-33 is stalled and the pilot attempted to keep the wings level.

If this condition is encountered, the pilot should immediately bring the throttle back to idle, hold the ailerons in neutral, get the stick aft and retract the gear and flaps. In other words, follow the same procedure used in a spin. After rotation has developed and the spin direction is apparent, use the rudder to stop it just as in any other spin.

A final word of advice concerns altitude. If the terrain clearance is less than 10,000 feet, it is recommended that the canopy be jettisoned. This serves a dual purpose. It is the first step toward a possible bailout, and it may assist recovery.

LOOK *BEFORE YOU* LAND

Don't become an accident statistic at the end of your journey; keep your head on a swivel and be a see-all before touchdown.

THE tired old bleat that two is company and three is a crowd doesn't even begin to apply to that part of aviating more commonly referred to as the approach and landing. Two flying airplanes may become a good-sized crowd when one pilot or both fail to follow the cardinal rule of keeping their heads on respective swivels while bringing the old crate home to roost.

Take the recent cases of a couple of T-33 accidents at Alpha Air Force Base. Each T-33 aircraft was being flown with a student pilot in the front and an instructor pilot in the rear seat. None of the pilots involved in the accidents saw the other jet until the time of collision.

The traffic pattern in each case was flown with one plane slightly above and behind the other and, in both cases, the planes were over the runway and touching down for a landing. In each case the controller in the Mobile Control unit had seen the jet trainers in dangerous positions to each other while they were in the landing pattern.

Radio calls were transmitted for one or both of the jets to go around. However, the instructions were either not heard or the pilots failed to recognize that the radio calls were meant for them. In the first accident, a red flare was fired just as the aircraft reached the end of the runway but this warning was too late to prevent the collision that followed.

Both of these accidents could have been prevented if the number of aircraft permitted in the pattern at one time had not exceeded the number which could be safely monitored by ground traffic controllers . . . or if the pilots concerned had made that all-out effort of making *sure* they were clear before landing.

From the simon-pure pilot error standpoint, consider this F-51 accident at an overseas base. This Mustang jockey was attempting the old tactical approach with a restricted visibility of from one to two miles. Upon reaching the end of the runway, he peeled up sharply to the right, dropped flaps, and attempted to complete a tight 360-degree turn just off the end of the runway in order to be lined up for a nice, hot grease job. The plane stalled into the ground, bounced over a road, and skidded to a stop fifty yards short of the runway. This pilot's "looking around" had not included the haze that prevented his accurately lining up with the runway.

Look Around

The final phases of approach and landing usually takes about two to three minutes. If there is restricted visibility, or if the landing is being made at night, the pilot might spend a couple of those minutes guiding the aircraft more or less on instruments to a point where adequate visual reference would indicate whether he is safe to land or go around again.

On the other hand, the looking around rule can be overdone and the pilot can become a victim of his own vigilance . . . like this B-50 pilot who completed a routine test flight and was coming in for a routine night landing.

At least that's what the pilot thought as he routinely called the tower for landing instructions. The tower came back with the poop and the pilot acknowledged the instructions and entered traffic at an indicated altitude of approximately 800 feet, about two miles out from the runway. Visibility was good and the runway was well-lighted. The checklist was run through while the B-50 was on the downwind leg and the crew got ready for landing.

As the aircraft turned base, permission to land was received from the tower with the usual gear-down-and-locked remainder. At this point, the tower also advised the pilot of a corrected altimeter setting, but neither the pilot nor copilot corrected their altimeters.

The pattern was close to the field and the base leg was just a momentary roll-out in which full flaps were started down. The turn onto final approach was made between 400 and 500 feet indicated and the B-50 continued descending at about 130 mph.

As the pilot completed the turn into final, he realized his dangerously low altitude and attempted to maneuver out of the situation too late. The left gear, nose gear and Nos. 1 and 2 engines struck a dike and the bomber skidded in a groundloop and stopped about 700 feet from the end of the runway. These pilots had apparently looked every way except down.

Because many USAF aircraft in current use have little or no rearward visibility, the pilots of such type aircraft, say, holding for clearance in takeoff position on the end of the runway, must rely almost entirely upon the tower or mobile controller as to whether or not the approach is clear of landing planes. In this situation, a hazardous condition can be created by a momentary communications failure, distraction of the tower man or other unusual condition.

Dangerous Situation

For the pilot who is holding on the end of a runway or the jockey who is entering the traffic pattern, the tower man or runway controller has his share of the responsibility for a safe landing. The ground men must give their full attention to the taxiing and flying aircraft and maintain strict control whenever there appears to be a dangerous landing or takeoff situation developing.

Although the alert tower man can, and often does, prevent serious aircraft accidents, this does not in any way relieve the pilot of his responsibility for making proper landing and takoff checks and watching where he is going on the ground or in the air. Nor do tower instructions in any way relieve the pilot of the responsibility for using sound judgment on whether to taxi, take off, land or go around.

There are no crystal ball solutions for making all landings and takeoffs absolutely safe or solving the problems that are being brought about by an ever-increasing amount of air traffic. The weather factor and Air Traffic Control problems on IFR flights are being solved in part through better radar equipment and procedures.

It's up to the pilot, when it's CAVU to use his head and eyes and be sure the way is clear for a safe touchdown.

TRAFFIC PATTERNS

Even under the most favorable conditions, the most hazardous moments of any flight are at its beginning and end . . . the takeoff and landing. At these extremities of flight, the aircraft's altitude is lowest while at the same time the airspeed is close to the stalling point, a combination that leaves a pilot no time for recovery or maneuvering.

A goodly percentage of all USAF accidents occur during this phase of flight and only constant vigilance on the part of the pilot will help reduce the landing accident figures to a minimum. Here is how you can help by following good landing rules:

- *Initial checkout*—Complete orientation of pilot on aircraft landing characteristics and performance.
- *Cockpit checks*—Pilot must establish and know a definite procedure for each aircraft in which he is current.
- *Approach speed*—Maintain proper speed during all phases of landing pattern.
- *Gear and flaps*—Make complete gear and flap check.
- *Runway alignment*—Make sure the alignment is accurate.
- *Radio watch*—Listen to the tower . . . there may be a plane you *can't* see.
- *Pattern*—Fly the correct pattern procedure and look around.

...FIT TO BE TIED

The protective helmet, if properly fitted and worn, can mean the difference between a slight headache and possible injury – the smart pilot makes sure his helmet fits.

By 1st Lt. William A. Johnston, Safety Education Division, D/FSR.

THERE'S a story they tell about the confirmed gambler, who, night after night, lost all of his money in a crooked gambling joint. One night, after dropping a month's pay, the gambler's friend asked:

"Why do you keep gambling in this joint? You know the place is dishonest.

"I know," replied the gambler, "but it's the only place in town." Smart gamblers, however, never play unless the odds are right.

It's a well-known fact that most Americans are gamblers by nature, and some of them have been known to gamble with their lives.

Speaking of odds, do you know that your chances of having a protective helmet (hard hat), that fits you properly are 100 to 1 against, poor odds in any game . . . if you can look at today's kind of flying as a game . . . and it's closer to being a cold, hard science.

Inspection teams from the Aero Med Laboratory have visited six bases in the past few months, and have found few P-3 helmets that are properly fitted or worn. The team has listened to complaint after complaint about how poorly the helmets fit, how heavy the visor is, how vision is impaired, etc.

Most of the complaints are justified, but usually they're soon rectified by proper fitting of the complainant's helmet, and proper installation of the visor mechanism. Adequate instructions to personal equipment personnel are to be found in two Tech Orders—13-1-37 for the helmet, and 13-1-40 for the visor.

It would appear logical that a pilot should check the T. O.'s to see to it that the helmet, which may save his life, has been properly adjusted and modified to do the job it was designed to do. And yet, most pilots interviewed on the trips have displayed complete ignorance, and sometimes indifference, to the proper fitting and wearing of the protective device.

There's a good checklist recommended for use in T. O. 13-1-37, "Use and Maintenance of Type P-3 Flying Helmet," which states, in substance:

"It is the responsibility of using personnel to visually check, prior to flight:

★ *All lacing cords of the sling assembly to see that they are sufficiently taut.*

★ *All knots to see that they are securely tied with a SQUARE knot to prevent any slippage.*

★ *The oxygen mask to insure that it is properly attached and fitted.*

★ *The visor mechanism to insure that it functions properly and that the lens is not scratched to the extent that vision is impaired."*

★ ★ ★ ★

All using personnel should check T. O. 13-1-37 personally, for, while it is the responsibility of personal equipment personnel to properly fit the helmet, every pilot owes it to himself to see that his helmet fits properly.

In order to clear up a great deal of confusion about the nomenclature of the various helmets in use, all using personnel should read T. O. 13-1-38, "Modification of Protective Flying Helmet, Type P-1."

Basically, the P-3 helmet is the P-1 helmet, with a serious of modifications, and by reading the T. O.'s, a pilot can determine the major differences between the three helmets—the P-1, the P-1A, and the P-3.

Proper installation instructions for mounting the visor mechanism to the P-1A helmet may be found in T. O. 13-1-40, which is contained only in the modification kit. Care should be taken to insure that the visor mechanism is properly installed for the ultimate in emergency protection.

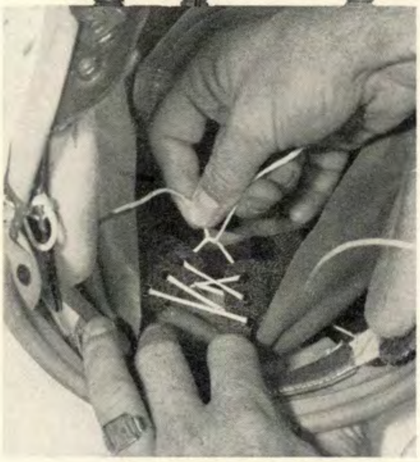
Excuses, Excuses!

Excuses are many, and in some instances, justified. The major complaint appears to be that rapid personnel turnover does not permit competent personal equipment people to stay on the job long enough to learn the business. If that's the case, and it seems to be, the pilot owes it to himself to read the tech orders, and if necessary, to fit himself or at least insure that his unit's personal equipment specialist does the job properly.

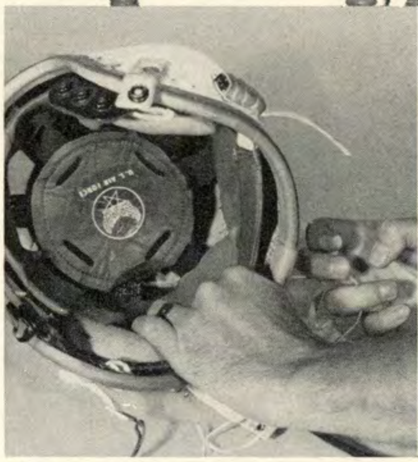
Another major complaint received from the field is that neither helmets nor the visor attachments are available. This fact is admitted, but supply is expected to meet demand soon. Until that time, stop-gap measures should be taken. An old battered helmet, properly fitted, is better than a hole in the head—and that's no joke, son!

Speaking of holes in the head—prevention of these holes is the main purpose of the "hard hats." The helmets are not intended to be crash helmets. Rather, they are meant to offer a reasonable amount of protection during emergency operations when a head can be buffeted about considerably moreso than somewhat.

For example, motion pictures taken of an actual ejection show that the head is subjected to a violent snap forward as soon as the seat leaves the tracks—and then—just as violently, The odds are extremely high that none of these helmets properly fit.



Before attempting to fit the helmet, the headband should be let out.



The shell lacing does not control head size but must be as tight as is possible.

After tightening, lacing should be secured around cord with a square knot.

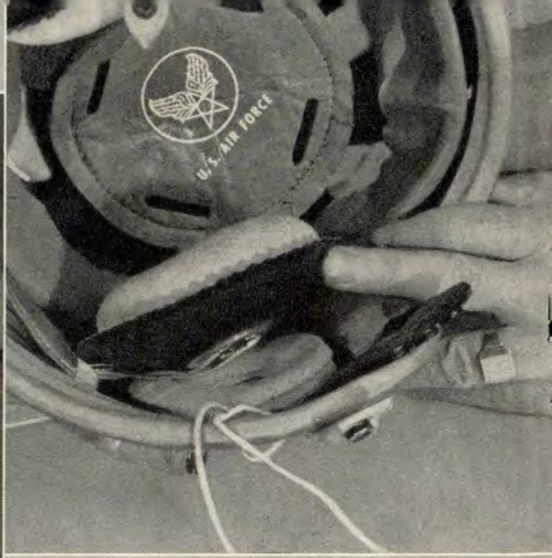
After knotting, tie each end of the lacing in a half hitch around the cord.

Earphone mounting pads should be adjusted to touch the lobes of the ears.

Radial webs of the top sling should be straight and entirely free of wrinkles.

Headband should be taken up slowly, trying on helmet after each change.

Foam rubber pads insure comfort; eliminate most external noises.



Full rubber pads should be spot-cemented in the earphone mounting.

snapped backwards, where contact is made with the headrest.

Odds Aren't Good

If the pilot loses his helmet as soon as he jettisons the canopy, the contact with the headrest could cause unconsciousness, and while some pilots have been known to unfasten the seat and pull the "D" ring while unconscious, the odds aren't too good that Mr. Average Pilot will make it.

Once again, it all reverts back to a proper fit, and proper installation of the visor mechanism. The visor was designed to prevent the loss of the helmet during high speed ejection. And, tests have been made which prove that the helmet will stay on at speeds up to 600 mph.

There seems to be some confusion as to the designation of the various helmets in use today. The P-3 helmet is a modification of the P-1 and P-1A helmets as follows:

The P-1 helmet was originally modified to include a neckstrap, revised and strengthened oxygen mask assembly tabs, and other minor changes. This was designated the P-1A. The P-1A has been modified to add an anti-blast visor and assembly to prevent loss of the helmet and oxygen mask during high speed bailouts or ejections, and called the P-3.

The rigid outer shell of the P-3 helmet is molded and laminated for strength. An inner sling assembly provides a means of adjusting the helmet to different head sizes, and sponge rubber pads regulate the pressure placed on the head and ears by the earphones. When worn properly, the weight of the helmet should be distributed between the top sling and the head band.

Fasteners are installed on either side of the ear tabs for attaching the oxygen mask. Wiring for the microphone and earphones is integrated in one cable which enters the back of the helmet. The microphone jack on the lower left side of the helmet makes it unnecessary to disconnect the oxygen mask microphone plug during bailout. The visor mechanism restricts the rush of air into the helmet from the front, reducing the chance of losing the helmet and mask during bailout or ejection. It also affords glare protection and protection to the face from flash fires within the cockpit.

Check It Over

There's a pretty good checklist that can be used before embarking on a flight when a helmet is worn:

. . . Don't make like a yo-yo with the communication cord!

Oxygen mask should be attached to the helmet by brass machine screws.

Neck strap lacing should be tightened until strap just touches back of neck.

This is proper grip for removing mask. The clasp works easily after you practice a few times.

• Are all lacing cords adjusted correctly and taut, secured with square knots and half-hitches?

• Is the oxygen mask fastened securely to the helmet oxygen mask tabs? The left side should be secured with button fasteners plus screws. The right side should be fastened with the hook assembly, which in turn is fastened to the right oxygen mask tabs with button fasteners plus crews.

• Does visor assembly function properly and easily, both up and down, and does it lock in place when lowered?

• Is visor lens free from dirt and scratches which might affect clear vision?

In addition to the preflight checklist, there is a series of everyday do's and don'ts, which every pilot should be acquainted with:

• Don't object if you find it difficult to get your oxygen mask off after a flight. It is far more important to have it stay on in a wind blast than it is to have it come off easily after you are safely on the ground. *Your mask can be unhooked with one hand after practice.*

• Unless it is absolutely necessary, don't let others borrow your helmet. It should be fitted to *your* head. If it is, it probably won't fit anyone else properly without changing the harness assembly.

• Don't throw your helmet in a locker, or in the corner of your room, and don't put it down on the visor.

• Don't spread your helmet unnecessarily when putting it on, or you will alter the shape and fit.

• Don't use a helmet that does not fit properly.

• Don't let the communication cord dangle and flop about, or carry your helmet by the communication cord. You may kink or break the communication lines.

• Fasten the throat strap and carry your helmet like a market basket or tuck it under your arm.

• Always place the canvas cover over the visor when not using the helmet.

• Hang up your helmet by the throat strap or place it upright on a shelf.

• Thread the communication cord behind the shell lacing to prevent the cord from flexing and kinking.

• Be sure of a correct fit.

• Take good care of your helmet.

• Read T. O. 13-1-37 which tells you how to get a correct fit for your P-3 helmet, and T. O. 13-1-40 which tells you how the visor mechanism should be attached to the helmet.

. . . Take good care of your helmet. Don't be sorry!

slant range visibility is essential!

Another Point of No Return . . . This incident happened in the Great Lakes region, not too long ago. I am sure that it broadened considerably the education of the F-86 pilot, and I am also sure that he is more confused than ever on the inability of weathermen to give him accurate reports for landings during bad weather.

Here is the story as the pilot related it to me.

"I was flying on top at 35,000 feet, enjoying the bright winter moonlight and the ease with which I was skipping across the milky white cloud deck. Below the cloud deck, I had been briefed by the weather people that the ceiling would remain at about 2000 feet, with visibility dropping to three miles in light snow flurries. I figured a penetration of the cloud deck, and then a GCA pattern into the field was just SOP.

"Just to be sure, I called for the latest weather condition and was told that there was an indefinite ceiling, 1500 feet, obscured, with $2\frac{1}{2}$ miles visibility in light snow. This caused me no sweat; it was well within my know-how and I had made many a landing under worse conditions. That is my busines. In the All-Weather Interceptor squadrons we expect to fly in severe weather and the report just made me relax.

"I also obtained the weather for the alternate which was within 80 miles of my home station, just in case the weather closed in, but now I was all set. By the way, the alternate weather was a measured ceiling of 4500 feet, with visibility of more than 15 miles, and I had more than enough fuel to go to the alternate. I wasn't cocky about this landing, but later events showed that I had a lot to learn. When I committed myself to landing at the home station and found that the conditions were not as reported to me, I didn't have enough fuel to climb out and proceed to the alternate that was 80 miles away. Jets are peculiar machines. They get you there in a hurry, but they don't give you the fuel cushion that we used to have in our old type fighters.

Everything Normal

"I let down through the cloud deck on an unrestricted letdown clearance to the range station — eight miles from home, figuring on a cocktail at the Officers' Club with my friends, and a good steak dinner with the family.

"I passed over the range station at 2500 feet and was picked up by GCI. Everything was normal and I told the controllers that I had the runway in sight. I should correct that and state that I *thought* I had the runway in sight. It was snowing

The perspective drawing at the right shows the approximate flight glide paths and altitudes of two jets whose pilots followed missed approach procedures when windshield plus ambient obscurations prevented sighting of the runway until it was too late to land.

and, as you know, a little wet snow bouncing off a jet windshield, looks like a lot of snow. GCI directed me down the glide path and at 300 feet altitude, I asked them to 'Please turn on the high intensity runway lights.' They came back immediately and seemed surprised. They said the lights had been on all the time and I must have seen them when I reported that I could see the runway over the range station.

"At 300 feet, I was below the authorized minimums for the airfield and believe me, I hit the panic button! I felt like the guy who flew up a blind canyon. I climbed out on a missed approach procedure and did a lot of squawking to tell them what I thought of that weather report. All the time I was reporting, I kept thinking of that fine alternate only 80 miles away, with a 4500-foot ceiling and 15 miles visibility. Apparently, I wasn't going to enjoy that cocktail in the Officers' Club, or that good steak dinner.

"It takes time to make a precision instrument approach and I knew that I would run out of fuel before I could complete another. There was only one thing to do—leave this fine piece of machinery that my country had entrusted to me and hit the silk —with the hope that they wouldn't also lose the big training investment in me!

"I am still a little confused. I looked at this instrument approach from all angles and I think I did the right thing. It never occurred to me that maybe the weatherman might make a mistake, or that he was just guessing at those weather conditions when I decided *not* to use the open alternate.

"I guess that I am just an overly trustful jockey."

Brother, this weatherman didn't make a mistake, or give you wrong information. You went through an experience that is more common in the flying game than it should be. (Another F-86 pilot stated that he got a glimpse of the runway at one-quarter mile but couldn't land. He was more fortunate and had reserve fuel to go to the alternate.)

Weather Limitations

The United States Weather Bureau and the military weather sections have recognized their limitations in accurately measuring obscured ceilings occasioned by snow, rain, dust and haze. Without doubt, the American weather people are the best in the world, but they do not have a method or technique that will give them precise and accurate measurement of obscured ceilings. Air transportation is only 30 years old and the jet age is only five years young. Great progress has been made in all fields of aviation, but we have a long way to go to solve all of our problems.

All pilots, commercial and military, would welcome an accurate measurement of obscured ceilings, especially at low altitude—with ceiling measurements made on the approach to the active runway in the airspace containing the final approach glide path. The pilot wants to know at what altitude and at what distance from the touchdown point on the runway he can transition from instruments to visual reference. To our knowledge, there is no blind landing system in existence in the world.

Precise and accurate measuring of obscured ceilings are lacking in not only the Air Force, but in commercial air operations. Obscured ceilings at moderate altitudes pose no landing problem; however, the absence of precise measurement when the ground is obscured to a pilot at low altitude, is extremely hazardous.

Invariably, high intensity ceilometers or light beams and weather balloons used for determination of these obscured ceilings are taken in the vicinity of the airfield weather section, located near the terminal or operations building. It is the consensus that ceilings must be most accurately measured in the airspace containing the final approach glide path.

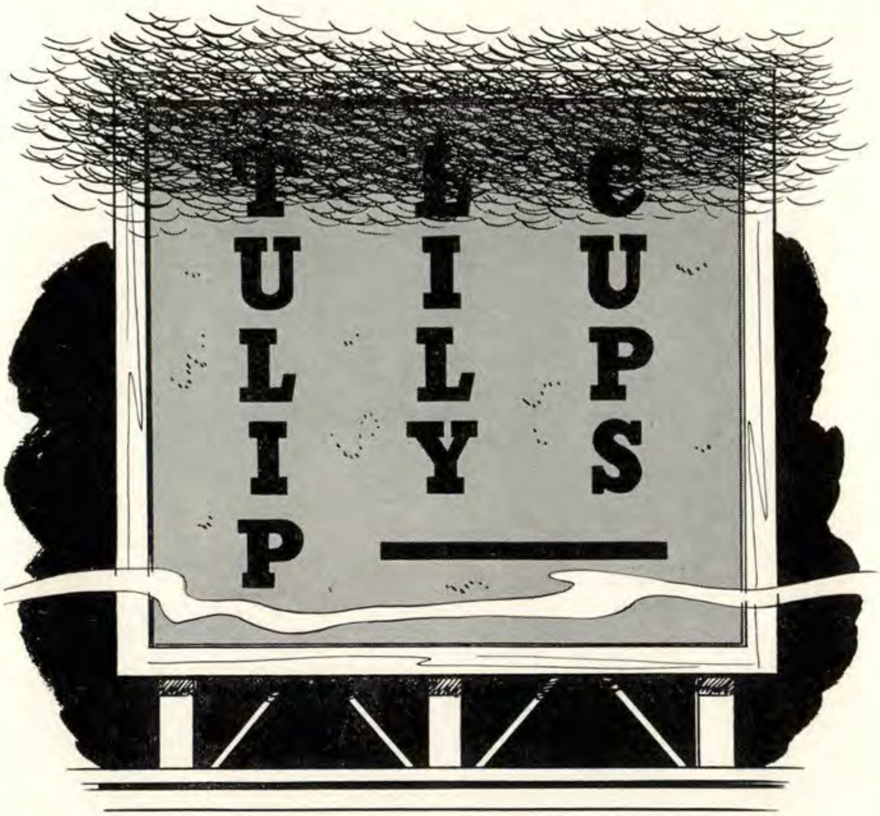
Ceiling Defined

Both the Air Force and Civil Aeronautics Board have identical defini-

obscured, 2½ miles visibility with light snow.

tions for the word "ceiling." Airfield weather sections can accurately measure well-defined cloud decks but cannot, with present techniques and equipment, accurately measure the indefinite or precipitation ceiling from which a pilot in flight can see the ground during conditions of P (precipitation) or W (dust, haze, fog, etc.)

Under conditions of a P or W ceiling, airfield weather observers estimate the height of the obscured



ceiling by using as a guide the upper limit of a high intensity ceiliometer reaction, the top of a ceiling-light projector beam, or the height at which a balloon completely disappears. The meaning of the term "indefinite ceiling" is clear to skilled weathermen; however, the F-86 pilot in this accident assumed that the indefinite ceiling of 1500 feet obscured would pose no particular problem. The phrasing used, "Indefinite ceiling—precipitation ceiling, obscured," can mean many things to the pilot and usually does not have the same meaning to him as it does to the skilled weatherman. The pilot thought he could see the runway from 2500 feet and called for runway lights at 300 to 400 feet altitude. The high intensity runway lights were on at the time and the pilot could not see them.

The pilot's angular vision from the cockpit, through the windshield, or over the side of the fuselage, is a slant range of sight. The human sight capability is not identical to, nor comparable with, ceiliometer reactions, light projector beams, or the height at which a balloon completely disappears to the vision of a ground observer. These last-minute terminal weather conditions are given to the pilot for the purpose of accomplishing a safe landing. They might be in error, as they were in this case, *from the pilot's position in the cockpit,* by as much as 2000 feet altitude.

Therefore, the ceiling weather observations given to a pilot for a landing under conditions of obscuration phenomena are of questionable value. At low altitudes, obscured ceilings must be accurately measured and not estimated. Solution to the problem of precise measurement of obscured ceilings at low altitudes is very important in landing aircraft under adverse weather conditions with reasonable safety.

The visual problem due to obscuration phenomena is further complicated by rain or wet snow on the windshield. This rain or snow will add another factor of obscuration to the ambient weather condition and will also introduce windshield distortion.

The CAA and other research organizations are working on the problem through windshield design and are also testing the effectiveness of windshield anti-wetting agents. Preliminary reports indicate that the anti-wetting agent is effective with rainfall rates up to 2″ to 3″ per hour.

The finest research brains in the world are working around the clock to maintain the American airpower position—both civil and military.

Someone will come up with the answer because a nation that can produce the atomic bomb can certainly solve this little problem for the pilot.

Our old airline pilots with many thousands of hours in air carrier operations, have learned the hard way. Through experience, they have learned that they must carefully interpret the weather terminology used by the weatherman and they know that the weather observations given to them in flight may change drastically in 30 seconds when an obscured ceiling is present. This problem has existed for the airman since he flew the first airplane across the United States.

Until the solution is forthcoming, all pilots must recognize the limitations of our weather techniques and act accordingly. This is more important to the jet pilot than it is to the commercial transport pilot who still flies the reciprocating engine and has a large cushion of reserve fuel for all contingencies.

For years, commercial transport pilots out of La Guardia have been using the *"TULIP LILY CUPS"* billboard sign for ready reference on slant range visibility and ceiling. When the sign said, *"ULIP ILY UPS,"* the ceiling was below 300′ and safe minimums.

We wonder!—do they still use this sign for their best weather reference?

Selby

tell the WHOLE story

HOW MANY OF YOU pilots would fly for hours and forget to log the time?

The Form *1* is a record of your flying time; it is usually filled out with meticulous care, each minute is pampered and sometimes promoted to five; unfortunately, its kid brother, the 1A, doesn't fare so well.

Imagine the problem presented by *each* "remark" you make in the Form *1A*. Remember this:

Out of the few words you pencil in the form, maintenance must create a safe airplane, not one that is temporarily fixed but one that is cured. Fortunately in many cases the trouble is accurately diagnosed and corrected, whether the Form *1A* was helpful or not. But sometimes the trouble is unknown or so poorly described that the write-up is meaningless.

Some typical "write-ups" are—

- Engine seems rough at 500 feet. O.K. elsewhere.
- Manifold pressure decreases as altitude increases.
- Engine cut out twice in cruise, flew O.K. two hours after that.
- Radio and instruments inoperative when battery switch is turned off while taxiing—must be a short somewhere.
- Prop ran away on takeoff.
- Check for vibration.
- Check for high M.P. on left engine.

Reading between the lines of such "squawks," like the mechanic, you will suspect things. You will have questions but the guy who wrote them, too often, has gone. How much did the prop run away? What RPM? How high did the manifold pressure go? Where was the vibration? How long did it last? Did you notice the fuel pressure when that engine "cut twice?" Were you switching tanks at the time or changing any settings? What do you mean by "seems rough?" Did you check mags or change mixture? If so, what happened?

When you lose an engine it's P.T.M. (props, throttle, mixture). *How about a checklist* of the Form *1A?*

- Put down all you know about trouble experienced. Don't guess.
- Tell the crew chief or engineering officer about all the other little details if they are too numerous to mention.
- Most important of all, don't forget the Form *1A*. Enter your flight as O.K., or put down your remarks on those things that you object to.

Use this checklist after each flight is completed. It will make the aircraft safer for the next pilot, who may be *you*. And the crew chief will greet you with a smile when you come out to fly his ship. ●

Crescent Wing Design

The goal of aircraft designers is to evolve the ideal aircraft for high altitude, supersonic flight, with safe control near the ground. According to C. S. Stafford, chief designer for Handley-Page Ltd., the crescent wing design achieves this objective.

The essence of the problem has been wing drag. As the main drag comes from the wing, the solution lies in the design of a wing with low drag at high speed. With speeds in the past well below that of sound, the forces on an aircraft were directly related to airspeed. On approaching the speed of sound, air compressibility causes a rapid increase in drag. Since air must go faster in following the shape of a wing or fuselage, there will be many regions on the aircraft where air velocity will be greater than flight speed.

Apart from their influence on drag, shock waves affect control, stability and flutter and that is why the shape of a long-range, high-speed aircraft must be determined with greatest care. Even small regions causing shock waves mean large increases in drag. Naturally, the speed at which this sudden drag-rise occurs must be higher than the intended cruising speed.

Low drag, good control qualities and stability and freedom from flutter or divergence are essential for the highspeed aircraft. Additionally, it must be controllable and stable at the stall in order to land at reasonable speed with safety in the hands of a pilot of normal skill. Also, we must have structural lightness with strength and stiffness and, ideally, a wing must be thick enough to house engines, undercarriage and fuel.

How are we to fly at high subsonic speeds at great height and with the aircraft under control near the ground? Wing sweep is the partial answer. It is the recipe for the delay of compressibility-drag. High subsonic speed with low drag is attainable with wings that are straight-swept either backward or forward or with razor-thin unswept wings. These are, however, serious shortcomings with straight-swept wings in that large sweep-angle cannot be used except at very low aspect ratio owing to poor stalling qualities.

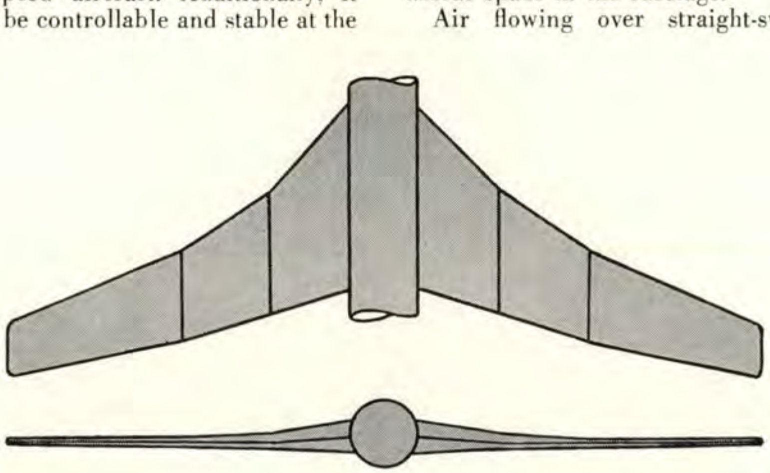
The back-swept crescent wing, with angle of sweep progressively decreased towards the tip, permits the use of high aspect ratio for good altitude performance with good stall characteristics. To analyze the problem, why have sweep at all? Why not a simple straight wing?

To avoid compressibility-effects a straight unswept wing must be very thin indeed. It could be built in this way, but a bomber would look like a Christmas tree with engines and fuel tanks hanging from the wing and the undercarriage would take up useful space in the fuselage.

Air flowing over straight-swept wings is deflected outwards if wings sweep back. If the wing has a high aspect ratio, this air builds up at the tip when the wing is near the stalling point. The tip stalls and the aircraft becomes unstable and maximum usable lift is not as great as we want. The crescent wing, with its tip only slightly swept, avoids these snags, says Stafford.

Objections to the straight-swept wing of high aspect ratio are reinforced by bad aero-elastic qualities. Movement of the ailerons tends to twist the wing so that the change of its lift opposes the control force due to aileron deflection and so reduces lateral control. Again, if a straight-swept wing twists under air load the aircraft may become dynamically unstable. The crescent wing meets this difficulty by having a tip only slightly swept so that aero-elastic troubles are greatly reduced.

Unlike the crescent, the swept wing of low aspect ratio suffers from having a poor performance at high altitudes, the induced drag being high. If the aircraft is to operate at high altitudes, span (and hence wing area) must be large with corresponding penalties in drag and weight. Engine tail pipes must be long and inefficient. The center of gravity can only be moved between narrow limits. In order to take off or land at a reasonable speed, the pilot must fly at an unusual angle, greatest lift being obtained only at high angles of attack.

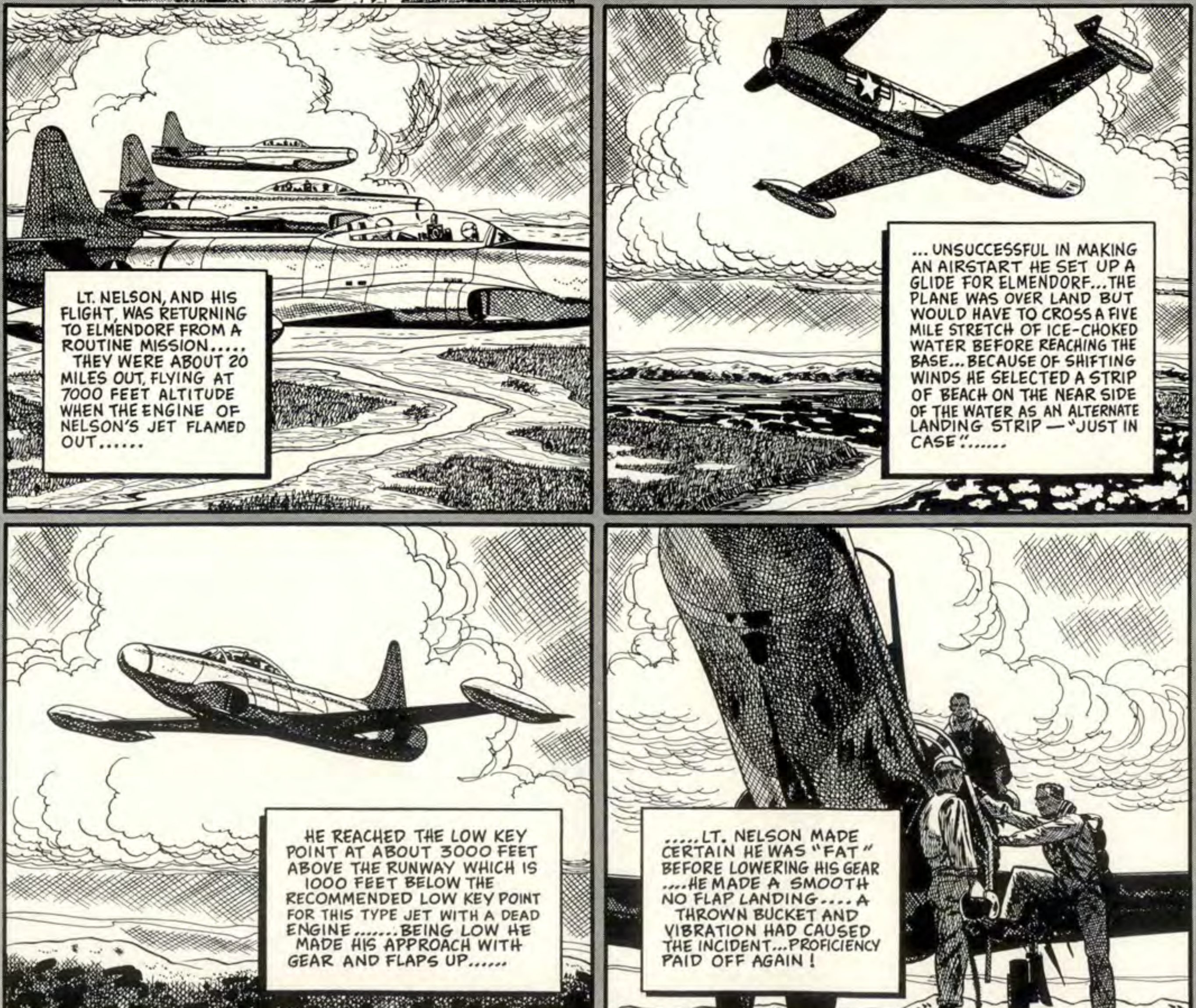


With the crescent wing, engines and landing gear are enclosed in a light efficient structure. Its large center-wing sweep enables a fuselage bomb bay to be unobstructed as the main load-bearing wing structure is well forward. Behind this, the landing gear can be folded away and engines can be buried. They are accessible without weight penalty as no cutouts are needed in primary members. With the main structure ahead of the fire zone, the chance of an engine fire being fatal is remote.

(Shell Aviation News)

WELL DONE!

ARE YOU prepared for a flameout landing? Lt. S. H. Nelson of the 64th Fighter Interceptor Squadron was. The article "Project Flameout" appeared in the August, 1951, issue of *Flying Safety*, and Lt. Nelson was an avid reader. Several times he practiced landings as prescribed in the article and when an emergency arose he was prepared. . . .



Cross Feed

flying safety idea exchange

Blanking of UHF Radio Signals

The attention of pilots is invited to the fact that they may experience blankingout of UHF radio signals when the fuselage and/or wings of the aircraft come between the aircraft antenna and the ground station or other aircraft which they wish to contact.

Pilots should become familiar with the radio characteristics of their aircraft so as to be able to avoid this difficulty.

Lt. Col. W. V. Jacobsen
ADC Branch, OR&TI Div.
Office of the Inspector General, USAF

Cheney Award

While reading the account of the presentation of the Cheney Award to Capt. Daniel J. Miller, and the Roster of Award winners (FLYING SAFETY, Jan. 1953), I find an error which should be corrected.

In 1936, Maj. Frederick D. Lynch *AND* M/Sgt Joseph Murray were awarded the Cheney Award (double award for 1936).

Major Lynch was in Flight C, 16th Obs. Sq., and M/Sgt Murray was in the First Balloon Sq. Both were in a free balloon of which Murray was the pilot. The ballon crashed and burned; both men were active in trying to rescue the two men who did not get out of the crash and resultant fire. Both Major Lynch and M/Sgt Murray were awarded the Cheney Award, and Sgt. Murray was awarded the Soldier's Medal in addition to the Cheney Award.

President Roosevelt made the presentation with General Marshall.

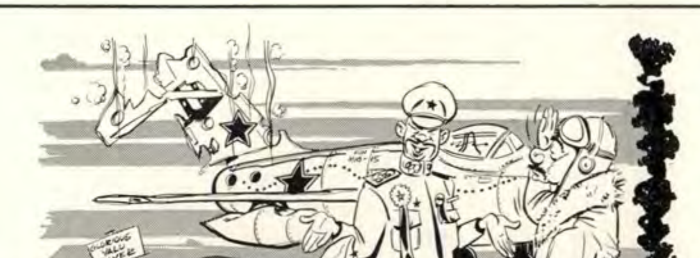
M/Sgt. Richard G. Leonard
AFROTC Det. No. 455
Montana State University
Missoula, Montana

(Thank you for the information about M/Sgt Joseph Murray.—Ed.)

Bouquet from Denmark

A few days ago I had an opportunity to read a copy of your excellent magazine, "FLYING SAFETY." It was a real pleasure because it was very interesting. We have a flying club here in Copenhagen: The Copenhagen Airplane-spotting Club. I am the president. I showed the magazine to some of the members. They were happy, too, to read it. Therefore, I ask you if it is possible for you to send a copy to us from now on. We will be very happy to have it—if it is possible. I am waiting to hear from you with good or bad news, and in the meantime, I will say

Sincerely,
Wilhelm Jorgen Jensen
President
Copenhagen Airplane Club
15 Oster Farimagsstreet
Copenhagen K, Denmark



Hero pilot reports was half-way through split-ess when capitalistic sabre-jet hit him, causing tail damage!

That Belt Again

I am writing to you in reference to "That Belt Again" in Crossfeed, February issue of FLYING SAFETY. I quote Ed. Note: "Captain Slater is correct, except for the correct TO reference, which should be Section 1 AN 01-75FC-1 Unquote."

Does FLYING SAFETY magazine publish its own Technical Orders now? The reason I ask is because the T. O. you quote is not listed in T. O. 00-1-1. According to the index, the Captain has the proper T. O. listed for T-33 and TF-80 type aircraft.

If the Safety belt does what was written in Crossfeed, November issue, it must be highly educated.

You have a fine magazine and I would like to see it stay that way. No more phoney Technical Orders Please. . . .

M/Sgt. James J. McCann
58th Air Rescue Sqdn.
APO 231, N.Y., N.Y.

Ed Note: You are right! Captain Slater was correct in his T. O. reference. Thanks for your interest.

Likes Magazine

FLYING SAFETY continues to improve with each issue. The stories seem to be written with an expert hand, by people who know what they're talking about. I think your issue on Weather is one of the best issues of its kind I have ever seen, and I have been reading FLYING SAFETY for many years.

Maj. George Spelvin, USAF,
APO 231, New York, N. Y.

the form 1-a for tennis

A flying man wouldn't have any gripes at all to write up after an A-1 date for tennis. He could remember everything in vivid detail. Why not keep the same attitude toward your job as a pilot in the USAF . . . if you have squawks after a flight, write them up on the Form 1-A . . . explain what, where, why, and when something went wrong. It will make the airplane safer for the next pilot who may be YOU!

Use a Form 1-A Checklist After Each Flight

MARA CORDAY, *Atlantic Productions*

AO . . . CHECK RAMPS AND RUNWAYS NIGHTLY

THE airdrome officer represents the base commander and the operations officer in all matters pertaining to flight of aircraft. His duties consist of more than checking clearance forms, if he is to do his job right.

It is important that the airdrome officer check ramps and runways each night to check adequacy of facilities, freedom from congestion, and the possibility of dangerous obstructions in the form of parked vehicles or equipment.

A careful check of airfield lighting should also be made, and inoperative lights should be reported at once to the Control Tower and to the Installations Officer.

LOOK SMART—BE SMART—FLY SMART THROUGH

FLYING SAFETY

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