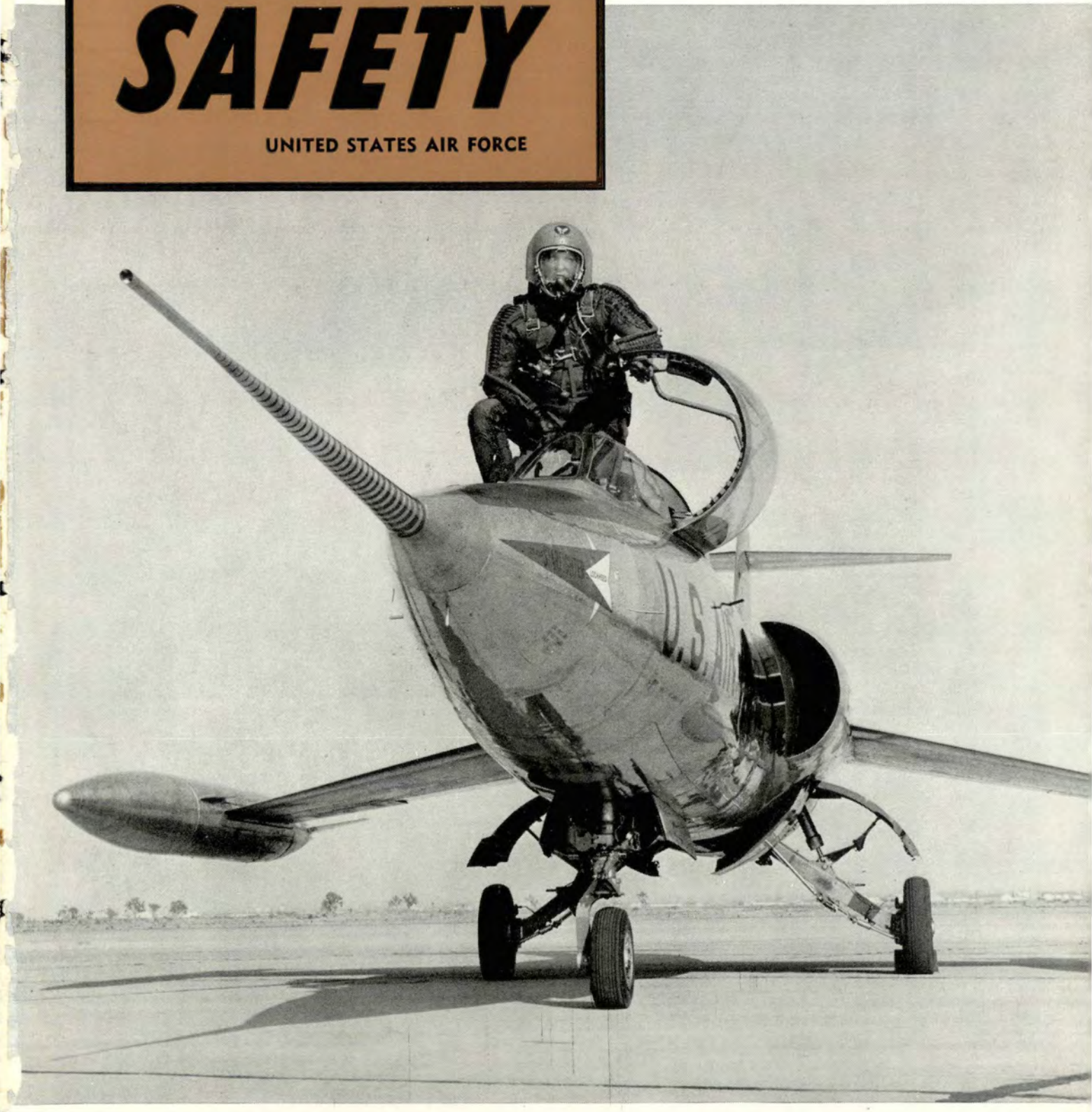
FLYING SAFETY

UNITED STATES AIR FORCE

NOVEMBER
1956



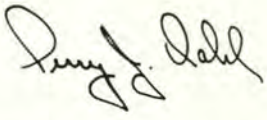
The F-104 Story . . . . page 10

File Thirteen

. . . This month our cover shows the XF-104. Incidentally, if you have been led to believe this bird is more missile than airplane you have been misinformed. . . . Headquarters AMC, ARDC and WADC are receiving numerous unsigned recommendations by well-meaning troops who are seriously trying to improve Air Force equipment. This isn't the way to get the job done. The correct method is set forth in AFR 66-30 and T.O. 00-35D-54. The procedure is to submit recommendations through the USAF Product Improvement Program (PIP). The channels exist, so use them. They are the shortest route. . . . The other day I land my T-Bird only to find a notice to call the Ops officer. This I do, and he says, "We have had a report of a jet buzzing a hospital, downtown. Where were you at 0950?" Fortunately, I was somewhere in the GCA pattern at the time, however, the point is not so much who as why? Why would anybody roar around at extremely low altitudes any place, much less over a populated area? With our new noise makers, expanding facilities and growing communities, we have enough trouble keeping peace on the home front without some knucklehead noising up the area. There are many, many reasons for not flying dangerously low.

1. Gets folks mad at the Air Force.
2. 'Tain't safe.
3. I may not be able to prove where I was at that time.

'Nuff said.



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USAF PERIODICAL 62-1

FLIGHT SAFETY
★ AWARDS ★

Fourteen coveted FLYING SAFETY PLAQUES have been awarded for the period 1 January through 30 June, 1956. The recipient organizations, listed on the following two pages, stand as symbols of increased economy and effectiveness through accident prevention.

The exceptionally commendable accident records of these units reflect the uncompromising efforts of each officer and airman. Only through utilizing and implementing sound accident prevention practices and the display of exemplary airmanship can such achievements be attained.

The following pages list the units by major command. A brief narrative of the missions performed and hazardous circumstances encountered substantiate their claim to "top honors" in the field of flying safety.

3594th CCT Sq
Nellis AFB, Nevada
Air Training Command
F-100

A new, ***super-sonic aircraft*** was introduced. Instructors had very ***limited experience*** in the F-100. The experience level of the students was as low as 350 hours total flying time. Pilots with ***no previous F-100 time*** performed the transition, formation, gunnery and tactics.

★ ★ ★

464th Troop Carrier Gp. (Med)
Pope AFB, South Carolina
Tactical Air Command
C-119

During this "accident free" period ***319 tons*** were airlifted, ***175 tons*** dropped, ***10,713 personnel*** dropped and ***11,957 personnel*** airlifted. The airfield was under ***major construction,*** necessitating the utmost caution. Field maneuvers were performed involving mobility capability tests under simulated combat conditions.

★ ★ ★

6614th Air Transport Gp. (Med)
Pepperrell AFB, Newfoundland
Northeast Air Command
C-54 — C-119 — H-21

There were no accidents or incidents while performing such missions as helicopter supplying to the remote ***DEW Line*** and AC&W sites; ***ski-equipped*** cargo aircraft operating in ***uncharted areas*** and POL airdrops on the ***Greenland Ice Cap.*** In addition, support was given the Royal Canadian Mounted Police and the Danish agencies during emergencies.

3525th CCT Wg
Williams AFB, Arizona
Air Training Command
F-86F — T-33

The Wing compiled a total of ***37,545 flying hours*** during the award period. The mission of the wing was changed to the F-86F aircraft requiring ***up-grading*** of all instructors. MDAP students from nine different foreign countries contributed to training difficulties due to the language barrier.

★ ★ ★

43rd Bombardment Wing
Davis-Monthan AFB, Ariz.
Strategic Air Command
B-47 — KC-97

Over 13,000 hours were flown for this period without a major or minor accident. Missions included ***aerial refuelings*** during the hours of darkness, while maintaining radio silence and with formations intact. Extensive ***airfield construction*** required extreme caution during aircraft ground movements.

★ ★ ★

3rd Air Rescue Group
Nagoya Air Station, Japan
Military Air Transport Service
SA-16 — SH-19 — SC-47

The speed with which rescue aircraft must be dispatched ***prohibits adequate preflight*** planning. Many missions were flown over ***hazardous terrain*** without navaids. Missions included over-water flights and tricky ***open-sea landings*** as well as low level search over mountainous terrain.



Some of the aircraft operated by the winners.




1611th Air Trans. Wg. (Med)
McGuire AFB, New Jersey
Military Air Transport Service
C-118 — C-54 — C-47

A total of ***61,741 hours*** were flown during the award period without a major or minor accident. Every ***type of weather*** phenomenon except tornadoes were encountered while flying in all the climatic zones. Communications and navaids in ***foreign countries*** presented many hazards during IFR letdowns.

★ ★ ★

49th Fighter-Bomber Wing
Misawa AFB, Honshu, Japan
Far East Air Forces
F-86F/D — C-119G — B-26

The large majority of the pilots are ***young and inexperienced*** with less than two years in jet fighters. During the spring months, ***fog, low ceilings*** and ***light precipitation*** hampered operations and made them more hazardous. The weather is "famous" for going from clear to ***below minimums*** in a 15-minute period.

★ ★ ★

33rd Fighter Group (Def)
Otis AFB, Massachusetts
Air Defense Command
F-89D/H — F-94C

Around the clock operations in all types of weather was the keynote. ***Marginal weather,*** frequently below GCA minimums made recoveries more hazardous. The main instrument ***runway was closed*** one-third of the time due to construction and repair.

★ ★ ★

388th Fighter Bomber Wing
Etain Rouvers, France
U.S. Air Forces in Europe
F-86F

Opening of a relatively new base, coupled with ***inadequate navaids*** required close observance to safety practices. Unusually ***severe weather*** throughout Europe added to the hazards. The base operated ***without a GCA*** unit for a large portion of the award period and, due to political considerations, the homer was located within the Air Field boundaries, necessitating an ***unsatisfactory penetration*** and ***letdown*** procedure.

439th Fighter Bomber Wing
Selfridge AFB, Michigan
Air Force Reserve
F-80

There were no accidents or incidents during this period. The mission of the Wing is to train personnel so as to become "operationally ready" for fighter bomber efforts.

★ ★ ★

302d Troop Carrier Wing
Trenton County Airport
Wilmington, Ohio
Air Force Reserve
C-46

In accomplishing a "no accident or incident" record, the Wing participated in operation "Sixteen Tons" and transported personnel for the summer encampments of the Reserve and ROTC groups.

★ ★ ★

197th Fighter Interceptor Sq
Sky Harbor Airport, Phoenix, Ariz.
Air National Guard
F-86

In training to maintain operational proficiency there were no accidents or incidents during this period. Operational missions were transition, instrument and tactical flying with formation, navigation and gunnery training.

★ ★ ★

141st Fighter Interceptor Sq
McGuire AFB, Trenton, N. J.
Air National Guard
F-86A/E

In supporting the Air Defense Command mission, no accidents or incidents were experienced. A complete transition from F-86A aircraft to the E models were made while performing operational proficiency missions.

Above, the armament of an F-101 is cold weather tested. Right, an ice-crusted B-47 outrigger gear is cold soaked.

When it comes to checking to be sure our birds can still operate when the temperature drops out of sight, the cold test hangar is the answer.

Baby it's Cold . . .

ADDED TO THE many other requirements, the Air Force birds of today must be capable of operating at temperatures ranging from −65° to 160°F. At 65 below, cables may snap like dry spaghetti; intricate parts may not operate, and touching cold soaked metal with your bare hand would cost you a layer of skin. Design and manufacture must be keyed to this requirement and, to complete the picture, we must know just how a new piece of equipment will stand up. We don't want to send a Cheechako to do a Sourdough's job.

To be specific, the United States Air Force requires that all aircraft and ground and personal equipment used by Air Force personnel operate satisfactorily under all climatic conditions, or be capable of such after undergoing acceptable modifications. To meet this requirement, a climatic testing program has been established. The program is the responsibility of the Air Proving Ground Command at Eglin Air Force Base, and thereon focuses our story.

A bird's eye view of the main chamber of the Climatic Hangar displays a variety of aircraft.

Previously, all testing had to be conducted in natural locations. This procedure involved a multitude of problems. Long departed are the difficulties of setting up a complete testing operation far off in the boondocks of the Arctic. Arrived is the Climatic Hangar of the APGC, one of the most unique units of its type found anywhere. Its functions are two-fold. To supplement and reduce the required field-testing program and to make

possible, year around testing under controlled temperatures and other climatic conditions.

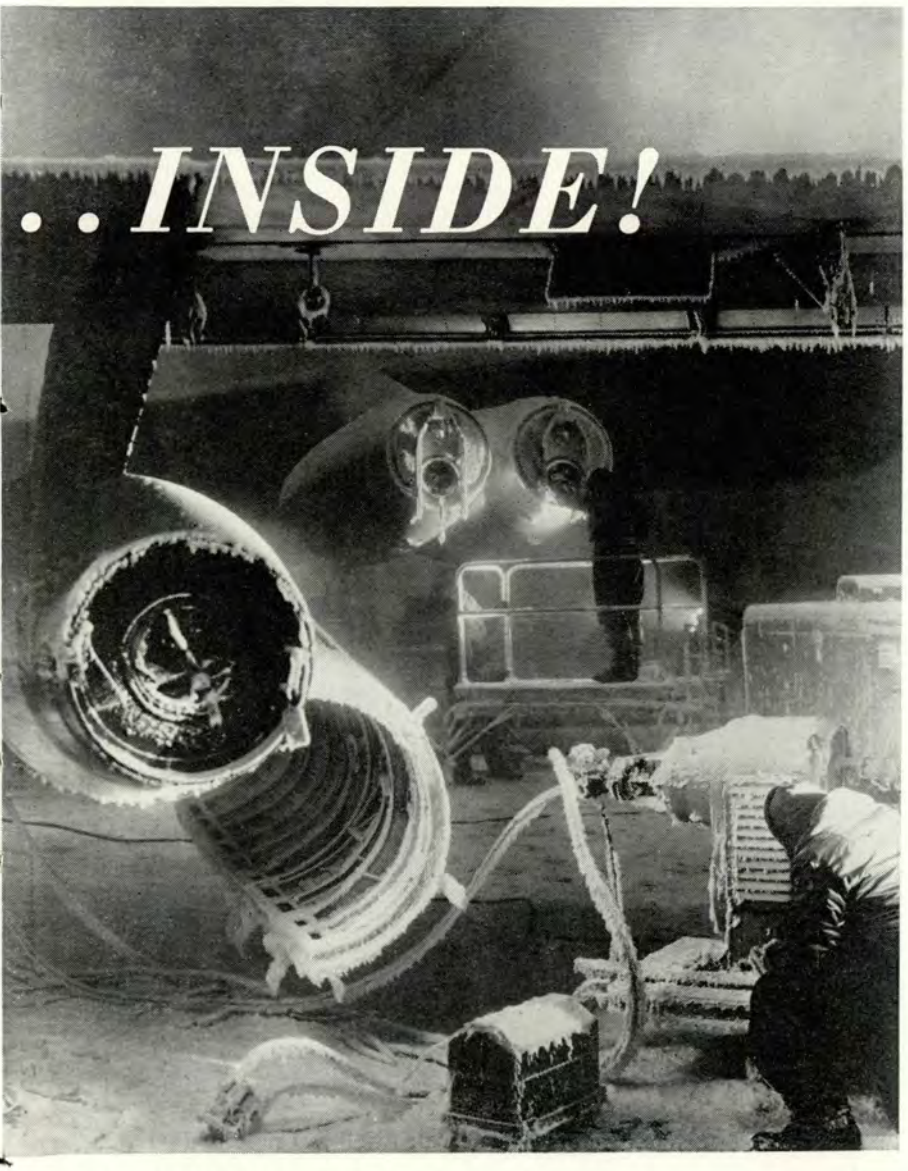
As the name implies, the climatic testing program includes everything from the conditions existing in the Arctic to those of the Equator. The Laboratory is made up of

- Climatic Hangar
- Engine Equipment Facility
- The All-Weather Room
- The Armament Strato-Chamber
- Physiological Strato-Chamber
- Desert Test Room
- Hot Test Room
- Tropical Marine Test Room
- Cold Test Room
- Jungle Test Room
- Salt Spray Chamber.

All of these facilities carry out important test projects. However, this article will be restricted solely to the climatic hangar.

The climatic hangar is an insulated room with a clear working area of some 50,000 square feet. It will house a B-36 and several smaller aircraft at the same time. In addition to the temperature range, relative humidities can be controlled from 10 to 95 per cent.

Due to the extreme temperatures which will be encountered at all times within the main chamber and test

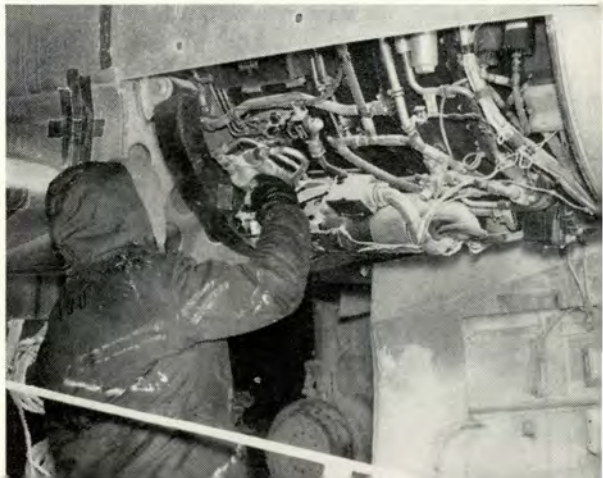


Two heavily clad airmen test the electrical equipment on an ice-covered RB-66 at 65° below.

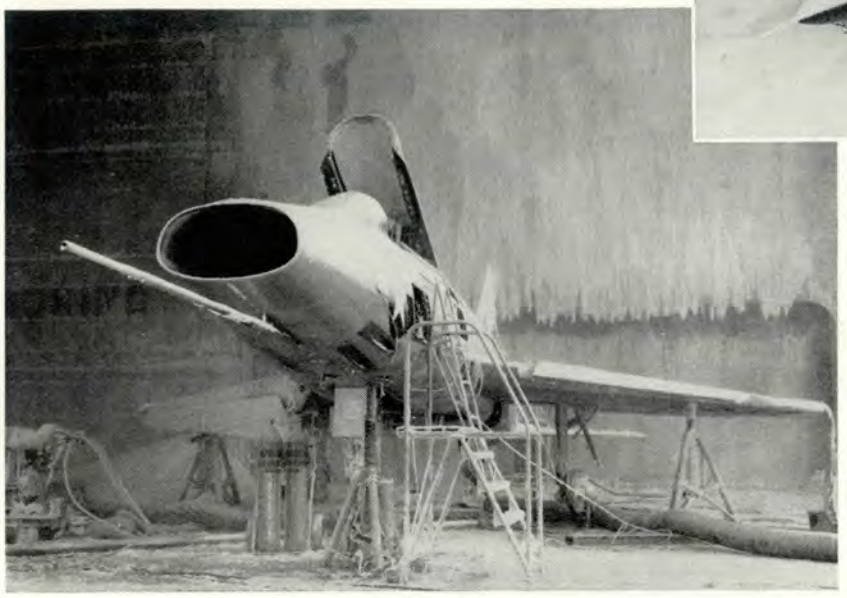
. . INSIDE!

A landing gear actuator stand test is used to check operation of the gear mechanism.

A fire guard stands by as one engine is run-up. During runup certain parts are checked.



The "deep-freeze oven" cold-soaks the aircraft, then many tests including actual firing of guns are performed.



rooms, special clothing must be worn. Clothes worn for cold testing are both Arctic ground type and heated suits. The electrically heated suits are supplied with power from mobile transformer units which can be placed at any location in the hangar or test rooms.

Project officers run up jets in the hangar and perform a multitude of tests. They can even fire the aircraft's weapons. The east wall of the chamber faces a firing range. This wall is fitted with five gun ports located in two elevations. The weapons are fired through these ports and the projectiles explode harmlessly in range 22 on the bay.

On the floor of the hangar is a pit for the testing of bomb racks and release mechanisms. Aircraft are towed over the pit and dummy bombs are dropped into a sawdust bed.

A wind machine, mounted on wheels and adjustable as to height and angle of discharge also is available. It will provide a 100 mph wind for use in tests which require the simulation of certain flight conditions. Apparatus is being designed, which, in conjunction with this wind machine, will simulate sandstorms, snowstorms, rain, and icing conditions, for testing de-icers, propeller pitch control and such.

Everything from gear retraction tests to engine runup is accomplished in this chamber.

The versatility of the hangar can best be summarized through reference to a claim by some engineers that "you can do anything in the hangar but fly." This claim, however, was disproved when a helicopter was actually flown a few feet above the hangar floor during a test.

For those who don't care to expose themselves to the elements, mobile observation rooms are available. These rooms are wheeled about the hangar floor enabling close observations through the anti-frost windows, without the discomforts of frigid temperatures.

Of course all types of precautionary equipment is installed. There are five different types of fire fighting systems. They include water fog, foam and carbon dioxide, just to name a few.

Personnel and equipment are protected against the hazards of carbon monoxide and explosive vapor by an automatic electrical detecting device which draws air samples continuously from eight points in the main chamber.

All in all, this is quite a facility. The climatic hangar itself and the specialists who operate and maintain it face a real challenge in simulating some of Mother Nature's worst moods. Here is another cross-section of our Air Force. . . . One that is destined to contribute its bit toward defense as well as safety of flight. ▲

Snow can start falling from a cloud-laden sky in a moment's notice. For those who must remove it and for those who must operate aircraft around it, the answer is the same. Be prepared. . . .

When the Whistle Blows!

BUSINESS and traffic in half a dozen major cities came to a dead halt. For three days, almost nothing happened. Among them were Dayton, Cleveland, Pittsburgh, Toledo and Akron. Snowbound. Trapped by tons of snow. That was Thanksgiving 1950. Last year, it was the Panhandle of Texas. What happened? Nothing. It just snowed. And snowed. And snowed. Everybody said it was "an unusual snow" — and maybe it was. But that's little guarantee that it won't happen in your town, or on your base this winter. They have lots of snow in lots of places every year; the same kind and the same amounts that you might call "unusual" for your particular location. Nobody gets overly concerned about the matter in those areas when the snow starts falling. Nor do they get bogged down in the stuff to the point that they can't operate.

The big difference in them and you is that they are prepared for the stuff. They know exactly how to cope with the problem, what they're going to use, and when they're going to start. To them, it's old hat. Just like getting up in the morning—snow in the winter. To keep things moving, move the snow.

But this sort of thing doesn't "just happen." The wand-waving technique for moving snow was abandoned some years ago. It's a problem. If your base is something like the average throughout the Air Force, you have roughly 15,000,000 square feet to shovel off before your base is operational. That doesn't include the first street, the first fire lane, nor the entrance to the coffee shop. That is merely the ramps and runways. With the average size snow shovel you can pick up about 2000 cubic inches worth of snow at a time. If you have just a two-inch snowfall at your base, and you alone are assigned the job of shoveling it off, you'd better start now. After that first shovel full, you have 29,999 more to go. Some little time before you finish, you'll agree with me that, "Snow removal is one of the most difficult tasks facing the northern Air Force base."

If you have a copy of SAC Manual 85-2 handy, you'll have the source of the quote. And you'll also have one of the best guides for snow removal planning that can be had for the price. If you can't find one of them around, check AFR 90-6. Best of all, read both of them, the following story and your SOP. To add more fuel to your

Above, sno-gos at work blowing the snow toward edge of the runway. Right is a picture of fir-tree marking.

The windrows are cut down to size by bulldozers. For tight spots you can't beat shovel brigade.

fire, suffice it to know that during the past three winters the Air Force sustained a total of 71 major aircraft accidents for which the basic cause factors were listed as "Snow and Ice on Runways and/or Airfield." Far too many of these also bore the brand of "Supervisory Error."

Here's a sample. The weather at takeoff time was clear with excellent visibility. The ops officer had briefed the pilot to fly target ship for an interceptor crew. This was a cinch. Nothing to do but fly a rectangular pattern for an hour and a half while the other jokers made the passes. This is the way to earn flying pay. A crisp cold morning, an airplane that flies like a dream—the sun in the sky and the world covered with snow. Life can be beautiful . . . almost too good.

Not just almost—it was. He slid into the landing pattern and played the approach to set it down as near the end as possible. With all this snow and ice around, there might be a slick spot on the runway, and besides, coming in from this direction you had to land downhill for the first half of the runway.

Almost over the end—better begin the flareout.

And then, WHAM! Who left that snowbank right on the end of the runway? The right wheel hit it.

But why load you with gory details. This was just one of the twenty-four airplanes that "bit the snow" last winter. Most of them happened on the runway. But judging from statistics there was no safe place to hide; the ramps, the taxiways and especially the overruns were hazardous.

This all happened last winter. The names can be changed but not the facts. When the runway is on a red cross it should not be used.

As it pertains to our sample accident, the regulation (AFR 90-6) is quite specific. It states, "Residual snowbanks will be established so as not to constitute a possible hazard to air or vehicular traffic during normal operations. Snow will be removed from runway overruns to a point 500 feet from the end of the runway and the full width of the runway. Snow will not be deposited at the end of such cleared areas."

In many respects, AFR 90-6 contains much more specific detail than that normally found in an Air Force regulation. Five essential elements for successful snow removal are specifically outlined:

- A definite, well thought-out and practical plan of action.
- Maintenance of equipment (including refueling trucks) in first class operating condition. This also means that when a storm is imminent, they be warmed and ready to go.

The removal is slow but spectacular process.

The final result, only after much hard work.

• Immediate availability of trained operators and helpers and maintenance personnel.

• Availability of electrical night-lighting and radio equipment with necessary spare parts.

• Trained, experienced and efficient leaders in charge of each team at all times.

The regulation is also pretty clear when it comes to planning requirements. Here is the law:

"Prior to the advent of each winter season, commanders at installations where two or more inches of snow is anticipated, will prepare a snow-removal plan incorporating, but not limited to, the following:

• A layout plan of the installation indicating routes and priorities for snow removal and ice treatment on runways, taxiways, aprons, parking and open-storage areas, roads, railroads, walks, and the location of snow fences, delineators, snow dumps and the like.

• Amounts, types and use schedules for available equipment, material and personnel.

• Assignment of related responsibilities to the weather officer, operations officer, transportation officer, installations engineer and any others concerned.

• A plan for training personnel in the use of snow-removal equipment, and personnel schedules to provide regular and relief crews on a 24-hour basis of operation."

Over and above the specific requirements of the regulation, each base has its own problems. The bulk of these problems concern facilities and people. To cope with these, each plan will vary somewhat in approach, but all make maximum use of available resources. Some even incorporate a plan for hiring additional civilian personnel on a seasonal basis. These are on call at any hour of the day or night to do the job.

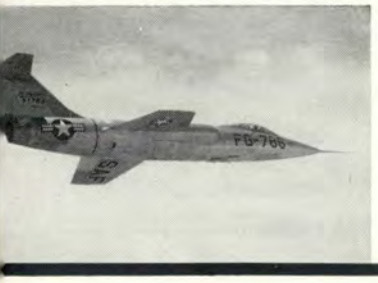
Bases also vary in their approach of the actual task of snow removal. These approaches generally depend on the type of equipment available for use. The following is a sample received from one of our northern bases:

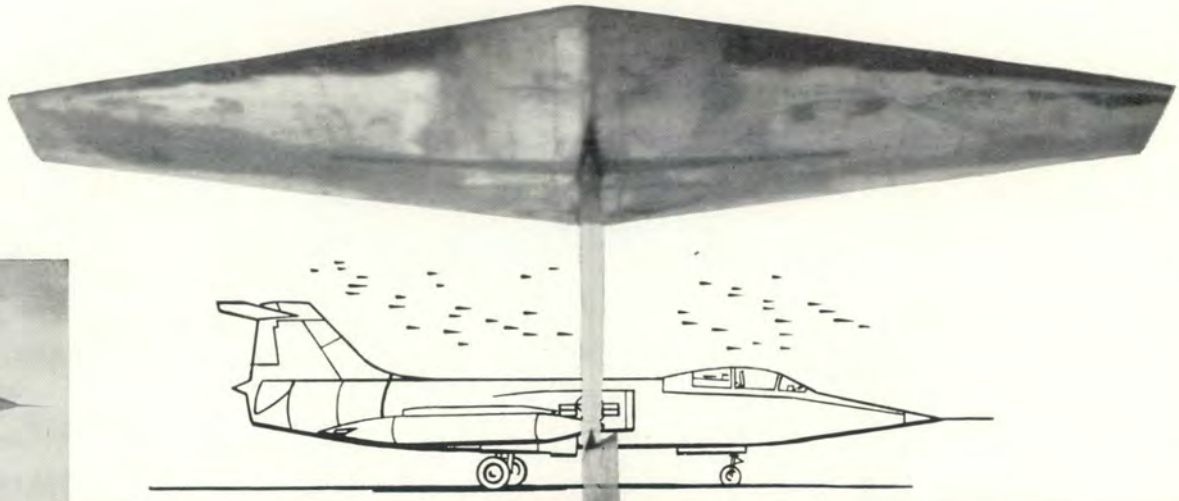
"In removing snow from the runway, the conventional type plows will start by plowing in echelon down the center of the runway, windrowing the snow toward the outside edges. One snow plow will make a single pass along the outside edge of the pavement, throwing the snow toward the center. The conventional type snow plows will plow the snow to the side of the windrow formed by the plow making the pass along the outside edge. The snow plows plowing from the center of the runway should operate at approximately 25 miles per hour until the snow has been worked to within one plow's width of the windrow formed by the snow plow operating along the edge of the pavement. The last pass should be made at a very low speed in order to form a neat windrow to facilitate the using of Sno-gos to blow the snow beyond the lights.

"Sno-gos will be utilized by spacing them along the runways on both sides in equal distance so that each plow has approximately the same distance to clear. The conventional type plows will be used on lower priority work while the Sno-gos are working on the runways. When the Sno-gos have finished the runway, the conventional type plows will plow the snow 50 feet beyond the edge of the runway. If the snow in the area beyond the edges of the runway is too deep to handle with conventional type plows, the Sno-gos will be utilized in clearing this area. Snow plows will clear the snow to the area within approximately five feet of the runway lights and the remaining snow will be cleared with hand shovels by a detail of men. Taxiways will be cleared in the same manner as described for clearing the runways.

"In the event of strong winds, it may be necessary to plow the snow all in one direction, starting at one edge. It may also be necessary to utilize a grader to make trenches parallel to pavement and approximately 100 feet on the windward side of the pavement to aid in the control of drifting. If the drifting condition is bad, two trenches approximately 50 feet apart will be made; then, as these trenches become filled the grader will be sent back to clear them out. This method of drift control has proven very satisfactory."

While it is obvious that these procedures will not be required at many locations, variations and adaptations may be employed. It has been proved that the system works in some of our heaviest snowfall areas. It should work for you. ▲





Parade of the

Here is an airplane that will out-perform anything you have ever flown. Light weight, easy to fly and you can really "get with it."

Tony LeVier
Director of Flying Operations
Lockheed Aircraft Corp

You may have heard it compared to a missile, you may think it looks like a missile, but this article by Tony LeVier should convince you; here's an airplane.

F-104 Centuries

WELL, BY NOW the F-104 Starfighter is probably the most widely talked about—and perhaps one of the most controversial—airplane flying in the world today.

What I mean is, people have heard so much about it that they're probably beginning to wonder if it is for real. And I can understand why they would feel this way. I've seen stories written about it which have ranged from the ridiculous to the sublime.

For example, some writers state that the bird will hit Mach 2 going straight up . . . (no comment!). Others liken it to a manned missile . . . (come now, men!). And others express frank skepticism that this design is legitimate . . . (it couldn't be more so!).

I want to tell you what the true facts are about the plane. And, above all else, remember this—the F-104A *is* for real.

Let me give some of the background highlights on her and then we'll get down into the specifics of performance, handling and safety features.

First off, because it establishes the plane's authenticity, I would like to pass along a quote by C. L. (Kelly) Johnson, Lockheed's Vice President in charge of Research and Development, and the man responsible for the design of the F-104:

"This airplane represents an evolution of literally thousands of design studies, tunnel evaluations, flight studies with experimental aircraft like our XF-90, and intensive performance tests at high Mach numbers of rocket-powered wing models. It represents the synthesis of the best design knowledge available from these programs."

If anyone in the aircraft business should know a good design when he sees it, he's Kelly Johnson. And when he says, "This is it," that's plenty good enough for me. And I've been flying long enough to want to know what I'm getting into before I go charging around upstairs in a brand new bird—as high as this beauty flies.

Actually, before we ever made the first flight in the XF-104, back in February, 1954, I had done some flying "towards the design" in a series of special in-flight dynamic tests conducted at the Ames Aeronautical Laboratory early in 1952. That was before we even started to cut metal for the F-104.

Back of all of the preliminary design studies (and a lot of those designs were more similar to today's competitive airplanes than our own F-104) were these basic objectives:

- We did not want to build an aerial "hot rod" that required the utmost skill and care in handling. We did not want to build a "stripped down" fighter.
- We did want to build a "pilot's airplane," a bird that is decent to handle, and we succeeded. For, in my opinion, the F-104 is easier to fly than the T-33 trainer. But I've said this before and I'll have more to say about it in a little bit.

It Fits You

Now, let's get down to business and talk about just what it's like to step up to this airplane.

The F-104 is a bird in which the pilot can really "get with it." You know the feeling you have when you drive a sports car, as compared to larger, standard-make models. It's like "being a part of the machine." Everything is compact, built snugly around you. Like slipping into a tailor-made suit. It fits—and comfortably. That's the way it feels to get into the cockpit of the Starfighter. And we pilots here at Lockheed had a lot to do with the cockpit design.

For one thing, the pilot is properly placed, visibility is excellent and everything is real handy. Controls are mighty easy to reach, right at your fingertips. And there aren't a battery

The author, who made the first flight, needs no introduction to FLYING SAFETY readers.

of knobs and dials that would require a mechanical wizard to figure out. We've kept it real simple.

I guess that simplicity is the essence of safety in my book. The fewer switches to throw, the fewer dials to look at, the fewer handles to move, all improve the pilot's chances of not making a mistake. We've done our best in this respect on the F-104.

For cockpit temperature you set the dial and forget it. Fuel management? Just like your automobile, unless you're carrying external fuel. Then you have one switch to throw. These little things add up.

About the way this plane "looks." To me it's like an artist's sketch of what I used to wish I had back in the old racing days. Man, if I'd had a plane like this, they would have had to rewrite the book.

New Look

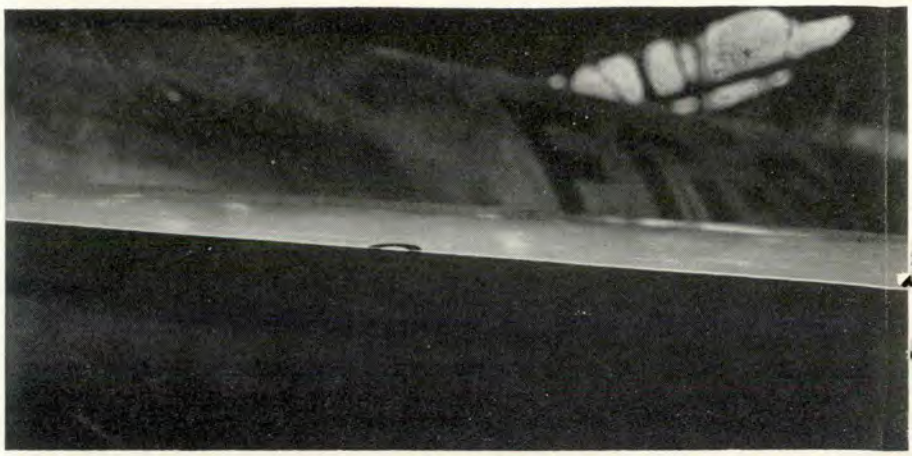
This is the first of the "new look" airplanes. And there are going to be more. So you might as well get used to it. Because if we're going to be flying faster and higher than we've ever flown before—the airplane configuration is going to become sleeker and "more to the point." It has to be so. Aerodynamic and thermodynamic considerations will dictate it.

But don't let this new look throw you. Oh, I've heard pilots come out, take their first look at the F-104 and say, "What ever happened to the PT-13?"

Well, the PT-13 had its day, a long time ago. And then we stepped through the P-38 era. Remember, it was a pretty hot job too, the first time around. Along came the F-80, starting this country's pilots into the blowtorch-riding business. Jets became faster and faster, moving into the century series. And now, the F-104.

The state of the art has progressed by leaps and bounds in the past few years. And just as airplanes are able to do more and more, the capabilities and limitations of the pilot himself are now being made a vital part of the design consideration.

Airplanes like today's F-104 have electronic devices that make them fly the way they should. Control is no longer limited to the human reflex and response. Now there are controls which have ways and means of sensing movements of a tiny fraction of a second—and controlling them.



This close-up shows one of the many new design features, the razor sharp leading edge of wing.

And the F-104's "fineness of control is the finest." New stability augmentation devices pre-sense and simultaneously correct for gusts and tricky air which might upset stability.

To my knowledge there is no other airplane flying with flight characteristics as good as the F-104's. Part of the reason for these good flight characteristics lies in our power control systems. We pioneered power boost controls on the P-38, and today at Lockheed we probably have the widest range of experience with hydraulic powered flight controls of any company in the aircraft industry.

What about its speed and inflight performance? Okay, I'll tell you.

Although it has ultra-sonic speed, this plane handles like a dream all the way. And for landing it's in the same speed range as the other century series fighters — touching down at around 135-150 knots, depending upon weight. This puts it within 5-10 per cent of other late fighters.

Pattern speed is normal for the century aircraft, around 200 knots. And the Starfighter can really slow up

A downward ejection seat makes for a manual canopy that weighs one-fourth of power models.

with the help of new wing flaps on the leading edge as well as the trailing edge of the wings. Approaches are standard. And it could take off and land on a six to 7000-foot runway.

Of course, our top speed is in multiples of what we've grown accustomed to. So this is almost like eating your cake and having it too. We did this by building a plane that was both light in weight and structurally strong, and designed from the outset for supersonic flight.

As Bill Ralston, project engineer for the F-104, has pointed out in discussing structural features, the short, stiff wing is one of the speed secrets in the F-104. Because the airplane is light, it didn't need a big wing. But that wing isn't weak. It will carry dynamic loads of more than a ton per square foot.

The entire airplane is strong — plenty strong. Take the speed brake housing, for example. It had to be strong to take the loads when the flaps are opened at high speeds. But there's no need for this strong structural member to use up weight for only one purpose. So it serves as the dive flap pivot fitting, an engine mount fitting, and splices the bulkhead together.

And just to make it lighter, we used part of the strength of the dive flap hydraulic cylinder to make up the strength of the housing.

By having a downward ejection seat (incidentally, a safer type of seat), we have a simple "unlatch it and open it yourself" type of canopy. We didn't need a power operated canopy with its heavy rollers, heavy framing, electric motor-driven screwjacks and the like.

Another thing, we also didn't need the associated emergency systems that go with a power canopy, nitrogen bottles to blow it off if the screwjack failed, and so on.

In this bird the pilot is properly placed, visibility is excellent and everything is real handy. Below, the ground crews really will like this airplane too.

Simplicity

Complexity breeds complexity. Every complex device must be backed up with another because complexity can't always be trusted. For that reason, we made the F-104 simple throughout.

And, incidentally, contributing to the weight saving design principle, a power-operated canopy weighs from two and a half to four times as much as the one on the F-104.

Sometimes we are kidded about our "little airplane" and they allow as how it can't do much of a job, being

so small. Well, that's pure hog-wash, and here's why:

A .44 Magnum pistol is another small weapon, but it will drive bullets through an automobile engine block. It will kill the biggest man—just as dead as an elephant gun would. And that's the mission of a fighter—to kill.

Whether it is a bomber or a fighter makes no difference to the F-104. It has ample equipment to take care of either.

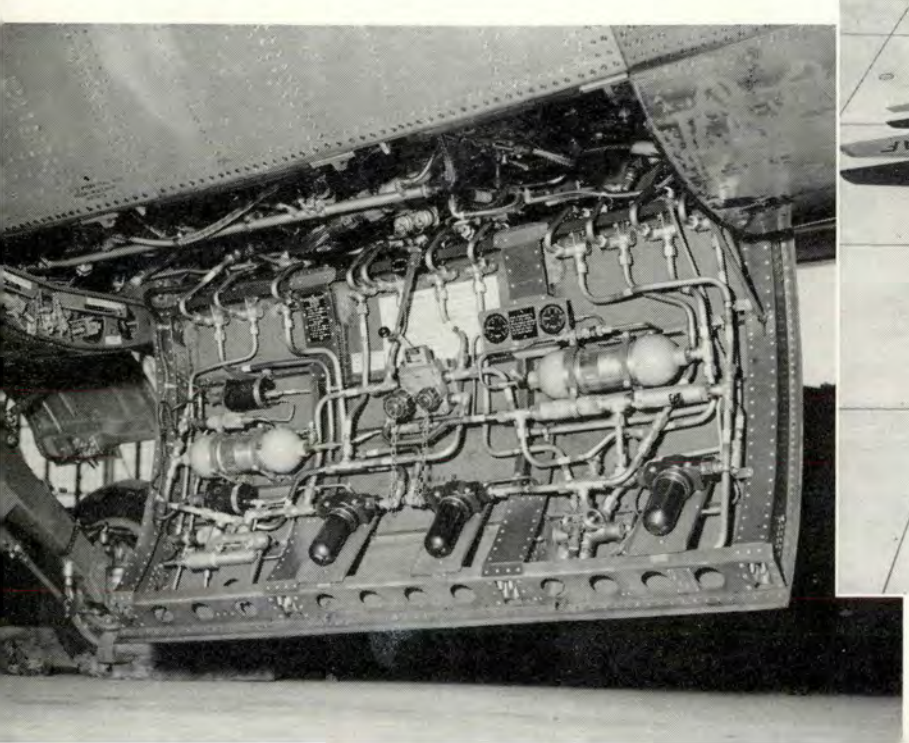
I mentioned earlier that the F-104 is a pilot's airplane, that it is easy to fly. Here's a good example of that.

Early in the flight test program of the Starfighter the Wright Air Development Center sent out a test pilot who specializes in control characteristics of aircraft. He flew the F-104.

At approximately 45,000 feet, he tipped the airplane into a dive. Then he took his hands and feet off the controls. He wanted to see how far it would go before he had to take the airplane in hand.

He went through the speed of sound and to high Mach numbers without touching the controls until the approaching ground made it necessary. He said it was "just like riding an elevator."

Above, the nose gear retracts into the fuselage. The forward hatch has been removed here showing bottom of downward ejection mechanism. Right, are pictured four Century series fighters. Below, is the "easy to get at" hydraulic panel located just aft of the main landing gear.



Left, another view of the "do it yourself" canopy. Above, shows leading and trailing edge flaps.

Some of you know Chuck Yeager. He was the first man outside Lockheed to fly the F-104. Chuck has flown in a lot of birds and some haven't been so good from a pilot's viewpoint. So he was skeptical when preparing to go with the F-104. I'm glad he was skeptical because he's one of the best judges I know.

I'd just like for you to know that he hadn't been off the ground 60 seconds until he started talking on the radio. I never heard Chuck talk so much, and it was all praise—"Never flew anything like it . . . Stability and control are perfect . . . Fantastic . . . A real tiger!"

Safety Items

I'm sure you're interested in safety. We all are. Well, this is one plane whose design grew hand-in-hand with the slogan, "Safety First."

A lot of the airplane's inherent safety stems from the fact that peak performance has been designed into the F-104. When you're a fighter pilot you've got to have the performance, the ability to beat the other guy to the punch, or you're not going to be in business very long. At least not nowadays, in view of what we know is coming along behind the Iron Curtain.

So when you've got the performance, superior performance, you're in a safer position than you would be if your bird was second best. This is the best kind of life insurance a pilot can have.

The Starfighter's control systems are designed specifically for pilot safety. For instance, we have two completely separate and distinct hydraulic systems. And if we lost both hydraulic sources—say in the case of engine seizure—we have an emergency hydraulic pump and generator, a ram air turbine, that doesn't depend on the engine. Even if the engine quits, however, it will still windmill enough to run the pumps.

Along this line, here's an incident I think will interest you. In the early days of testing the XF-104 prototype I lost the engine. I had lots of altitude so I headed for home at Muroc. I glided more than 50 nautical miles home for a landing.

You might be surprised that this airplane glides. Actually, with everything up it is so clean that it glides extremely well. You can figure on a glide ratio of ten to one.

Our landing gear group has done a real job on the F-104. This gear falls free and locks within three to four seconds. Considering that you have 15 to 20 seconds on the roundout, this means you don't have to lower the gear until you are over the runway and have it made.

Another thing about the F-104 that you will like from a safety standpoint is the engine, a General Electric J-79. This plane's engine response is the best of any jet and compares with, or maybe even tops, piston engines. Acceleration is prompt and strong, thus correcting an old complaint about jets, and this is over the entire range of flight.

Speaking of the engine brings us back to speed and while the F-104's speed to date has been exceeded by research aircraft, they have been highly experimental rocket planes designed to fly only a few minutes at maximum thrust. And it takes pilots months, with special training, to be able to fly them. But the F-104 is a combat plane, built to be flown by pilots assigned to tactical outfits.

Summing it all up, I'm convinced that this is the best fighter plane ever built. And not just because I like what I've felt when flying it, or because Air Force pilots have heaped praise upon it, but primarily because any properly schooled and well checked-out pilot will find the F-104 easier to fly than the Air Force's standard jet training plane.

Sure, it's hot—and new—and different! But it's also as normal a progression from what we've been flying as a change from yesterday to today. There's always something new under the sun. We've just brought tomorrow here today with the F-104.

I wish that all Air Force fighter jocks could feel the thrill of flying the '104. Plenty of you will, before long. That will be a great day. Then, paraphrasing an old slogan, you'll be proud to say, "Ask the man who's flown one." ▲

This is the final article in the series prepared for FLYING SAFETY by Lt. Col. Mulholland. It, like all of the previous stories, is close to our hearts. I am sure you will join with us in thanking the author for his down-to-earth approach to our many flying problems.

Recognition of Error

Lt. Col. Mitchell J. Mulholland
Safety Research and Analysis Div., D/FSR

IN THE FIRST article in this series it was pointed out that human pilots make errors constantly. Some of these errors pay off in accidents, some do not. The reason that some do not is attributable to the circumstances. However, a bigger reason —and one that we can exploit to our benefit—is that some errors are detected in time. In time, that is, to correct the mistake before something happens. This timely recognition may involve merely spotting an error of manipulation or a mistake in figures. More often though it goes deeper into diagnosis of trouble symptoms and the recognition of where human error was a factor in producing the symptoms. Here once again professionalism pays off, and error recognition can be materially aided by alertness, by anticipation and by prudence.

Up and Locked

Remember the cadet who flew from San Antonio to Dallas with his wheels down and wondered why it took him so long? The same thing on a less spectacular scale happens to every one of us once in a while. When an airplane starts doing peculiar things the chances are good that it's your fault rather than the machine's. But it's funny how far we will go sometimes in our bland assumption that the machine is at fault. A classic case occurred some years back, in which the pilot probably owed his neck to a forgiving airplane. The airplane and pilot are obsolete but the mental processes involved are most germane to this discussion.

The pilot was making his first water takeoff in an OA-12, an aircraft which had to be seen to be believed. The gimmick in this case was that the prop pitch control was a knob protruding from the upper left corner of the instrument panel. On a hasty pre-takeoff check, the knob appeared to be in the full forward position. Power was applied and the bird lumbered forward in a cloud of spray. At full throttle only 1600 rpm showed on the tachometer. Noting this, the pilot made

his first deduction—"Tachometer is out." Lord knows the airplane was making enough racket — sounded okay. Of course the takeoff run was pretty long and sluggish, but as this was his first water takeoff in this bird the pilot figured it must be this way all the time—deduction number two. Surprisingly enough the thing became airborne and clawed for altitude among a forest of masts, derricks and smokestacks. Time to reduce rpm, thought our hero, and pulled on the pitch control, which naturally didn't move. And the trigger mind of the pilot leaped to its third deduction — something wrong with the prop control!

Low rpm, long takeoff run, prop control won't come back—light finally dawned, and the pilot pushed the prop knob *forward*. Power took hold with a stinging howl and the bird climbed upstairs in blissful relief. The little knot of anxious friends, who had watched the whole episode from the seaplane ramp, wiped their eyes, stopped slapping their thighs and returned to work, limp with laughter. Old buddies.

The pilot at least retained a lasting impression of just how stupid you can get. You see, the pilot was this writer.

The interesting point here is the appalling reluctance of the human mind to accept the possibility of error when it can blame things on a machine. Here the airplane was exhibiting such obvious symptoms that it might just as well have been yelling "Shove up the prop pitch, you idiot!" But the pilot, with a cranium full of oatmeal, refused to listen.

Familiar Situation

In analyzing accidents we frequently find ourselves baffled by cases such as that of Lieutenant Squash, who landed his F-86 at Parsnip AFB one sunny day—everything fine but with his gear up. Checks showed there was nothing whatsoever wrong with his gear system. The horn worked, the selsyn indicator and warning lights worked; in fact, Lt. Squash blandly assured the tower "turning base — gear in the green!" Mobile Control spotted him, fired two red flares across his nose, the tower gave him a red light. Every one of the safeguards worked the way it was supposed to, but all the king's horses and all the king's men couldn't stop Squash from pranging his bird. Evidently the source of the trouble can be isolated between Squash's earphones, but why? why? why?

Before we rush right in and denounce Squash as a blithering idiot, let's first realize that he has already shown himself a thousand times to be capable of landing an aircraft on its wheels. So have we. In other words, there but for the Grace of God go we. So let's at least settle this disquieting thought before we start rolling the drums and marching Squash into an F.E.B.

At first blush, the baffling thing about an accident like this is the blithe disregard by the pilot of all warnings, even to the extent of his own statement to the tower that his gear was "in the green." Digging a little deeper it becomes less baffling. The basic reason Squash's mind didn't register these warnings was because as far as he was concerned the gear *was* down. Heck, the gear is *always* down when you're turning final. He was in a familiar situation—everything appeared to be normal, so he concentrated on the landing. The possibility of something not being normal never occurred to him. So all these warning sounds and signs just sailed past his head. They had no meaning for him, they were just so much background clutter.

Each of Lt. Squash's thousand previous landings had involved a pattern, a sequence of events, culminating in a successful landing. This time something disturbed the sequence, but as the pattern progressed all the old familiar details slipped into place, except the gear, that is. Man is a creature of habit and he resists change. If you don't believe that, try changing the hours for the coffee break in your shop and see how far you get. Or—you, yes, you! How long did it take you to start saying Bravo instead of Baker? Haw—I thought so. I still say Baker, too.

Why bring all this up? Just in case you're thinking of curing Lt. Squash's trouble by adding another gimmick to his procedure. It was years ago that they thought up the idea of requiring the pilot to make that gay little remark about his gear before landing. This, they thought, will cure everything. It will remind him for sure. But as you see, it doesn't. It's just another little chunk of ritual for him after he has said it a few thousand times. He might just as well be saying, "Win With Willkie," for all it signifies. We can figure that the same thing would happen to any other additional warning device. That is unless we want to reach back into history and exhume that marvelous foot-buzzer they had on the BC-1. Actually that was probably a darned good idea. It gave the pilot a hot foot instead of blowing a horn, and as I recall, the BC-1 was not noted for inadvertent, gear-up landings.

In any event, the point of Lt. Squash's troubles is he did not recognize his error in time. And characteristically he disregarded or misinterpreted all the warning signs because it never occurred to him that Squash could have made a mistake.

Just Mislaid

This same attitude, compounded with a lot of wishful thinking, crops up in cases of navigation error. The pilot is lost but he refuses to admit it. He gets radio signals or sees landmarks that he promptly identifies as being what he wants them to be, not necessarily what they are. In the old prop jobs this could be good for a laugh—in a jet it is no laughing matter. It used to be that a pilot could

say, "Heck, I wasn't lost—I was just mislaid." In a high speed jet, using fuel at a gillion gallons per hour, he can't afford to be mislaid. He either knows exactly where he is and when he'll get in, or he's lost. In our modern aircraft, deluding ourselves and pampering our pride are expensive luxuries. We have to face facts and take action right away. Pride or no pride, getting lost is an emergency and we have to call it that. There are people on the ground who can help us if we holler soon enough. They can't salvage much from the mess if we wait till we're down to a dram of fuel.

Fuel! We all know there are few things worse than running out of gojuice, and few things that are harder to excuse. Fuel consumption is figured against time en route before we take off and should be monitored throughout a flight. But sometimes our arithmetic fails us—our figures miss the mark. How often, though, has the sobering realization of our error penetrated only when we see the gages getting perilously low and we still have a long way to go? And how often have we pushed on, rationalizing that "Oh heck, it's probably the gages"? Higher than expected fuel consumption will show up early in a flight if it is being watched.

Errors in figuring should show up after a few check points if you're following things the way you should. And here comes the crux of the matter: just because you cleared for Foster doesn't mean you have to push through if it looks as though you'll be coming in on the fumes. Every Air Force Base, every Naval Air Station, and many of the civil airports along your route, can fill up your tanks with precious fuel if you go on in and ask them. And what's wrong with changing your flight plan en route, even if it was necessitated by an error on your part? To admit and rectify an error nullifies its effect. To push on through is really just an attempt to prove you didn't make a mistake. The trouble is, *you did*, and you may well compound it into a worse mistake by augering in with a windmilling engine short of your destination. All this second mistake will prove is that you were a fathead.

Recognition

As you can probably see, recognition of error is frequently very closely allied with anticipation of trouble. An error in flight planning may have serious effects on the subsequent course of a flight or on the arrival at the destination. Once an error has been detected and remedied, all its ramifications bear scrutiny. It may well make a good deal of difference in the circumstances of your arrival. A time or fuel error may mean your arrival when weather is worse than you had figured on, or when you may not have the fuel you need to go to your alternate. Think it all the way through.

A few months ago a B-25 leaped off in the Middle West on a non-stop IFR flight to a West Coast base. At best this was stretching the range of the airplane a little, and headwinds made things worse. The pilot had badly overestimated his groundspeed, but as he passed his check points this should have become apparent to him. As far as is known he had never been in to his destination base before—it was surrounded by high mountains and had a complicated letdown procedure. It was obvious he was going to arrive after dark and the weather was known to be rugged. In spite of all this he pushed on through, arriving in the destination area without enough fuel to be sure of reaching an alternate. Still overestimating his groundspeed and probably worried about his fuel he started his letdown procedure too soon. He didn't let down very far, only to about ten thousand feet, where he joined many of his predecessors on the side of a mountain that is one of America's most notorious aircraft graveyards.

This pilot had flown directly over two Air Force bases right on his route, one of them at his half-way point. Several others were near his route. At any one of them he could have refueled and made a further check on the weather. Instead he flew into a really rough situation with minimum gas. Did he recognize his error and ignore it, or didn't he spot it at all? This we will never know. But it's easy to see what he should have done.

The same thing applies, most urgently, on an instrument letdown. This is one time above all that a pilot must know *exactly* where he is. If he makes a mistake he has to rectify it right now or execute an emergency climbout. Saying "oh hell" and bulling his way on down is simple suicide and nothing more, especially in hilly or mountainous areas.

A tanker started one of these winding letdowns into a base in a West Coast valley one night. The crew was unfamiliar with the area and they got balled up. Instead of going back upstairs and getting his ducks back in a row, the pilot spotted the lights of a city under him, assumed it was the city he wanted it to be and continued his letdown, right into the side of a

The BC-1 was not noted for gear-up landings. The pilot got a hot foot, not a horn.

Mathematical talents that once only required counting kids to see how many were eaten up during night, now must solve equations in nuclear physics or perform lightning fast calculations during high speed flight.

medium-sized mountain. Of course the city was not the one he thought it was. It was another town, about 10 miles away, and that's all it takes in that kind of terrain.

Three Approaches

One of the most apparent ways of heading off possible error by anticipating it is to get all the information lined up ahead of time. If an instrument letdown looms as the probable conclusion of the flight, the more the pilot knows about it before he gets there the better. Runway length and direction, frequencies, letdown procedures, forecast weather, landmarks—the time to know all these things is long before the payoff. Learn them at leisure, then use the knowledge when the time comes.

A useful adjunct to anticipation might best be called imagination. It shouldn't be overdone, of course, but an intelligent imagination can alert a person to a lot of the possible goofs he may be likely to commit.

Imagination can frequently see through the possibilities of some of the booby traps in aircraft and procedures. It can warn of the disastrous results if something is done wrong. It helps by giving a mental picture of what's going on in the various systems when controls are actuated. Instead of dry words or diagrams it can visualize fuel gurgling through lines, hydraulic pressure surging through valves, vital components getting overheated. As long as it is controlled by thorough knowledge, imagination can be very helpful in picturing situations that can arise. We certainly don't recommend the conjuring up of bogeymen, but what has been thought of as "pilot's intuition" or "instinct" is really just imagination based on knowledge and experience.

The third and most important approach to heading off error or anticipating it is prudence. This is a better word than caution, because rightly or wrongly to many of us "caution" implies reluctance to act, lack of the aggressive spirit demanded by combat operations. Prudence isn't like that. Prudence is just good horse-sense. The prudent pilot doesn't push into something he's not sure about. When the gages show 150 rpm mag drop, low oil pressure and a few other things, he doesn't shrug, say "here goes nothing" and take on off. He doesn't leap off on a "Oh well it'll burn off by ten o'clock" weather guesstimate. If he's not sure about something he makes sure of it before committing himself to a dubious course of action.

Prudence is something we have all sinned against at one time or another. In wartime, in a combat situation, it's forgivable — first things must come first. But most of the time we're not in a combat situation. We're training ourselves and developing and conserving our aircraft so we'll be ready when and if the whistle blows.

The basic design of Homo Sapiens hasn't changed for a long, long time but the things he has been asked to do have changed tremendously. The same hands, senses and brain that were once devoted to such simple pursuits as knocking over a woolly mammoth for a community supper, are now expected to guide with accuracy a precision machine at faster than the speed of sound. Mathematical talents that once only were required to count the kids at sunrise to see how many were eaten up during the night, now must solve prodigious equations in nuclear physics or perform lightning calculations during high-speed flight.

Man is really quite remarkable when you stop and think about it. We crowd more and more requirements on him all the time, yet with amazing resiliency and adaptability he does the job. He is even capable of doing a job safely. Really he is so good that if we're not careful we pile things on his back until something has to give. When it gives, we blame it on him.

To sum up. Accident investigations are not courts martial—we are seeking causes, not scapegoats. On the other hand this does not imply that our pilots should be mollycoddled. They are military men first, and we have a right to expect them to be professional. But to approach a pilot error accident as though the only objective is to fix blame, is not going to produce results for the Air Force. We have a long way to go, but two vital principles should guide our efforts:

- We are all in this thing together. So we cannot assume that our assignment to investigate or review an accident implies that we are more capable than the pilot involved, or less inclined to err.
- The pilot is 50 per cent of the man-machine combination that we call a weapon. His inner workings deserve at least as much research and study as does the machine half of the combination. ▲

The preflight planning before chasing one of these girls involves a lot of coordination.

"Tai-Fung" Chasers

Above, is a typical "eye" to a Pacific typhoon. Surface winds around it range high as 170 mph.

THE RECIPE might read: Take one weather reconnaissance outfit, add numerous jolts of severe turbulence, some torrential rains, with a liberal smattering of lightning and black clouds, shake well and presto! . . . you have a typhoon chaser.

Do I see you wagging your head, meaning that you take yours straight and don't need a "chaser"? Then, maybe you'd rather recline on the nearest sofa and read about it instead. Indulging in pursuit of these fabulous storms of the Western Pacific is somewhat strenuous.

Okay. Do that and I'll try to fill in the answers on the manly sport of typhoon chasing. But, first—let me introduce myself. I come from one of the top weather recon squadrons in the world—the 54th Weather Reconnaissance Squadron. Let me substantiate that with some proof positive.

Our squadron came to Guam nine years ago. Since then, we've ridden herd on 151 typhoons. We've done a lot of flying without an accident — over 48,000 consecutive hours since October, 1952. We fly more tropical storm and "cyclone" missions each year than any other recon squadron in "el mundo." (We will pause 10 seconds to listen to the cries of rage from our cousins, the 59th Weather Recon Squadron in Bermuda, as well as other storm hunters.)

We belong to the 1st Weather Wing of Air Weather Service (MATS), and our outfit daily patrols 800,000 square miles of the Western Pacific pond when it isn't busy riding herd on a "Vulture cyclone." Don't let that "Vulture" throw you. It happens to be a bird's name specifying the tracks flown by the Typhoon Chasers.

Join us in a visit to the 54th Weather Reconnaissance Sq. They are known from far and wide as the "Typhoon Chasers," or if you prefer the Chinese dialect, "Tai-fung" Chasers.

Captain Lyle P. Earney

Our area of responsibility extends from the China Seas to the International Date Line (where today regresses into yesterday), and from the Equator to 25 degrees North Latitude. Naturally, it follows that we're able to compile a heap of weather information over that large a space.

We have two fine little detachments of the 15th Weather Squadron, forecasting the movement of circulations out around these parts. One of these has its spread here at Andersen AFB. The other has a holding at Clark AFB in the Philippine Islands.

We spent 11,467 hours last year branding 19 different typhoons. What's more, we didn't compromise flying safety in setting these marks. Our squadron had (and still has) a very thorough safety program in action. We don't have dancing girls but we do have everything else that makes for a good, informative show. We emphasize the fact that a competent individual usually is a prepared one.

Now, you take a record like ours and you'll probably wonder: How does it happen? Friend, take a look at the experience level of the pilots. Ten throttle "jockeys" had over 4000 hours each. Our "boss" man tops the list with 7100 plus. Most of the flying personnel have had considerable experience penetrating typhoons. The OIC of the weather section, had 47 penetrations during a single tour.

There's an incomparable thrill awaiting those who venture into the inner sanctum of these Western Pacific tempests. Sure, they have names like the gals in Philly and Denver and 'Frisco, and, brother! you "ain't never" dealt with more tantalizing personalities. But, while there may be a fairly definite pattern to their lunacy, each has its own peculiarities.

Some are born one day and a short time later become yesterday's headlines. Others seem to live relatively long, robust lives. Some have only light turbulence; others seem severe enough to tear the engines from their mountings. Some have large ill-defined "eyes," while others have small distinct centers. Some have formidable barriers of cumulus boiling like a volcanic eruption in the "wall" cloud surrounding the "eye"; others have virtually no "wall" cloud.

Typhoon Is Born

In China's Cantonese dialect there's a word for these storms: *tia-fung*. The *tai-fung* generally is born in the hot, humid latitudes hugging the Equator. Like the young colt which eventually becomes a bucking bronc, the storm goes through stages leading up to the time it "explodes" on Pacific islands and mainlands. Let me give you a little lesson on the subject.

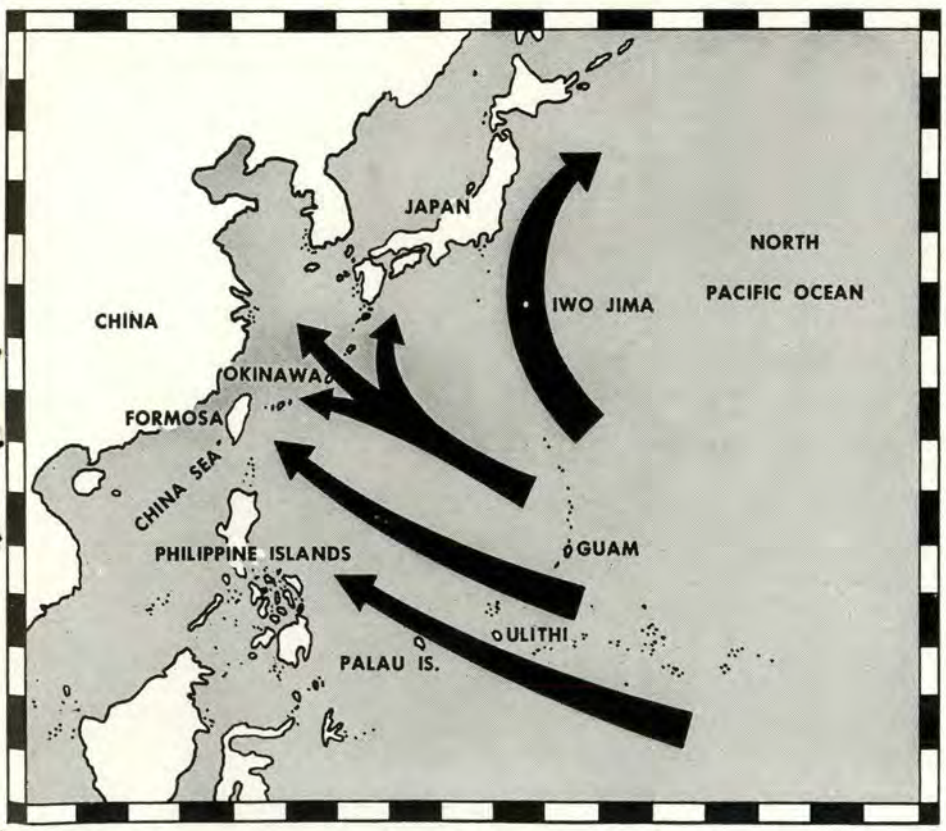
The storm at first is known as a vortex with counter-clockwise winds up to 35 knots. Encouraged by its progress, the young critter starts to flex its muscles and while its winds increase in velocity up to 64 knots, the weather station is busy labeling it "tropical storm."

There's no stopping here. Anxious to "go for broke," the closed circulation steps up its pace and climbs into the major league class when its velocities exceed 64 knots. The occasion is made conspicuous and historical by the weather department giving it that sinister title, "Typhoon——."

While this is going on, our boys haven't been sleeping on the job. Our aircraft have been observing every move of the youngsters, day and night. Flight crewmembers, mainly the weather observer and the weather technician, have been compiling and recording data which is sent via radio to the ground station monitoring the missions. That's where Detachment 15-2 steps into the picture.

The Andersen detachment receives this data at half-hour intervals. It evaluates and uses the information in its prognostications and in forewarning areas lying in the typhoon's path.

You can't easily measure the number of lives and dollars in property



All hands attend a special briefing. Then the aircraft commander finishes it up at Operations.

saved by these storm warnings each year. The inhabitants of islands and mainlands of the Western Pacific and Far East benefit immeasurably from them. But, the typhoon may still deal a large parcel of destruction despite advance warnings. This happened with "Louise" which struck late last year, and "Vera" which pummeled the Philippines this July.

We can write about "Louise" with a certain amount of authority. We were on the crew that christened that little gem. Hold on! Did I say "little"? That's hardly an apt description for a storm spread out over approximately a 500-mile area.

We found "Louise" waiting for a pickup just off the east side of Pacific and Mariannas intersection. It gave every promise of being one of the fiercest storms to hit these parts in many a moon and—before it died in the North Pacific—it lived up to the very worst expectations. It took a north-northwest heading and roared and snorted toward Iwo Jima. Warnings were posted and personnel on the island tied down for the big blow. Then—it struck.

Metal buildings toppled in complete surrender to the rash impact of winds over 200 miles per hour. Except for the early warning, everything on the island would have been destroyed. Somehow, Iwo managed to survive the *tai-fung* and, despite extensive damage, the runways were back in operation not long after the storm had passed.

"Louise's" appetite was whetted. The storm turned westward toward Okinawa. But when it found the island forewarned, it changed its mind and took off for Japan.

We followed it, plotting its every move, watching it while it slept, chasing it when it awoke. It smashed into Japan, but evidently the foray at Iwo had taxed its strength. Although it still managed to claim the lives of many and destroy a great deal of property, it was slowly dying. Like a warrior wounded in battle, it slowly withdrew and a short time later expired. When the final tally was in, the Typhoon Chasers had flown no less than 13 missions chasing the ole gal!

The Season

The height of the typhoon season out here generally is the period from July through October. Records from the files of the Typhoon Chasers show this to be the most prolific time of year. During our squadron's nine years on Guam, September and October have given birth to more of these storms than any other month. August follows closely behind, but then there is a definite drop. February evidently doesn't care much for the "girls," having produced a single typhoon during our stay.

These same records reveal that 1952 was a banner year with the squadron tracking 22 different typhoons. The least productive year, meanwhile, was 1949 with a repeat in 1954 when there were "only" 15 of these storms.

Sometimes the "girls" like to wander out of 15-2's area of forecast responsibility into that of Detachment 15-1 at Clark AFB. But, the 54th WRS, like a jealous suitor, tags along behind. Last year these staging crews flew 29 typhoon missions and again,

All the equipment must be operational here.

this year, staged during two of the first three *tai-fungs* striking the Western Pacific.

Try and get a weatherman to describe the causes leading to the formation of a typhoon and you will get a wry smile and a negative headshake. Fact of the matter is that many theories have been advanced, but no particular one is accepted universally. We have shown you previously how erratic these storms can be. However, most of those originating in this area follow one of four tracks.

Routes

The first route extends from a point southeast of Guam and heads northwest between Palau Islands and Ulithi Atoll and on to the Philippine Islands and the China Sea. Early this year, "Sarah" and "Thelma" took that route.

A second track is one which generally starts south of Guam. Then it moves past the island on a northwesterly heading toward Taiwan (Formosa). Sometimes, the "girls" will want to follow it into the China Sea and even beyond it to the mainland. "Iris" took a fancy to this route in August, 1955.

The third corridor begins northwest of Guam. It heads to Okinawa and then offers the "girls" one of three choices:

- One leads into the East China Sea area.
- One has a "yen" for the Yellow Sea (down, boy, down).
- One goes north towards Japan.

Not quite so complicated is the final route which starts north of Guam and extends on a northwesterly heading past Iwo Jima toward Japan, but—veers out into the open North Pacific before it hits that country. "Nora" and "Hope" preferred this corridor in 1955.

Specially trained airmen with specially built equipment get set as they near the typhoon center.

Batten down the hatches, for there she blows.

These were the courses taken in a majority of cases by these fugitives from a sunny day. But, there have been many other examples where typhoons took different courses or even circled in relatively small areas until eventually they expired. "Helen" followed the latter pattern in 1954.

Grab your flying suit, oxygen helmet and lunch and join us on one of these missions. We warn you, though, after a few hours in the storm area, you probably won't care for it. And, oh yes, bring along a "cookie" bag—just in case!

Here's the setting: It's just an hour past midnight. The only activity on the base is that of the street lights winking at each other. Well—almost! Suddenly, a car comes around the corner with a screeching sound like when rubber intermittently kisses the pavement. It comes to a halt in front of the squadron Personal Equipment building. Two men hop out of the vehicle. They're dressed in a manner to indicate that they are *not* civilians; they are not plumbers on a night call and they are not supermen—but, that they are crewmembers of the 54th reporting for a flight. . . . Dum-te-dum-dum.

And right here is when the fun stops and the deadly serious preparation for a typhoon mission begins. Did I say "begins"? Actually, it began yesterday afternoon when the crews assembled for briefing. They

sat in their chairs and listened as an operations flight commander conducted the session.

"Gentlemen, your missions for tomorrow are, first priority, 'Vulture Typhoon 0408' to coordinates——," and so on while the crews sat back and listened. In a way, it brought back memories of the days when the briefing officer said, "Gentlemen, your target for tonight is——."

You listen to the information being dished out: The weather observer explaining the winds expected to be encountered en route to the storm, the possible courses the storm might take and the terminal forecasts; the navigator with information about the flight and the briefing officer with additional flight information. Finally, the briefing ends with "That's all I have. Any questions?"

Yes, that's when all of this began. And now you're at Personal Equipment and it's early in the morning and you wish that you were back in the sack.

You help load equipment such as Mae Wests, parachutes, professional equipment, coffee jugs and so on, into the crew bus. It begins to rain—a tropical shower, phooey. If the storm center isn't too distant, maybe it's weather associated with it.

The bus goes to the flight line. The crewmembers spill out of it and settle down to completing their preflights. After the pilot has completed his walk-around inspection of the aircraft, you accompany him to base operations with the navigator and weather observer in a jeep. Then comes the weather briefing when you're brought up to date on latest developments within the storm. The pilot fills out his clearances and you return to the aircraft to complete the preflight. The maintenance personnel are already on the job to be sure the bird will get off on time and complete its mission. Their part in a successful and safe mission should not be considered lightly. Without these boys going for you, you are out of business—but good!

Over an hour has elapsed since your arrival at Personal Equipment and the aircraft is at the end of the runway awaiting its clearance from the tower. This time has passed swiftly and you realize it's because of the speedy and efficient manner in which the crewmembers perform their multiple duties.

After the mission a farewell look at Louise.

You're Off

At last you're off! The pilot points the nose of the aircraft on a heading towards the storm center. Your altitude is 1500 feet until you reach the storm area, then it's 10,000. You watch the crewmembers take care of their tasks. The excitement they feel is hidden under a mask which now and then falls, revealing the tenseness of the situation.

You begin to feel the first bit of mild turbulence. When the aircraft is 200 miles from the storm center, the navigator notifies the radio operator who makes subsequent transmissions on an "emergency" precedence.

The "road" is getting rougher. Outside the aircraft, the clouds have a dirty grey color. The radar navigator reports he has the "wall" cloud on radar. He tells the weather observer which quadrant appears to be the weakest, judging from returns on his scope. Then, the penetration begins.

Crewmembers tighten their safety belts. The weather observer, with the assistance of the navigator, guides the pilot through the "wall" cloud with his observation of surface winds, pressure tendencies, cloud formations and radar readings. The plane leaps and bucks. An air current sends it soaring to a higher altitude and then drops it just as suddenly. Your stomach muscles are taut.

The Eye

Suddenly, the glory of an early morning sky sends a shaft of sunlight into the aircraft. You breathe a sigh of relief. You're in the "eye."

The pilot circles in the storm center while the navigator takes a "fix" and the weather technician releases his dropsonde. As the dropsonde floats down to the surface, it radios coded information regarding temperature, humidity and pressure, back to the aircraft. This information is copied and transmitted back to the weather station along with other data.

Now the aircraft leaves the "eye" and prepares to "box" the storm. You soon find out this procedure involves flying to a point where surface velocities observed by the weather observer are less than 50 knots, descending to 1500 feet, and "fixing" the cardinal points where velocities drop off to 50 knots. When the operation is completed, you glance over the navigator's shoulder and see the course lines on his chart have formed a "box."

If you're lucky, you'll head home after the "box" is completed. Otherwise, you'll stay and make another penetration of the "eye." This generally is determined by the distance of the storm center from the base of operations. Regardless, you will be part of an exhausted crew stepping from the aircraft after landing; exhausted by emotional strain which such an ordeal invites; exhausted from the beating the turbulence gave you.

Maybe, now, you can understand why we're proud to be members of the 54th Weather Reconnaissance Squadron. A squadron must have something besides luck to continue adding to its flying safety mark when its aircraft and crewmembers take such a beating year in and year out.

Sure, the mark is amazing but is understandable because of the excellent maintenance measures and precautions employed to lessen the chances for accidents. A sound, active flying safety program is designed to give crewmembers and their equipment a better opportunity for survival in the never-ending battle against the forces of nature.

Who is responsible? Each and every man who has been a member of this organization in the years during which the record was set. The alertness and vigilance of these men to the hazards involved in this type of flying are commensurate with the skill they have demonstrated in doing their respective jobs.

"It takes safe maintenance for safe flying. We, and those who've preceded us, have been fortunate in having both. It has been strictly a team effort all the way." ▲

Keep Kurrent

NEWS AND VIEWS

Pictured here is the mask with liner glued into the proper position.

Comfortable Seal—An oxygen mask facelet insert has been developed for those who have trouble getting a good seal and a comfortable fit with the standard (MS-22001) oxygen mask. This facelet is a "V" shaped piece of "Ensolite" (sponge-like material), 1/8-inch thick. It is glued to the sealing portion of the mask. The facelet comes in a small box with glue, a brush for application and installation instructions.

WADC has conducted a service test program with Air Force personnel from TAC, SAC, ADC and APGC. This test resulted in a 92 per cent acceptance. The facelet is now standard and will soon be available to Air Force flying personnel.

★ ★ ★

Mobile Fish Bowl—A new type mobile control tower, designed and built at McClellan AFB, is shown with a WB-50 in the background. Equipped like the main flight control tower, the emergency vehicle consists of a half-ton pickup with a specially designed van body topped by a plastic bubble, converted from a B-29 gun turret.

The mobile van has its own power source with a six, 24-volt battery stand-by system in the event of generator failure. The vehicle has a built-in CO_2 fire extinguishing system, special purpose signal and flood lights, and is air-conditioned to protect the sensitive radio equipment.

Described as the nearest to an all-purpose vehicle ever developed, it performs a variety of functions. If an aircraft crashes in the area, it leads all other ground vehicles to the scene. It can substitute for the main tower when necessary and directs aircraft in emergency operations such as the recent winter floods in northern California last year.

★ ★ ★

Policing Up—A monstrous vehicle that makes ordinary snow plows look like toys has been developed for the Air Force. The vehicle, an aircraft crash pusher, is intended to shovel a 40,000-pound crashed bomber off a runway in less than 20 minutes. Such an operation formerly required from five to 15 hours. The crash pusher can be used during emergency operations when an aircraft has crashed on a runway, preventing others from taking off or landing. Operating in pairs, the pushers place scoops against the crashed aircraft and literally shove it off the runway. Each vehicle weighs 150,000 pounds and is rigged with a scoop on each end for speedier operation.

In cool comfort, in his air-conditioned van, traffic is controlled.

The old and new. A B-52 looks down its nose at the Boeing Kaydet.

....If They Could Only Talk!

IF THE RADIO Facility Chart and In-Flight Data publication and the Special Edition RFC had deep throaty voices designed to charm the ear rather than features meant to catch the eye, they might well sing a simple melody, "There'll be some changes made." Or the standard RFC as coyly as a dame in the mood for a new facelift might remark, "In a few months, you'll be seeing the real me."

The July issue of FLYING SAFETY told you (under the title of "Same Book, New Look") of some of ACIC's plans for the Radio Facility Chart. It was too early when that story was written to tell about comments received from major air command project officers favoring the new sheet type RFC, which had been tested on the West Coast. Based on these command comments, ACIC is proceeding with more development and should have something new in the way of an RFC very early in 1957.

New Look

A prevue of this newer "New Look" shows it shaping up like this:

- Eleven small scale charts the same as those used in the Special Edition to cover the U. S., with the two supplemental area charts, Norfolk to Boston and Chicago to Pittsburgh, one side LF/MF and the other VOR.

More aerodromes will be shown on the charts and the directory on the outside flap will show en route data including primary communication frequencies.

- A new planning chart about the same size as the other charts, probably a two-color job, showing LF/MF and VOR airways.
- A "beefy" In-Flight Data Booklet about 8x10. No facility charts in it, but it'll have a complete aerodrome directory in a new format which gives air/ground and tower frequencies. Although this booklet was not designed specifically for you jet types, it should be a lot easier for you to find the information you want than it was with the Special Edition.
- A new container for the charts, possibly for use in the map case. So far, the samples have been in a variety of sizes and shapes and very, very expensive.

Map Change

"A chart is a chart is a chart" to Gertrude Stein-it a bit. But there is many a change in a chart. For example, the Jet Navigation Series (JN to you) will shortly change the color of its polar grids from red to green. Reason: green shows up better under red cockpit lights.

And in case you are interested in contours (most Air Force men are, aren't they?), the JN chart has new categories in contours. Sure enough, you will find a brand new reliability note in the margin giving the following information:

Reliable contours—or accurate to within 500 feet—are shown solid contour lines with solid gradient tints. Naturally, you know what a gradient tint is, but in the event some other Joe needs his memory refreshed, a good explanation is that it's a means of showing average differences in elevation by various shades of color.

Approximate contours—which are accurate to within 1000 feet are shown by dashed contour lines with solid gradient tints.

Those accurate to within 1500 feet are shown by solid yellow contours with broken gradient tints, and those accurate to within 2000 feet are shown by broken yellow contours and broken gradient tints.

Consolan

Maybe you have used Consol while doing a hitch in the European Area.

F. C. Redmond, Aeronautical Chart and Information Center

Whether you have or haven't, your chance to use a very similar thing is coming up with the installation of Consolan stations in the U. S. Two are proposed on the East Coast—one at Atlantic City and one at Nantucket, and two on the West Coast—one at Lompoc, California, and one at San Francisco. Rumor has it that the one at Atlantic City will be commissioned about the first of October and the one at Nantucket about the first of November. Thirty days before commissioning dates, they will be operating on a test basis. The ones on the West Coast will be put in later. Primary purposes of these stations, so we understand, is to assist aircraft entering the United States to locate themselves so that they can make more accurate position reports.

You don't need any new equipment in the aircraft to use this equipment, the main thing you have to do is to count a bunch of dots and dashes. But since it isn't quite as simple as that, information on the operating characteristics and use together with frequencies and locations of the stations should appear in a Military Aviation Notice correcting the Supplementary Flight Information Document, North American Area, any day now. Large sheet type charts are proposed covering these installations including reporting data for both the Eastern and Western United States. If the charts aren't ready by the time the equipment is commissioned, the dot and dash sector tables will probably be in the MAN too.

Check-In Time

If you're IFR in a jet and "drag racing" with a stiff breeze, you gotta check in at least every 200 miles and as requested by ATC whether you're on or off airways and regardless of altitude. Reporting points must be the ones you've listed in your flight plan. For these, use the compulsory ones shown in the RFC if you can.

If you're riding along in a recip engine aircraft and aren't flying airways, you must use the same procedure as listed above. (Note: It's also in the RFC; see the page opposite the inside back cover.) And if you're on airways, you get a break. Above 15,200 feet, you don't have to check in quite as often. The RFC now uses a new symbol (watch for that L in a

circle) for those reporting points which are designated as compulsory below 15,200 feet only.

Be sure to listen in every minute on the designated CAA frequency and notify the CAA before you change.

Flying High

In this vale of mangled jokes and mixed-up jive it isn't well to assume too much. And just because ATC clears you "via flight planned route" don't assume that you are approved to fly at exactly the same altitude as requested in the flight plan. The CAA has reported that some Air Force pilots seem to think so. So let's pass along a word to the wise—before you begin your "rock and roll" along that "flight planned route," get an okay from ATC on your planned altitude.

Suggestion

Take one Radio Facility Chart publication (standard book type), turn it over lightly so that the index map on the back is looking straight up at you; take one pair of shears; use two twists of the wrist so as to snip off a small triangular square from the two top corners of the two back pages (outside cover page and the page inside that). Result, you can easily find the station index for reference purposes.

A comment from an Air Force pilot states that this device is helpful to B-47 pilots who annotate their jet navigation charts with VOR frequencies as a navigational assist in certain missions. At the rate of a couple of missions per week, this takes a lot of looking-up. The perforation of RFC's so that corners can be torn off would be pretty costly, but this suggestion is one that you can try any day you happen to have a pair of shears or an old Boy Scout knife handy. ▲

Dead Man's Curve

Captain Harry J. Tyndale, 666th AC&W Sq

"GREEN TWO——I told you to go around! Take it around!" Mobile Control was transmitting and the voice was frantic.

From the front door of the Operations Building, someone yelled, "He's going to wipe him out!"

Colonel Hardy went through the crowd like a flying wedge and Captain Johnson, his Flying Safety Officer, followed. He emerged just in time to see an '86D rise from the runway and tuck up its gear. The tail of a second "Dog" was visible, standing still at approximately the point where the first one left the ground.

The entire group put up an audible sigh of relief. Closer calls may have occurred but this group of people had never seen one.

"Lieutenant, get out there and relieve the Mobile Control Officer and tell him to report to me here," and, turning to Captain Johnson, he said, "Let's go into the office."

As they passed the Ops desk, he addressed his NCOIC. "Send Lieutenant Magee in as soon as he lands."

"Yes, Sir, will do."

"All right, Campbell, what happened out there?" Colonel Hardy asked, as the Mobile Control Officer entered.

"Well, Sir, the leader blew a tire shortly after touchdown. I didn't see it 'cause I switched back to watch Number Two. When I looked back at him he was flaring for touchdown. I grabbed the mike and waved him off, but he still kept coming. I don't understand why he continued the approach. Anyway, he touched down with full power on and he made it! Boy, I don't want to see any more like that."

When Lieutenant Magee stepped through the door, he was sharp and well composed.

"Have a seat, Lieutenant," the Colonel said, "What happened out there, didn't you hear the wave off?"

"Yes, Sir, I heard it," he answered.

"Why didn't you just go around then?"

"Well, Sir," he answered, "that's what I was doing; it's just that it was marginal and I needed everything I could get."

The Colonel stood up, "It's customary to just pick up the gear and go in this outfit, Lieutenant. We take a dim view of having people do things any way they see fit. What caused you to make a touch-and-go, instead of a plain go-around?"

"I was in too deep to just pull up and go, Sir."

"You were still flying."

"Yes, Sir, I was, but only last week Captain Johnson told us about a point of no return in this bird. What he said made sense and this deal has convinced me."

"What's he talking about, Johnson?" asked Colonel Hardy.

Captain Johnson began, "I briefed a few of the boys at beer call the other night, Sir. I'd like to have Lieutenant Magee give you the complete rundown on today's situation, if you don't mind. There's no sense in my talking when we have the proof of experience sitting right here."

"Okay," said the Colonel, turning toward the Lieutenant. "Go ahead. What's the story?"

"Captain Johnson showed us exactly what this 'back side of the power curve' stuff means. We studied the airspeed and power balance at various speeds on approach. He pointed out the reasons behind many things we already know, such as, why it takes so darned much power to make a late correction. He rather surprised us by saying that there is some definite speed of commitment for each of the later aircraft. Below this speed, he said, 100 per cent will not be sufficient to permit a go-around without touching down. We agreed that a good point for decision would be the point where you begin the initial flareout. At this point you start assuming progressively higher attitudes, pulling off power and reducing speed.

"Captain Johnson drew a graph, showing the amount of drag present at various airspeeds and the amount of thrust available at these speeds. It seems that with all the garbage out, you have a very limited range of speed on the back side of the curve. The center point of the curve is the point of least drag or the speed that requires the least amount of power to hold level flight.

"In our bird, and in most other late jobs, this is the recommended approach and gliding speed for the landing configuration. Even at this speed, it takes a lot of power just to make a controlled descent. This was easy to see, since we usually come down final carrying 87 per cent, or so. He told us that you run out of power before you reach stall speed.

"Some of the boys doubted this, so the next day I went up, put the gear and flaps down, slowed to 10 knots above stall and tried to fly level with 100 per cent. I couldn't do it. I had to either give altitude or lose airspeed. I found that by flying at slower speeds, it took even greater rates of descent to hold the speed. This convinced me. If you can't hold level flight, you certainly can't break off a descent and fly away.

"It figures that if you're in a descent, with the speed and power both on the drop, the situation will get worse before it gets better. If you just pour on the coal, you may have enough to make it but it is very possible that you won't. At any rate, by holding it in the air you don't allow yourself any gravy. If you go ahead and continue the approach, you allow all of the thrust to be applied to gaining speed. Then you can get normal takeoff speed and you're on your way.

"In my case today, I was already flaring and the throttle was nearly to IDLE. I wouldn't have had a chance of staying in the air. As it was, I touched down at about the 700-foot point and used all the runway up to where Bill was. I could have staggered off sooner but I prefer a good solid speed where I have a choice. As it was, I was never in doubt."

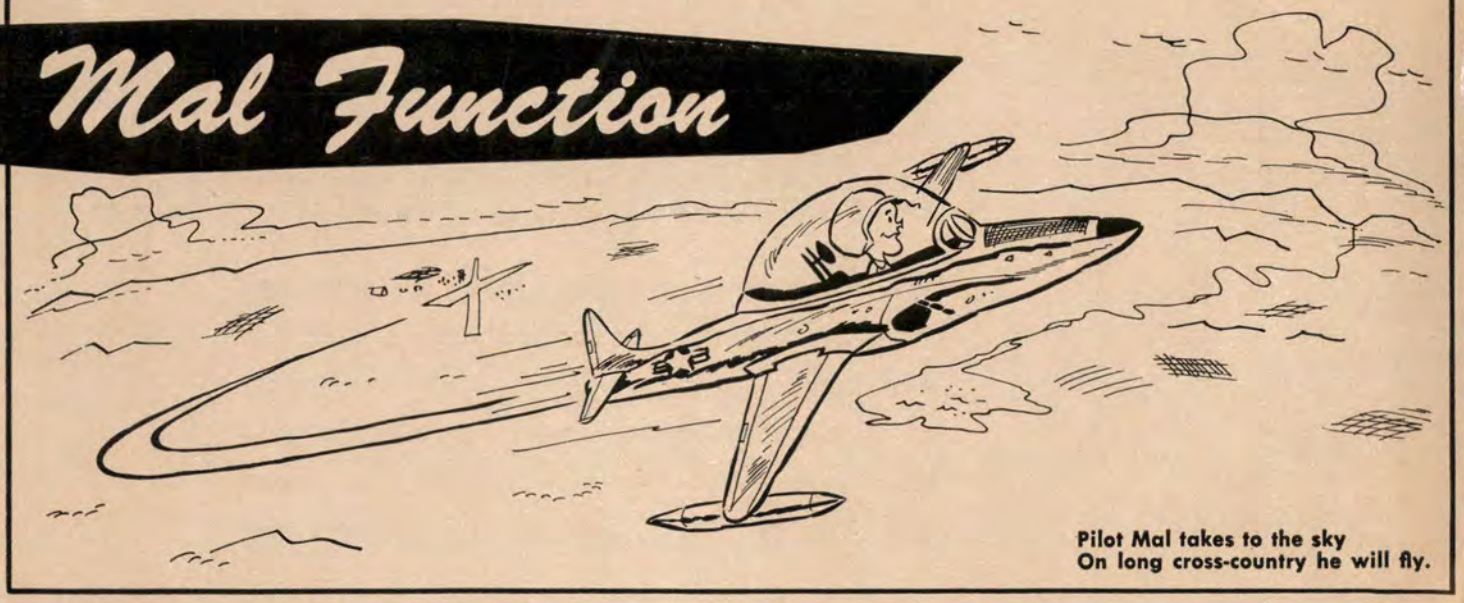
Colonel Hardy had a very sober look on his face. "Well, there's no doubt now that it works. Johnson, can you be prepared to brief the squadron on this material by Friday?"

"Yes, Sir! I've been trying to create a demand for this for months." ▲

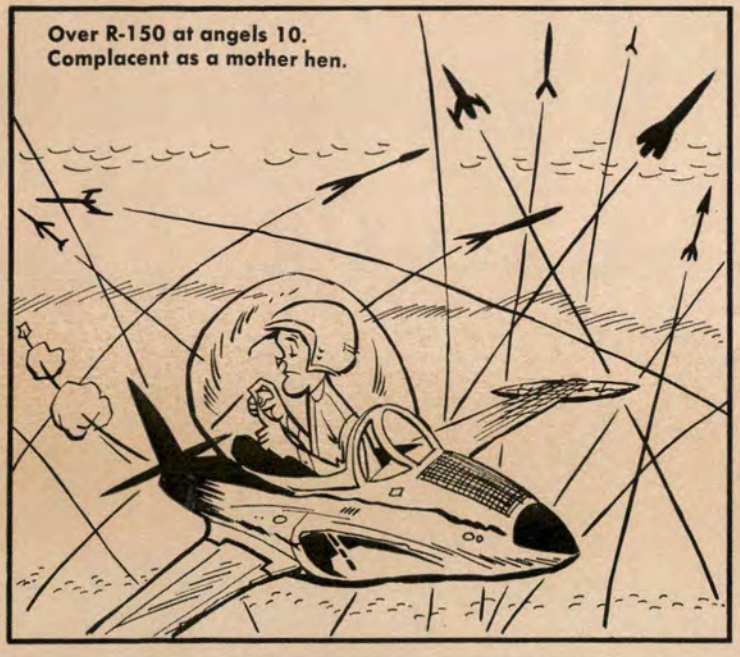
Hey! It's Snowing

When the alarm goes out that "it's snowing" it takes a heap of coordination, involving a multitude of units, to keep the runways operational. Remember snow removal is a big job and takes time. Take this into consideration when you clear to a destination where it is snowing.

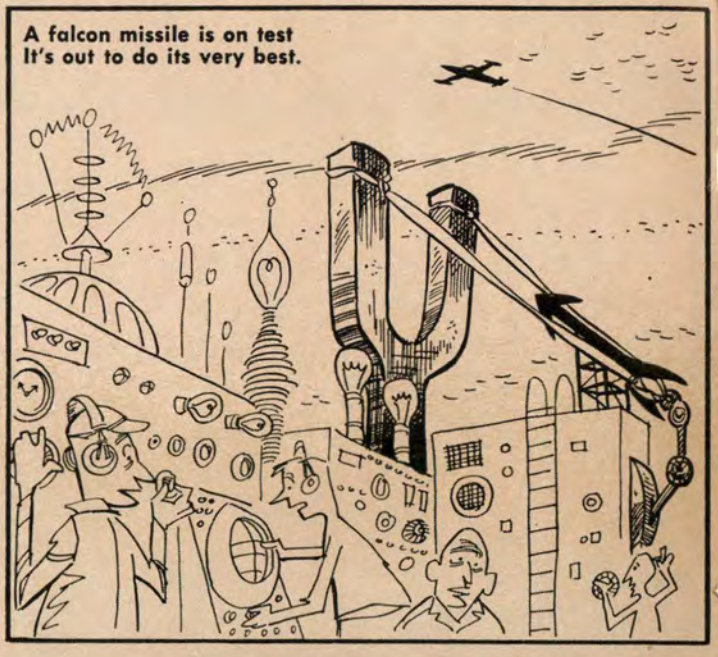
Mal Function



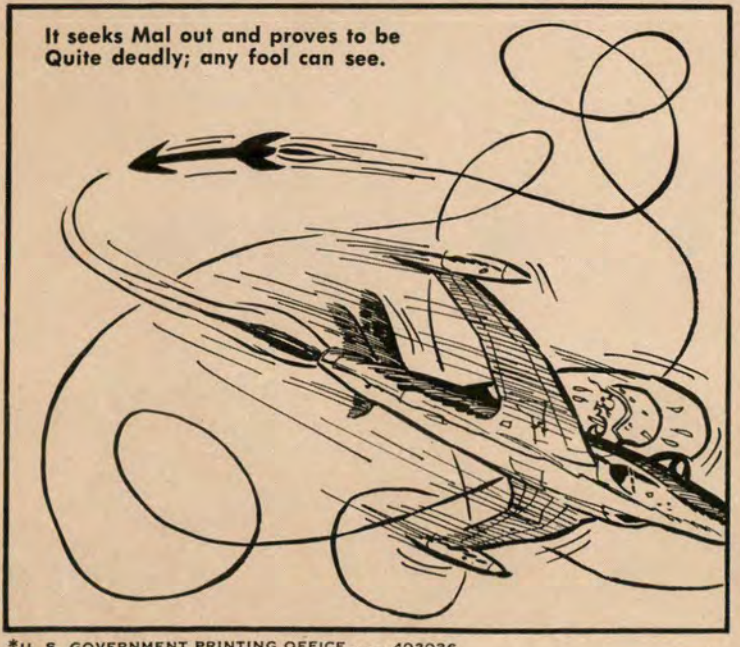
Pilot Mal takes to the sky
On long cross-country he will fly.



Over R-150 at angels 10.
Complacent as a mother hen.



A falcon missile is on test
It's out to do its very best.



It seeks Mal out and proves to be
Quite deadly; any fool can see.

Don't see why Mal should feel forlorn
Because of him, new star is born.

*U. S. GOVERNMENT PRINTING OFFICE . . . 402036