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FLYING SAFETY

UNITED STATES AIR FORCE

Straight Thru to Kyushu · The Little Drifter

FLYING SAFETY

VOL. ELEVEN NO. NINE

• This month we are featuring the first of a series of editorials prepared by Flying Safety Officers of five Major Commands.

• On page 26 the test pilot gives all the facts and figures on spinning the F-84F.

• Don't miss the quarterly quiz covering the last three issues of FLYING SAFETY. It's on page 28.

Next month FLYING SAFETY will feature some timely info on winter operations.

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USAF PERIODICAL 62-1

SAFETY Through Flight Planning

Colonel C. J. Cochrane
Chief of Safety Division
Strategic Air Command

SAFE AIRCRAFT operation requires competent flight planning. Continuous emphasis on this subject has proved to be one of the more productive fields in furthering the Strategic Air Command's aircraft accident prevention program.

In 1949 General Curtis E. LeMay, SAC commander in chief, demanded that his aircrews adopt a more professional attitude toward flying and directed that all levels of command place additional emphasis on safety of flight items. Prior to that time, flight planning all too often consisted of a quick stab at a wall map with a piece of string and a hasty fill-in job on a flight clearance form.

A not too typical, but highly illustrative example occurred several years ago when a second lieutenant was cleared in a T-6 from one of our midwestern SAC stations on a flight to transport a non-rated passenger to a West Coast air base. In an effort to make good an early takeoff, the pilot failed to plan his flight properly. As could be expected, because of the inadequate manner in which he planned the flight and his low experience level, he became lost, ran out of fuel and was forced to crash land, gear-up, on an emergency strip. During the course of the accident investigation it was revealed that a rated officer other than the pilot had prepared the charts used on this flight. Among other errors noted was the fact that true headings were entered along the intended flight path rather than the magnetic headings that this officer normally used. Before this deviation was noted, the pilot was so far off course that he never succeeded in orienting himself. In addition, borderline planning was evident in that the estimated time en route so nearly coincided with the range of the aircraft that this flight could only have been safely completed providing the pilot was able to obtain absolute optimum performance from his engine while utilizing strict cruise control techniques.

In view of the questionable practices employed in clearing this flight, the briefing officer was contacted in the course of the accident investigation. When questioned as to the adequacy of the pilot's route briefing and qualifications, the officer is reported to have exclaimed: "He had a map, a pair of wings and an airplane. What else could he need?"

Investigation of this and other accidents in which inadequate flight planning was a contributing cause factor disclosed that the mechanics and principles of flight planning were well known to the individuals concerned. The weakness lay in a tendency to rush through and gloss over this important phase of flying. Couple this with a feeling of over confidence and/or complacency that often exists among experienced crews, and you set the stage for an accident . . . via the improper flight planning route.

To combat this often fatal tendency, a new SAC directive on flight planning was written and placed into effect in July, 1953. Under its provisions, detailed flight plans must be filed with Base Operations on all flights, combat readiness training, administrative and so on, in sufficient time prior to proposed takeoff so that the flight plan can be reviewed personally by commanders. This is done to be sure that the mission requirements are within the capability of the aircraft and crew.

Specifically, this directive calls for review of the flight plan by either the tactical wing or air base group commander for the assigned or attached aircraft. In addition, detachment commanders review flight plans for TDY aircraft under their operational control. With this system all aircraft operations are continually monitored.

Every SAC mission is planned in detail with as great a built-in safety factor as can be achieved and still assure the tactical success of the mission. The reason for this is obvious. Proper flight planning, based upon accurate performance data and current weather information, can forestall many dangerous situations by recognizing and avoiding them.

Since this policy has been in effect, careful planning has paid off in a better safety record. Accidents involving improper flight planning have been reduced to a minimum.

The soundness of this policy is easy to defend since you can't argue with success. This record has been achieved in spite of the fact that air-refueling operations, both day and night, now being conducted by SAC crews on an average of one every 3½ minutes around the clock, increased overseas deployment over non-standard routes. Continued expansion and conversion to new equipment has more than tripled our accident exposure over the past six years.

Taking the time to plan a safe flight, regardless of the type of aircraft flown, has always been sound advice. The advent of the modern high-performance aircraft and inflight refueling, however, have magnified and made even more acute the old problems of range, altitude and weather.

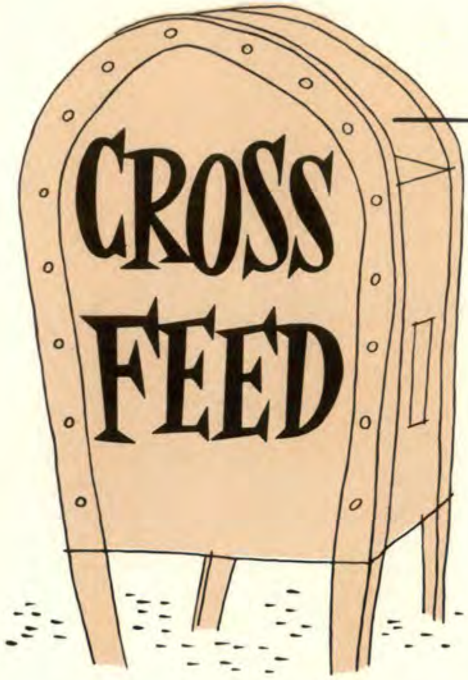
Also, it is a well established fact that a crew that has been airborne for a period of 16 to possibly more than 36 hours—almost a standard practice for SAC's combat crews—will need every bit of assistance they can get from thorough preflight planning if they are to safely complete their missions in today's highly complex aircraft.

Letdowns in jet aircraft are complicated by high fuel consumption at lower altitudes, and today's pilot must think and react more quickly to stay ahead of his fast-moving airplane. As a result, flight planning must be more meticulously thorough and detailed than ever before.

While it is vitally important, flight planning obviously is only one facet of a well-planned, aggressive aircraft accident prevention program. We have found, however, that flight planning, like other safety of flight items, requires continued emphasis. When commanders and supervisory personnel relax in any phase of the program, it is soon reflected in a rising accident rate.

Continued vigilance within is the keynote in the success of any accident prevention measure. No matter how many times it has been stated, "Plan your flight and fly your plan" remains the basic formula for safe aircraft operations.

LETTERS TO THE EDITOR



Crazy Climbouts

Before I get airborne, I want to make my position clear on one point. I'm firmly convinced that thorough preflight planning is good life insurance and we should all have it — it's free. I also go along with the idea that the more complex the weather situation, the more detailed the planning should be. I like to leap off knowing I have all the info. I've checked the facts and figures, slipped the stick and had the weather officer put his arm 'round my shoulder as he spoke of winds, fronts and precipitation. Whether it be a combat mission or local armchair boring, the flight is half over after you get strapped in. But where do we get this fighter pilot's life of "hours of boredom, punctuated with moments of stark terror?" I'll tell you one place — Climbout Instructions.

Recently (when I should have been at home, with my wife running her fingers gently through my hair), I tied on a pipe and leaped off on a night IFR flight with a very low ceiling and heavy rain. Departure point was Memphis NAS, destination Perrin AFB. On takeoff roll I was told to climb to 20,000 feet on the NE leg of the Memphis range. Not only is this an inopportune time to be turning on flash lights and retuning the radio compass, but it was exactly 180 degrees in the opposite direction to my destination. Sure, there was no sweat, since I had plenty of fuel for the short hop. But think what this did to all the facts and figures I labored over with the slip stick. Maybe I'm different, but in the event of radio failure I like to know at least what State I'm over — I might want to evade.

About a month ago I filed a clearance for a night 1000' on top, IFR flight. In takeoff position I received instructions to climb on top, tracking outbound from the station. The heading was approximately 45 degrees off course, and I broke out at 41,500 feet with an inoperative radio compass. The winds were a far cry from what I had planned on and I guess I would have been somewhat "shook up" without radar or DF assistance.

I realize that the jet traffic during IFR conditions presents a problem for ARTC, and I am cognizant of the priority afforded at destinations. But what can we do about these crazy climbout procedures we often get, that immediately start our flight out from an unknown point? I recommend that climbout instructions be made available to the pilot before he leaves base operations. Pilots could then plan flights more logically, and they wouldn't have sly grins on their faces at destinations as they read the sign, "Congratulations, here you are safe and sound. Did you know what you were doing, or was it just luck?"

Major Harold J. Hoffman
3555th CCTW (Int.)
Perrin AFB, Texas.

We certainly concur with the good Major in his gripe. But there is not much than can be done right now.

More modern electronic equipment is on the fire, designed to provide better separation methods. But, until this equipment installation becomes a reality, we had all better count on receiving some of these oddball climb out instructions.

Everybody should contemplate this and plan for the delay involved. Many of the boys call ARTC on the telephone about two hours before takeoff and find out what departure procedure they will get at take-off time. They figure this into their flight plan, then, provided they get off on time, they are in pretty good shape.

ARTC is cognizant of the whole mess and attempts to give on-course climbouts, but often traffic just does not permit it.

★

Rescue Slip

I read FLYING SAFETY every month and am particularly interested in articles concerning survival as I am the NCOIC of administering the written survival examination for the 3943d Strategic Evaluation Squadron. In reading the article in the June issue entitled "It's Better When You Help," I noticed a cut on ground signals. As far as can be determined, two of the "Little Men" are giving the same signal with opposite meanings according to the caption under them. Can you please clarify this for me?

I am inclosing page 27 from FLYING SAFETY for June with the two "Little Men" that I am in doubt about circled in red. I am also inclosing page 10 of the Survival Manual of December 1954 which does not mention a "need helicopter" signal.

I would appreciate a clarification on this signal. I am convinced other people may have some doubt in their minds. If there is a difference in the pictures of the "Little Men" as shown in the June issue, I sug-

Notice the rotating motion of the right arm.

gest their meaning be changed so no doubt will exist in the mind of the rotor pilot which signal is being given — "Go Away" or "Stay." Safety-wise it could mean a life saved. Yours for safer flying.

M/Sgt. LeRoy C. Dixon
3943d Strat Eval. Sq
Davis-Monthan AFB, Ariz.

Sgt. Dixon's point is well taken. Technically speaking, our Little Men were okay. The man signalling the helicopter is rotating his hand over his head, while the man signalling okay has his arm stationary.

However, we are in accord with the Sergeant. We suggest that if you need a helicopter, the arm be rotated vigorously overhead. (See accompanying illustration.) We have taken our illustrator to task for failing to make the figures clearer and he, in turn, passed the buck to the printer. Anyway, it won't happen again.

★

Photogimmick

Being a guy who is always on the lookout for new ideas, I thought maybe some other FSO's would be interested in this little gimmick I dreamed up in support of our flying safety program here at the 111th Fighter-Bomber Wing, Pennsylvania ANG. We're located at the Philadelphia International Airport.

The idea came to me while romping around with my kids. They get the darndest expressions sometimes. Anyway, not being a photographer myself, I made a collection of those baby portraits taken by a professional New York City photographer. It was no trick at all to mount them on pieces of white illustration board and then finish off the whole thing with a gag line. That's the meat of the thing. I just put down what the baby's expressions seemed to indicate in the vein of flying safety.

They have created a lot of comment and I'm sure that the punch line presented in this manner will stick with whoever sees them. You could probably work the same deal with animal pictures or even birds.

Capt. Edmund Galli
FSO, 111th F-B Wg
Pennsylvania ANG

Who says there's nothing new under the sun? Captain Galli's creation surely proves the old adage, "One picture is worth a thousand words." Just two words from us, Captain. Good work!

★

TWX Briefs

I think the SAC procedure of sending TWX briefs of accidents to all Flight Safety Officers is an excellent policy. Although I can only use or apply 10 to 15 per cent of the TWXs I receive from SAC Headquarters and 15th AF Headquarters, it does two important things for me. First, it helps me to channel my inspection and prevention activities into an area of most likely cause factors as indicated by the TWXs. Second, it gives me a wealth of material that is timely, pertinent and interesting to reproduce in local Flight Safety News Letters and to discuss at our mandatory Flight Safety meetings. If this procedure was placed into effect in all commands or at least numbered Air Force levels, I believe it would help the wing and base Flight Safety Officers to do a better job.

Maj. Norman W. Bernier
FSO, 814th AB Gp
Fairchild AFB, Washington

This suggestion certainly is worth passing on. The accident briefs help the good Major in performing his duties, so it figures that they could be of help to some of you other FSOs, too.

If the system isn't in effect in your command, maybe a note in the suggestion box will win you a three-day pass . . . or something.

★

Rabbit Stew

Upon completion of the Annual Inspection of the 2347th Air Reserve Training Center, Long Beach, Calif., Major George Hall, FSO for the Fourth Air Force, made this note in the inspection report: "A flying hazard exists on the flying field because of the large quantities of rabbits."

In reply, Col. Thomas Wiper, Commandant of the 2347th submitted this letter, headed, "Corrective action taken in compliance with 4th AF Annual Inspection." It read, "Transmitted is the result of corrective action taken to decrease the rabbit population of Long Beach Municipal Airport. It is estimated that this one rabbit will decrease rabbit population by some 2016."

The letter from Col. Wiper was accompanied by what else but —a rabbit, and around his neck a collar with the name "George." A very humorous but effective answer to the increasing Long Beach rabbit hazard.

Office of Information Services
Hamilton AFB, Calif.

After close consultation with several genetic experts, we find the Colonel's figures in error. Our guy tells us that the population would be decreased by only 1999. Seems he forgot to figure in a few old maids.

As for George, we'd like to know how he got that split ear? Looks to us as if some of them rabbits is the worst kind!

Flying Safety Officers find a million gimmicks in promoting safety.

Corrective action—(1) ea. photogenic rabbit complete with necklace.

Here is the answer to fast, mass movement of complete combat units equipped with gear.

Straight Thru to Kyushu

The story of how 4000 men were airlifted via Operation Gyroscope.

•

Major Joseph P. Tracy and Captain John H. Moore, Jr.

It's almost incredible how large and comfortable the crew quarters are on this bird.

SINCE THE DAYS of Caesar's Legions, one of the big problems that armies have faced is that of personnel replacement. Even as late as World War II, units in the field replaced personnel on an individual basis. Obviously this system lacked merit in many respects: untried men replaced combat veterans; experience level fluctuated greatly, and naturally esprit de corps fluctuated likewise.

Recently the Army decided to implement a program that is comparable with Air Force policies; that is, mass movement of complete combat units on a swap basis. This means that units transfer, carrying individual small arms and personal equipment, while the heavy equipment in the unit remains static.

The first mass move, made by the Army in 1955, was carried out by surface vessel. Men, dependents and personal effects were moved en masse. The program was highly successful with one exception. That was the element of time.

When it was proposed that the 508th Airborne Regimental Combat Team be transferred to Kyushu, Japan, to replace the 187th ARCT, a revolutionary plan was propounded. Since both units were used to flying by virtue of their basic mission, it was decided that a mass airlift might well be the answer. This led to the birth of the airborne phase of Operation Gyroscope, the largest personnel airlift in history, to date.

After the initial plans were formulated by key planners of both services, they were turned over to an old friend of the 187th ARCT, Major General Chester E. McCarty. As commander of the Korean airlift for two and a half years, Gen. McCarty's 315th Air Division transported the 187th jumpers into all combat DZs as well as on many day and night practice maneuvers. General McCarty's reaction to the proposed plan was typical, "We take chaos, organize it, then make it work." And initially, as in all gigantic plans, chaos was the order of the day. Involved were some 7000 paratroopers of both commands, faced with a round trip of approximately 18,000 statute miles. Here then was where the bugaboo of time could be licked.

With such a tremendous airlift in the offing and with all the obvious flight safety factors involved, FLYING SAFETY decided that this operation should be covered first hand to gain information about the many facets that enter into such a project. Consequently, through the good offices of the 18th Air Force whose 63rd and 62nd Wings were charged with physically operating the lift, we were invited to participate in the operation as observers.

Many of the safety factors involved were actually built-in as far as the 18th Air Force was concerned long before this specific project was even conceived. For example, the pilots of the participating wings receive an annual proficiency check which must be accomplished each year prior to their birthday in exactly the same way as the yearly instrument check is required of all USAF drivers. Incidentally, if this check is not accomplished or not passed, pilots are downgraded until such a time as they become current and can demonstrate that they have the required proficiency. In addition, they receive 90-day standardization checks and frequent spot checks by recognized IPs and operations personnel. Another feature of the 18th Air Force's program is their yearly instrument school of one week's duration. This is a must for every operational pilot.

The minimum standards to check out in the 18th's C-124s are 2000 hours total time and several hundred hours of four-engine time, plus 100 hours of transition in the C-124. Also, new pilots are instructed by a mobile training detachment for three weeks.

Of this 100 hours of transition in the C-124, a minimum of 50 must be spent locally, practicing normal and abnormal flight conditions, including everything from stalls to two-engine-out procedures. The other required 50 hours are devoted to problems peculiar to cross-country navigation, in-flight procedures and over-all flight planning. All aircraft commanders are checked out by a limited group of highly qualified personnel, after being recommended for final check-out by an IP.

Prior to the actual start of Gyroscope, all C-124 crews were required to participate in a wet ditching drill, wearing normal flight clothing. Further, after completing this phase of survival they were run through several dry ditching drills. This included organized procedures for dumping hatches, evacuating the aircraft and properly operating the 20-man rafts.

In the meanwhile, the Army troops were being given extensive briefing in the use of all survival equipment, such as Mae Wests, life rafts and accessories. They were drilled extensively in the evacuation of the C-124 in the event of an actual ditching. Nothing was left to chance.

As the plans were finalized, it was firmed up that each of the 43 actively participating aircraft would carry 90 combat-equipped troopers plus their personal luggage. This represented an average weight of 23,010 pounds of very important cargo per aircraft.

Starting at 0001 hours on 7 July 1955, the program got under way on schedule. Unlike most airborne operations, whereby many planes have been dispatched simultaneously, each C-124 was allotted a block time with a two-hour separation. This made it possible to march each load of troops to the aircraft 45 minutes prior to departure, call the rolls, personally inspect them as far as seating and safety belts go and cover all phases of additional necessary briefing.

Each aircraft was scheduled for a three-hour layover in Travis AFB, two hours at Hickam and two hours at Wake Island. This allowed time for the passengers to have a hot meal at each stop, for adequate servicing of the plane and for all necessary maintenance. At Travis a good part of the extra hour was devoted once again to additional briefing of the troops on survival equipment.

In order to carry sufficient fuel reserves for the long overwater hops, the loading ramps in the nose of each C-124 were removed along with some additional equipment deemed unnecessary for the project. As a consequence, this weight reduction allowed for almost 700 gallons of fuel above that normally carried and lent considerable weight on the side of safety.

The airlift was planned to allow each flight crew to fly one leg and then lay over for a minimum of 14 hours while the aircraft continued on with a new crew. This type of layover not only insured that the crews would get adequate rest and hot meals (which were specially planned in advance) but also allowed them to take full advantage of the excellent services rendered by MATS.

Here then we find two separate agencies within the Air Force working in close harmony. Operational control of the project was vested in MATS while much of the actual planning and all of the flying was done by the Troop Carrier Command.

At each stop a series of services were performed by MATS personnel to expedite the planned operation. Flight logs were made up by the navigation section for each outgoing crew. This relieved the navigators of a great deal of preflight planning, minimizing their workload. After

The engineer carries the ball on the engines, adjusting controls and monitoring instruments.

checking the weather and prevailing winds carefully, the required fuel load plus reserve were figured by MATS personnel and loaded accordingly upon landing.

Form 175's including route and best altitude were made out for each pilot's signature. The radio section briefed each radio operator on frequencies to be employed and check points where position reports would be required.

Finally, each Aircraft Commander and Navigator was given a comprehensive weather briefing, including profile maps and pressure and wind charts. Then they were briefed again on the entire route, with emphasis on fixes, reporting points, minimum altitudes, NOTAMs and letdown for destination and alternate.

After considering several ways of presenting our personal observations of Operation Gyroscope, FLYING SAFETY decided to give the whole affair a journal type treatment. This is the story.

2145 PDT, 4 July:

Amid the usual confusion accompanying some hundred pounds of excess baggage, which included cameras, typewriters, film, and, oh yes, some clothing, we finally got off from Los Angeles on the first leg of a journey that would eventually embrace some 20,000 miles of air travel. This was sort of backing up to get where we were going, but that's the way things sometimes go.

0800 CST, 5 July:

We arrive in Washington, D.C. amid a heat wave and transportation strike. Best a veil be drawn over the suffering of your editors during this phase. Finally arrived at Donaldson this evening at approximately 1930 hours, during a grand daddy of a southern-type thunder shower. Checked in with the project officer

Competent and highly qualified crews assured the safe transport of their valuable cargo. Nothing was left to chance as all units received briefings on every phase of the flight. The orderly and well disciplined manner displayed by the troopers greatly contributed to the success of the airlift.

and learned that we were scheduled to depart for Ft. Campbell, Ky., about 1200 hours tomorrow.

We have requested that we be allowed to travel straight through with one plane load of troops, as we feel that this is the best way to find out how the operation actually progresses.

1200 CST, 6 July:

Finally got off about 1330 in a C-119 for Ft. Campbell. The plane was filled with a varied assortment of news media correspondents. As is normal in an operation of this size some of the details (from our viewpoint, anyway) have been neglected. For example, one jeep meets us at Campbell although there are approximately 16 passengers aboard our aircraft, all burdened down with enough personal paraphernalia to sink the Lusitania. This, in itself, presented somewhat of a problem, especially aircrew or maintenance capacity. This adds up to almost 1000 people involved in the airlift in one capacity or another. No matter how you slice it, that's a lot of people to scatter around the globe.

The General tells us that most of the crews and support personnel will be furnished by the 63rd and 62nd Groups, while back-up aircraft and crews, in the event of trouble, will be furnished by other units of the 62nd TC Wing from Larson AFB.

The basic mission of the 18th Air Force is such that this is considered a routine maneuver. In reality, it merely consists of combining a series of relatively short flights into an over-all movement that will embrace about two-thirds of the world.

2000 CST:

We spend the rest of the evening discussing the troop movement with officers and NCOs of the 508th. They tween TV cameras, newsreel lads and Army and Air Force photographers, not to mention civilian PIO types. It seems like there are about two cameras for every trooper.

Our flight came in from Donaldson at 1300 hours and we met Capt. Robert S. Mulgrew, Aircraft Commander, Capt. Donald E. Knebusch, Pilot and the Navigator, 1st Lt. Conrad J. Kelliher. After a quick lunch we gather in Ops for briefing.

At this time the two busiest men on our flight are the Flight Engineer, M/Sgt. Dewey R. Church and the Loadmaster, A/3C John E. Davis. Church is busy with refueling and last minute checks, while Davis is supervising the advance part of the troopers who are loading the personal baggage of our 90 passengers. The day is sweltering hot and the Loadmaster and the Flight Mechanic, A/2C Ozro E. Ewers, as well as the

as there was a certain amount of hysteria as to where we were to sack that night.

After ironing out these small details we board an Army bus and are conveyed to a GI-type barracks which wasn't much, but it was home.

1830 CST:

We are fortunate to sit in on a briefing by General McCarty on the projected operation, much of which we have already covered in this article. The General is a past master at this sort of thing and it is surprising how easily he breaks down a complicated subject to the simplest form for the uninitiated.

We learn that there will be 43 loads of troops; that there will be 10 spare or extra aircraft stationed at the various stops along the way; that three airplanes have been dispatched ahead to carry the advance echelon of personnel who will act in a command, liaison, aerial port, are all highly in favor of the expedition and we were interested to learn that all dependents have gone ahead of the main body and are now on the high seas. Most of the sponsors have taken their families to the coast and will join us at Travis. This is genuine concurrent travel, and certainly a new twist in overseas rotation.

0630 CST, 7 July:

After a hurried breakfast we went to the Movement Control Center where we reaffirmed our scheduled departure on flight number 1117, at 1600 hours. The 18th AF Project Officer and the MATS Liaison Officer have arranged for us to be carried on the Form 175 for each leg. We're looking forward to some time in this big bird.

Spent the balance of the morning shooting photo coverage of the troops being briefed, marching to their respective aircraft and then boarding. This was sort of nip and tuck be- Army assistants are soaking wet. We understand how they feel. Shooting pictures inside the plane is comparable with sitting in a blast furnace. Japan *can't* be any hotter than this.

1530 Hours:

Loading starts on schedule. Each soldier carries his basic weapon, duffle bag and one or two sets of cleaned and pressed uniforms. Most of the troopers seem quite young, but all in all act like real good soldiers. We gather from the conversations around us that their only sweat will be the landings. They've been trained to bail out on every flight, and landings are something they go through only when things go wrong.

As usually happens under semi-serious conditions, someone always furnishes comic relief. In this case, the involuntary clown turns out to be the representative of a big newsreel outfit. After officiously dragging several of the young soldiers around to

C Company troop commanders did an outstanding job in contributing to the overall operation.

get special effect shots, and hampering the initial loading considerably, he finally got in position to shoot the troops as they came aboard. As they started up the ramp, he pushed in front of a service cameraman and started shooting. Unfortunately, for posterity, at this precise instant the side of his camera fell open and endless yards of unexposed celluloid unrolled across the path of the boarding troopers. Big, highly polished jump boots soon ground the film into nothing, amid cries of "Wait, Halt, Stop!" from our hapless cameraman. Needless to say this gave us all a moral uplift.

At 1550 hours, 10 minutes before block time, the engines are started as each item on the prestart list is checked off, with all personnel standing by on the inter-phone. As soon as all mills are purring smoothly, Capt. Mulgrew flips on the loud speaker system and gives the passengers a briefing of the projected flight —route to be flown, altitude, weather en route and ETA at Travis.

The radio operator, S/Sgt. Enos Childs and his assistant, A/2C Eldridge Parks report that their equipment is working properly and they are ready to roll.

At precisely 1600 hours we taxi out to the run-up area and start going through the comprehensive pre-takeoff checklist. At 1615 we line up on the active. Sgt. Church advances the throttles and we are off on the first leg of our long journey.

Our basic figures for initial takeoff on the trip were:

- Runway temperature/dewpoint-84/72
- Field Elevation — 560 feet
- Takeoff runway length — 9000 feet
- Predicted takeoff roll — 3900 feet
- Takeoff gross weight — 177,000 pounds. (MAC 28.6%)
- Critical four-engine speed — 98 knots
- Critical runway length — 4750 feet
- Liftoff speed — 110 knots.

We note an interesting item on the bottom of the takeoff performance chart. It reads, "No takeoff will be attempted when critical runway length is greater than runway length available." To that we can only say Amen!

After the first hour or so, we all get shaken down into our respective positions and realize this is going to be a long grind. It's almost incredible how comfortable the crew quarters are on this big bird. With padded seats and room to walk around, it doesn't lead to cramped legs and tired posteriors on a lengthy haul. The office itself is arranged not only comfortably, but in the simplest manner imaginable. With the engineer carrying the ball on the engines, the pilots can concentrate on the basic flight instruments. This is simplification at its best.

Somehow it seems to us that this old lady doesn't really fly, but rather, marches in a majestic manner across the sky. She is quite disdainful of normal thermals that set lesser craft to bucking and bouncing. She merely shrugs them off with a flick of a wingtip.

Booming across Oklahoma and New Mexico we have a few brief encounters with relatively small, but quite violent, thunderstorms. Sometimes you can't circumnavigate those little dudes so then it's a case of cranking the cockpit lights way up, cinching up the traces and riding 'em out.

When you get into these sort of atmospheric antics, even the C-124 kicks up a fuss. But we found her nice and light on the controls and it was certainly no great chore to hold altitude and course.

0100 PDT, 8 July:

We start a slow, gradual letdown for Travis; our ETA is 0115. Looks as though we've hit it right on the money. We've only grabbed off about an hour of shut-eye on the trip so far, but are eager to go on. We touchdown at 0115 local time.

Immediately after landing, the Aircraft Commander holds a dry ditching drill to insure that all troops know which exit they must use for evacuation, which raft they will board and then stresses the need for orderly disembarking.

Established block times made it possible to march troops to assigned aircraft 45 minutes before departure times.

Old reliable "George" made things easier for the pilots, but it was still a long grind. We know they'll be glad of the 17-hour layover here. This shows excellent pre-planning and is an added safety feature whereby each crew is well rested before starting on another leg. They will have the same rest periods between each additional leg, and a 60-hour layover in Japan.

After grabbing a fast sandwich and cup of coffee we head back to the Control Center and meet our next flight crew. The Aircraft Commander is Capt. Ted L. Bishop; Pilot, Captain Andrew D. Curtiss; Navigator, 2nd Lt. Larence E. Landis; Engineer, T/Sgt. Charles B. Lindley; Radio Operator, S/Sgt. Kimble W. Jones; Flight Mechanic, A/1C Kenneth B. Ernst, and Loadmaster, A/2C Hoyt T. Pinson.

Once again we get off right on our block time of 0400, after an excellent briefing for all the troops by the Aircraft Commander. Included in this briefing were personal checks by the commander and crew to insure that all Mae Wests were fitted properly and that each man knew its function thoroughly. These added briefings could pay off, for one trooper had his life vest on backwards and inside out. Just goes to show that you can't get too much of this sort of thing. Everyone must wear Mae Wests during takeoffs and landings from here on in.

On this leg we have two additional crewmembers. Major H. K. Smith, observing the operation from a logistical viewpoint for the 18th Air Force and Major Stanley Lutz, Deputy Surgeon, 18th AF. They are staying with this particular crew for the entire mission. Major Lutz reports that the rest time allocated for each stop is sufficient if the crew takes full advantage of it. They should average at least 10 hours in the sack. He'll report to the 18th AF on fatigue factors, availability of hot meals for the crews, the acceptability of billets and whether or not medical care is available, if needed.

In view of the obvious care that went into this operation we believe his report will be most favorable.

4½ Hours out of Hickam:

We got real lucky and managed five hours of solid sleep on this leg. A little stiff but much relaxed. We've been down talking with some of the troops and while they're a little weary too, there's enough room for them to stretch out for some sleep.

The "C" Company Commander, Captain Vern J. Laver, says his people have much more confidence in the plane now than they had initially. At first there had been a normal amount of apprehension over the fact that there were no chutes aboard. And as always when a group of servicemen get together, several interesting, if untrue, rumors had run rampant.

Some enterprising soul had spread the word around and about the area that the C-124s would be overloaded and consequently not have enough fuel to reach dry land, island or otherwise. Another interesting fable evolved around the possibility of three-engine operation. This tale went that these big birds couldn't remain airborne with one fan feathered. The excellent briefing given at the start of each leg laid the former rumor to rest and the fact that one C-124 went back to Travis with one fan feathered, after being an hour out successfully scotched the second tall tale.

Weather is good on this leg and we are getting an extra bonus in the form of a tailwind slightly stronger than forecasted, so we'll probably beat our original ETA by about a half hour.

We've been flying above a broken to solid cloud layer but occasionally we can see the ocean below. Evidently there's a fair surface wind, as the white caps are dancing across the sea in endless rows.

1130 Territory of Hawaii Time:

Only a few minutes out of Hickam and we get a lucky break. The clouds below dissipate and there lies Diamond Head, sparkling in the sun. We've seen it before, both from the air and from the deck of a ship, but to us it always represents a big thrill.

Oahu is as beautiful as ever—the deep blue sea, the white and yellow beaches and the sparkling white clouds all mix in with the overlying green foliage and the pastel houses. This place we like much.

1215 Hours:

Arrived okay and checked in with our new Aircraft Commander, 1st Lt. Herbert W. Austin and Pilot, 2nd Lt. Myron O. Jensen. They tell us that we have a bit less than an hour before we get set to leap again.

This is sort of a shaker. It's got to be either chow or a shower. We elect the latter, for our coveralls can almost stand alone at this point.

We rush down to transient billeting and rent two towels and two cakes of soap, scrub off several accumulated layers and scrape off some of the more outstanding bristles. At this point tragedy rears its ugly head. A little foresight enabled us to bring a change of sox and underwear. The shorts and shirts go on okay but in our haste to get into clean sox, we manage to tear one in half. Having no choice, we wear it anyway. At least it's clean, even if a bit drafty.

Now comes the bad part. We climb into the same old flying suits that are now beginning to show a little wear and tear around the fringes.

With time running out fast, we dash back to the plane, secure our luggage and transfer it to the new aircraft that is set up for the next leg.

Hickam is designated as a plane change base. Our old aircraft will

Right on schedule the clamshell doors swing closed, the big bird takes off and Operation Gyroscope is underway.

Frequent crew changes insured against pilot fatigue, a big factor on the side of safety.

After flying half way around the globe the troopers eagerly eye the Japanese mainland.

Flimsy Japanese houses indicate termination of this history-making airlift of personnel.

stay here for at least 12 hours while it's gone over with a fine tooth comb. This includes a normal post-flight inspection and all additional maintenance that is found to be necessary.

1325 Hours:

We leap off on schedule after another comprehensive briefing by the crew. This clockwork precision is still amazing. It is here that we learn that each crew is competing for the best record as far as making block times and ETAs on the money.

The Navigator, Capt. Martin Nisker, gets out the tools of his trade shortly after takeoff. He is in the process of checking out a student navigator, 1st Lt. Isiah Johnson in the intricacies of overwater navigation.

The Radio Operator, S/Sgt. Jean W. Granade, cranks up his equipment and settles down for the long standby watch. Now and again he chats with some unseen station. In the meanwhile the Loadmaster, S/Sgt. Johnnie L. Blaney rides herd on the troops. He makes sure that all is well and that everybody is getting a fair shake on the available floor space. That gets to be a precious commodity on a long haul.

Sometime later we get the opportunity again to fly this large bird. Things are going along smoothly although we're mostly on the gages, with little or no horizon reference. Lt. Austin is checking the APS-42 radar unit; giving us steers around the large cumulus build-ups in this area. We think this is one of the finest gadgets ever invented, for it not only pin-points all thunderstorms, but also insures a comfortable ride.

As we are chugging along, a red light suddenly flashes on the instrument panel. Naturally, we're a little shook and flash a quick query at Lt. Austin, who grins and says that the Flight Mechanic, A/1C Kenneth J. Wilson, is making an engine check. This is done immediately after takeoff, and once every four hours thereafter, while a tunnel check is made every hour. The red light comes on when the firewall door is opened during the engine check.

Having been exposed to a few red lights that, in our day, meant trouble, naturally we were relieved to learn that this was a routine affair. As much as the ruby flash can make us jump, we have to go along with the system. Nobody will ever take off with a warning light in his eyes, and this is a positive indication that something isn't secured.

We fly on into the night and cross the International Date Line somewhere around 2030 T.H. time. Seems sort of funny to have a day whacked out of your life like that, but, we'll pick it up on the way back.

We were extremely interested in the engine analyzer which is standard equipment on all 18th AF C-124s. Probably our interest was whetted somewhat by the fact that our sister publication, the Aircraft Accident and Maintenance Review recently had a very good coverage on this subject. Our Flight Engineer, T/Sgt. Darrell W. Bulis, gave us a real rundown on the capabilities of this gadget.

He tells us that, "This is the greatest gimmick ever invented.

"For example," he says, "every hour in flight I go over all four engines carefully. Funny thing though, I can sit here in my airborne swivel chair and do in two minutes what used to require hours on the part of maintenance men.

"Take a fouled spark plug. These engines might fly for hours and I'd never catch it. Sure, I'd know there was something wrong. The engine would probably run a bit rough, or, if several plugs were bad, the gas consumption would go up. But by using the analyzer, I can spot a bum plug right away. I can tell if it's merely fouled or actually not firing. I can determine exactly where it is and further, can determine why it's not functioning right.

"Let's say that we find a plug that's getting leaded up; in fact, usually there will be several. Okay, I find out which plugs are involved and then depress the primer buttons for a minute. This doesn't hurt the engines at all, but the sudden temperature change from a cruising lean mixture to one that's very rich sets up a fast chemical reaction and within 60 seconds or so, the lead deposits break down and the plugs commence to fire normally again. I recheck 'em with the analyzer and that's that.

"Of course, there are many other checks I can make," Sgt. Bulis went on. "By using the analyzer I can check all magnetos for timing. It's possible to determine accurately when the points open and close, or if any pitting or fouling has occurred."

The sergeant cranked a couple of dials while we watched. A myriad of exciting light lines dashed and danced across the green-colored viewing screen. Flashes of light zigged and zagged here and there with confusing jumps. It was all happening so fast we found it difficult to follow.

"See how nice that mag is timed?" queried the old Sarge. "You can see that it is right on the money." Of course we had to agree. Any fool could see that the mag timing was perfect. The fact that four engines were growling away in perfect harmony didn't influence us a bit. The fact too, that the lines on the screen looked all the world like our last cardiograph merely proved that we understood the system perfectly.

"That isn't all that we can do with

these things, either," continued Sgt. Bulis. "Naturally, we want to get the best fuel economy out of our engines. That's sort of essential when you're covering a few thousand miles of ocean. By using the analyzer, we can check the mixtures. It shows up fast if it's too rich or too lean. Here, you can see what I mean."

He did some more dial twirling and the lines on the screen grew positively hectic. "See that? A perfect mixture for this altitude. That's the best fuel consumption, and the best ratio for engine life, too."

We asked Bulis if the analyzer could perform any other feats of magic? "Sure, one of the handiest is graphically depicting the synchronization of the engines. Watch."

Flipping the throttle lock off, he nudged one throttle back a fraction of an inch. Personally, we couldn't feel any difference in the beat of the engines. The tachometers still registered 2050 rpm, but the analyzer went stark raving mad. Light lines danced with fury across the glass dial and at that moment the Aircraft Commander called on the inter-phone, "Pilot to Engineer, check the synchronization."

Sgt. Bulis grinned, "That lad's sure got a good ear." We had to agree. However, we mentally reserved the thought that the "good ear" was in all probability a super-sensitive feel. Good pilots develop that capacity early in life.

Maybe we're showing our age, but things are getting just a bit more than a little on the tired side and the runway lights of Wake Island are a welcome sight. This has been good flying and mighty good navigation. Even though we picked up the Wake range almost four hours out, Capt. Nisker has plotted our position right down to a fraction of a mile all the way in.

0010 Hours, 10 July:

We're taxiing back in to the line. Thought that we were on the way again but the old engine analyzer pays off by telling us that we have a dead magneto on No. 4. That's funny too, for we were batting a thousand when we came in, but that's life.

This is unfortunate for many reasons. Primarily because flight 1117 has been hitting it right on the nose all the way across. This will shoot our schedule to you-know-where. Another thing, some of the other flights are starting to stack up a little and we'll soon have them catching up with us on hourly, rather than two-hour intervals. Best we get hopping.

It's now 0130 Wake time and the advance maintenance echelon has come through in fine style. The bad mag is changed and we are once again upon our way. We're glad, too, because we're now getting mighty tired. This has been a long grind.

Unfortunately, things don't go just as we wish. We were lined up on the runway and the Engineer was advancing throttles to takeoff power when he suddenly pulled 'em off and we taxi back in for the second time. Now what?

We finally ascertain from the crew that the almost impossible has happened—no one can find the Form 1. We shake down the entire aircraft, with all of us pitching in to find the errant form. It just ain't here. We finally shut down and crawl out again, still earthbound on the rock known as Wake. After a lengthy search, the mystery of the missing form remains unsolved.

Time is running out, and the Liaison Officer orders us to proceed, starting a new Form 1. Finally at 0300 hours Wake time we charge down the runway and thunder off into the black of the night. It's high time too. The troops are starting to show a little stress and strain. They've been a long time coming and this extra delay hasn't helped a bit.

We figure the only place for us is in the pad. Again we get five hours of intermittent sleep as we ricochet between the bunk and the bulkhead during the penetration of several high, towering cumulus. Old "George" did his best though, and it wasn't really too rough.

0912 Hours:

We all get a large lift; the Navigator comes back and tells us to look out, dead ahead. There is Mt. Fujiyama rearing up approximately 100 miles away. The weather is clear now and visibility is excellent. The sight of land does something for all of us after a long overwater haul.

We go down into the passenger compartment and are surprised at the appearance of the paratroopers. Each one has on a fresh khaki uniform, with highly polished boots, and all of the men are clean shaven. These guys are good. We know how tired they really are but when they come off the airplane at Ashiya, they intend to disembark with their heads up, chests out, and in good formation. They'll do it, too.

Troop Commander, Capt. Laver and his assistant, 1st Lt. Russell B. Morgan, have done an outstanding job of keeping morale high. We are proud to have been a small part of "C" Company, 508th ARCT, if only for a brief 60 hours.

We skim down the coast of Japan, noting Miss Fuji on our right and arrive at Ashiya at 1116 local time. This has been an experience we will never forget and we've learned a great deal about safety of flight as it is practiced by specialists, like the 18th Air Force.

The close liaison between the Army and the Air Force has been an eye-opener. Operation Gyroscope may well pave the way toward a completely new era in safe, mass transportation of armies from any point in the globe to home and back again. ●

The prototype Boeing 707 with 200 flying hours behind it is destined to be the new KC-135.

The Boeing KC-135 is in production as the standard jet tanker-transport for the Air Force. Details of this airplane have not been revealed. However, the KC-135 is an advanced version of the Boeing 707, a prototype jet tanker-transport which has nearly 200 flying hours behind it. The experience has provided an idea of what will be in store for crews of the advanced version, the KC-135, when it comes into service.

The following article was prepared for FLYING SAFETY by the pilot who was in command of the 707 on its initial flight, July 15, 1954.

The 707 has flown at speeds well over 600 mph and at altitudes above 42,000 feet. It has operated from a 5400-foot runway with no difficulty.

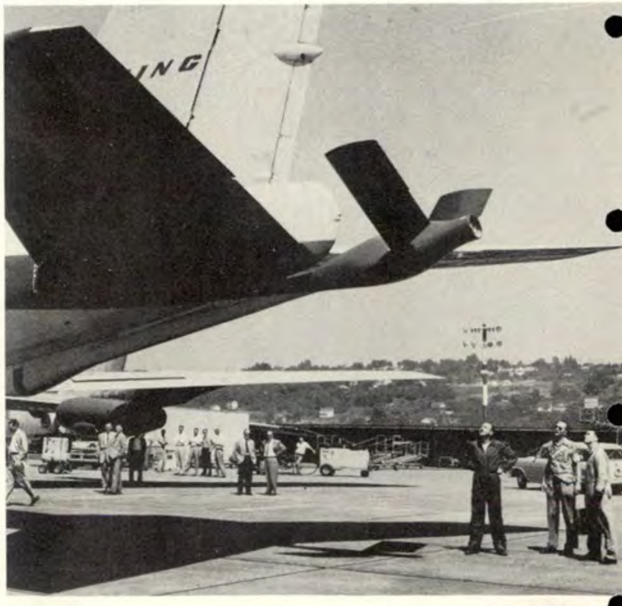
★

ANYONE WHO FLIES professionally has at one time or another taken off in an airplane with a

...a preview of TOMORROW'S

A. M. "Tex" Johnston, Chief of Flight Test, Boeing Airplane Company.

The 707 on final approach affords a good view of the four segment flap arrangement.



When the 707 turns KC-135, getting up and staying with the big boys will be no sweat.

cockpit layout that made him wonder if the instruments had been laid out by firing a shotgun load of dials at the panel. He knows, too, of twin-engined airplanes whose cockpits are complicated by confusion until they are as difficult to find anything in as the cockpit of a four-engined airplane; and he has seen airplanes that require a third man up front to keep track of what is going on.

Such airplanes make the Boeing 707 stand out as a welcome change.

Maj. Gen. Albert Boyd, Commander, Air Research and Development Command, flew the 707 last October, and he had this to say about it:

"From a pilot's standpoint, it is a simple straight-forward plane and very delightful to fly."

In this article an attempt will be made to show why, from the pilot's point of view, the 707 is "very delightful to fly." I consider that this will be good information to bring out in a magazine devoted to flying safety, since only a safe airplane can be pleasant for the crew to operate.

An airplane designed with the pilot in mind is the only kind that will turn out to be pleasant to fly, and the 707 is a good example of an airplane designed for the crew.

The airplane provides the pilot with an excellent field of vision. To aid this objective the designers put four windows in the roof of the cockpit, two above the pilot and two above the copilot. Consequently when the airplane is banked, all that either man needs to do is turn his head to see out. This is a considerable advantage when turning from base leg onto final, in fact during any turn.

Visibility from the cockpit is very good. Even the frames of the windows have been slimmed to allow good vision past them, an eye on each side.

In the cockpit, the number of controls and instruments has been reduced to about 50 per cent of the number in the KC-97 Stratofreighter. It has 115 fewer power-plant controls and instruments than the Stratocruiser. Two men, pilot and copilot, can operate the 707 with no strain whatever. In fact, I think it's easier than flying the good old C-47.

TANKER

Mechanics go over the anti-skid tires and check the new boom installation prior to flight test.

The main thing that has simplified operation of the 707 is its jet engines. A jet-engine control is as uncomplicated as a broom handle. It's a single lever mechanically connected to a hydro mechanical regulator on the engine. Push it open and the engine accelerates. Pull it back and the engine slows down.

Another characteristic of jet engines is the fact that there is practically no warm-up period. When you start the engines you are ready to go.

When in flight there is almost no vibration and very little engine noise. In these respects, as in many other ways, jet engines are superior to piston engines. About the only noise the pilots hear is a slight whine from the turbines and the sound of air whistling over the nose structure.

Besides being quiet and smooth, a trip takes less time due to the high speed capabilities of the airplane. When you add that the 707 is almost as comfortable as a rocking chair, you can see that these factors go a long way to eliminate crew fatigue at the end of a long flight.

The spacious interior provides ample space for lots of cargo and over 100 passengers.

Basic flight controls and instruments of a jet are the same as on any airplane, but the design engineers who planned the 707 cockpit were thinking about the pilot all of the time.

Another thing that has been done in the interest of safety is to orient engine instruments for fast, easy checking. Engine instruments, having indicator needles, are set so that during normal operation all needles are parallel. A pilot can inspect a whole panel at a glance. All he needs to look for is a needle that is off parallel. This is a great improvement over having to inspect each individual instrument.

In flight, the 707 has better lateral control at all speeds than any known airplane of its size. Spoilers and inboard ailerons between the two segments of flap operate at high speeds. At low speeds, when the flaps are down, outboard ailerons come into operation.

Ailerons, elevators and rudder are all internally balanced and spring-

Above, the 707 in contrast to KC-97 tanker. Below, low slung engines are handy to work on.

Below, the cockpit is evidence that designers always remembered to keep the pilot in mind.

Below, test equipment provided valuable data used by designers to iron out trouble areas.

tab operated, with the tabs connected by cables to the pilot's wheel and rudder pedals. Use of internal pressure balances gives the controls good feel and avoids both sluggishness and over-sensitivity.

Of all the flying controls, only the spoilers are mechanically boosted. In addition to helping provide lateral control, the spoilers are used as an air brake. By raising the spoilers on both wings, the wing lift is decreased and the drag increased. This feature makes possible an increased rate of descent if required.

The landing gear can be lowered at high speeds to increase drag and slow down the airplane, or increase the rate of descent.

Rate of climb of the 707 is much better than that of present-day transports. R.L. Loesch, my copilot for the early flights and captain of the 707 for later flights, says, "She goes up like a scared cat."

The airplane's performance with two engines out on one side is the answer to a pilot's prayer.

Takeoff and landing speeds and roll distances are about equal to those of a large piston-engine transport airplane. The good lateral control makes possible crosswind landings without any sweat.

Like the B-52 and the B-47, the 707's engines are in pods supported on struts below and forward of the wing. This isolation of the engine from the wing structure means that engine fires wouldn't be as serious as they would if the engines were in the wings.

In the 707, each engine normally draws fuel from its own individual tank. Two electric boost pumps in each tank, each on a separate electrical system, mean plenty of reliability. If both electric pumps should fail, and that's a very remote possibility, an engine-driven fuel pump will provide fuel to the engine. There is also a manifold line which makes it possible for any engine to use fuel from any or all tanks.

The hydraulic system on the 707 also features dual reliability.

The airplane's systems were tested and its performance characteristics have been determined during lengthy and carefully conducted tests. The tests made during each flight are very carefully planned and carried out, as much as possible during the time spent in the air. Tests flown to determine the stalling speeds and flying qualities near the stall may be used as an example to show the type of procedure followed.

Our specification sheet stated the airplane's weight for the tests, the various centers of gravity which should be used, the altitude at which the tests should be made, what flap positions were to be tested, and other essential requirements.

The basic data to be obtained were time-history plots of the stalls. These plots represented airspeeds, altitudes, control positions and forces, pitch angle, normal acceleration, rate of pitch, bank angle, thrust measurements, and outside air temperatures.

Each run in these tests was initiated from a trimmed straight flight, speed 40 per cent above the stall speed with idle thrust. We made successive runs with the flaps up, flaps at 20 degrees, flaps at 30 degrees and so on.

As the stall was approached on each run, the air speed was decreased at a predetermined rate. We observed the stall warnings, the control effectiveness, roll and pitching tendencies and the recovery.

Instruments on the plane recorded all the necessary data. The data were brought back to the flight center and reduced to their most useful form by special equipment and specially trained employees, before being turned over to aerodynamicists for evaluation. The speed and efficiency of this operation are reflected by our flight testing progress.

Other information also is obtained during a flight such as described. Takeoff performance and climb data may be taken during initial stages. Stability and/or performance data may be obtained following the stalls and fuel tank pressure information taken during descent. Braking information is obtained during landing and roll-out. By planning test flights in minute detail in this manner, every possible minute of test time is productive.

Even by the time we had completed the initial stage of Phase I flight testing, we had learned that the airplane was even better than the designers and builders had anticipated.

During the test program, we have encountered a few bugs which have been straightened out—that's what a prototype is for. I'm already looking forward to flying production models evolved from the 707, and I have no doubt they will be even better airplanes, due to the extensive test flying program. ●

Captain

Merrill H. Cross

3510th Combat Crew Training Sq
Randolph AFB, Texas

WELL DONE

KNOWLEDGE • TRAINING

CAPTAIN MERRILL H. CROSS was the instructor pilot on a C-119 on a flight from Randolph to Tyndall AFB. After being airborne for approximately two hours, the left engine became rough. Shortly thereafter it backfired several times, then burst into flames. Captain Cross immediately feathered the propeller and succeeded in extinguishing the fire.

The flight was being conducted in the soup as Captain Cross declared an emergency. He received letdown instructions, reported over the Mobile VOR and requested a GCA to Brookley. The weather was reported to be 200 feet obscured with two miles visibility in snow.

GCA had considerable difficulty in maintaining radar contact as the aircraft was turned onto final approach. Finally at 500 feet, contact was lost completely and a go-around was initiated. Another 300 feet was lost as the gear was retracted; however, Captain Cross was able to climb out to 1500 feet. Another GCA attempt also resulted in lost radar contact on final and once again a single engine go-around was completed.

After the second GCA attempt, Captain Cross contacted a nearby civil field and started an ILS approach. He broke out at 150 feet, lowered the gear and landed with a 25-knot tailwind on the 5000-foot strip. Upon touching down, the propeller on the good engine was reversed and a safe stop was made.

The professional manner displayed by Captain Cross in handling his aircraft and his knowledge of instrument procedures and techniques are a credit to himself and to the United States Air Force. WELL DONE!

By the Numbers

Tony LeVier, Director of Flying
Lockheed Aircraft Corporation

IN THIS MODERN jet age I have always said that summer weather brings on three things: vacations, sunburns and long takeoff runs, particularly for jet aircraft.

As soon as hot summer weather sets in, there's always an upsurge in takeoff accidents. It's really funny to hear all the various reasons why one guy went through the fence after an aborted takeoff; another blew out a set of tires and wrecked both wheels; and gear was retracted on another, and so on. The pattern is the same regardless of who you are or what language you speak — *Hot weather busted aircraft!* Okay, what's the reason? Simple! Matter of fact, you know good and well what causes it. Some jockeys say "Cripes, I had a loss of power," or, "It just wouldn't accelerate," and, "I racked back on the stick but she was glued to the ground." So, it's blamed on the engine and rightfully so, but not for the right reason.

Let's go back a few years and sort of review the problem of *hot weather* or, to the intellectual type of person, "*High ambient air temperature,*" and its effect on aircraft takeoff performance. Matter of fact, let's go back to the year 1903 when I believe a couple of brothers named Wright designed and built a flimsy sort of contraption called an aeroplane. For those not fully acquainted with this early age of flying, they happened to be the first to do so, and recognized then the fact that hot weather had a marked influence on takeoff performance, that is, a *bad* influence.

In those days they couldn't shove the throttle further forward to increase the manifold pressure, or hit the JATO button, light off the A.B. or use the water alcohol. They were lucky to even have what they had. Know what they did to solve the problem? They took advantage of the cool sea breeze at a place called Kitty Hawk, and later on used such scientific methods as taking off on the down slopes of hills, or flying early in the morning and late in the afternoon. In marginal conditions they would use a fish scale to measure thrust. If it pulled 60 pounds, OK.

Okay, I know you are fully aware of the fact that hot weather affects the power of our engines and lift of our wings. You should know, you have had the finest aviation training money can buy, and this was part of it. 1903 — 23 — 43 — 53 or now 1955 — it's all the same — temperature still has the same effect on aircraft takeoff performance, *except* we have it a lot better than the old timers on most every count. That is, all except when we have a crash resulting from a failure to become airborne.

My early flying experience taught me to respect hot weather and when confronted with a takeoff on a short strip, head into the wind, if any, use all the runway available, *and allow the aircraft to accelerate to takeoff speed before attempting to lift off, in spite of your feelings for doing it sooner.* Of course, this was not a very scientific method, but then we didn't have handbooks of instruction in those days with takeoff performance charts. In plain English, it was by guess and by gosh, and cut and try. If you didn't make it, well a busted airplane in those days only amounted to a few hundred bucks, and generally no one got hurt except the pilot's feelings.

On the other hand, today we are more scientific. Proof of that is the modern aircraft. It's complicated to operate, extremely costly to buy and maintain and usually requires a large crew to man the larger types. Even the fighter types have started to get complicated because of the military requirements. Therefore, they too are a very costly article. Not all air bases have runways of adequate length for jets and at times they are found to have a marginal takeoff performance in hot weather. At this point, I might mention that my introduction into the jet age, some 12 odd years ago, was during the beginning of the summer months when the ambient air temperature at ground level in the shade was often above 100°F. I remember one time when we flew (if you can call it flying) when the mercury hit 115°F. I believe this incident stands out in my mind above all others.

It was a test flight and the elevation was approximately 2300 feet. I didn't have a runway, thank God for that, but instead I had 3½ miles of dry lake bed. I knew I was going to use plenty of run because I had rolled some 10,000 feet on a previous takeoff with lower outside air temperature. To make a long story short and not to bore you with my problems, it took 15,000 feet to become airborne, and then I wasn't sure if it would stay there. During the ensuing few seconds it took to make up my mind what course of action to take, it was too late to do anything but pull the gear up, hold her steady and straight and hope! Had I chopped the throttles and aborted, it's anyone's guess what the outcome would have been. Finally, after several minutes of straight flight, I had gathered enough speed and altitude to assure myself of being out of any immediate trouble. To give you an idea what a terrific effect this high outside air temperature had, in addition to the takeoff, I flew 30 miles in level flight accelerating to best climb speed.

This little incident (if you can call it little) took place at Edwards AFB. I was test flying Lockheed's penetration fighter, the XF-90, a twin jet aircraft of monstrous proportions and underpowered, to say the least. We were not as yet blessed with afterburners and JATO equipment, a fact which nearly put us out of business. There was one guy who was more impressed than all of the others — and that was myself.

In the experimental test flying business, one can write off some of these so-called 'goofs' by the nature of our profession, and it is generally done even when an aircraft is washed out. However, *it is an unwise pilot who doesn't figure his chance pretty close when things look marginal, like high ambient air temperature for takeoffs.*

Let's take a look at the conditions that I was flying under on this typical Mojave Desert summer day and see what the "numbers racket" brings out. First off, to get you warmed up to my clatter, we must understand that the loss in jet thrust due to high ambient air temperature is *four to five times greater for a jet engine than that of a piston-type engine.* This fact is not generally known except by engineers and then only those dealing with aircraft and power plant design. I was fortunate enough to be working with engineers fully aware of the importance of temperature.

When the temperature is high, the thrust is low — but how much? For each 10°F above the so-called sea level standard temperature of 60°F, the thrust of a jet engine is reduced by four to five per cent. It is very seldom that we are favored with the so-called standard temperatures in the summer time. All normal performance figures are based on these *phoney standard sea level conditions* which, of course, when quoted make performance of aircraft look good. Throw in a few extra degrees of temperature and your performance is shot. Then, of course, when we talk about the jet engine alone and its *rated thrust,* we must realize that this rating is for the engine running at sea level in 60°F. air and *not installed in the aircraft.* Installation takes another toll in thrust depending on the type of aircraft we are talking about. What's left to push the aircraft in many cases would astonish even the pilots who consider themselves to be "tigers."

Okay. Ready? The XF-90 penetration jet fighter was powered by two Westinghouse axial flow J-34 turbojet engines. The original design and performance of the aircraft was based on engines each producing 4000 pounds of static jet thrust at sea level standard temperature without afterburner. We got engines that would produce only 3000 pounds of static thrust, down 25 per cent thrust to begin with. Now, install the engines in the aircraft and we drop another 200 pounds per engine installation loss and end up with 5600 pounds total static thrust. Static thrust is what is measured when the aircraft is at rest on the ground. Well! So we have only 5600 pounds of thrust. Sure — lots of jet aircraft are flying around with less, but the XF-90 was no ordinary critter. It happened to have grossed out at a hefty 33,000 pounds plus, full up, lugging everything but the kitchen sink. This day, however, we were grossing out at a mere 25,000 pounds for obvious reasons!

I'm ready for takeoff. I have taxied to the extreme north end of Muroc Dry Lake — my tail pipes are almost poked into the boon docks. I move the throttles forward until they are against the stops; the tach's steady at about 101 per cent rpm — all I can get and, boy, I well need it today! I release the brakes. Does the old girl jump? Negative! She barely waddles forward without any doubt in my mind that this is going to be a distance record for an aircraft takeoff roll. Well, let's see how much actual thrust I had at the start of my roll. We can take 60°F. sea level standard and subtract 8°F. to get down to the standard day temperature of 52°F. at 2300 feet above sea level. Subtract this supposedly standard 52°F. from my actual 115°F. and we end up with it being 63°F. above standard conditions — and all just for me! Now, 63°F. divided by 10, multiplied by 4, is about 25 per cent less static thrust. Take another 2 per cent drop per 1000 feet elevation and, well! I think you are beginning to catch on.

Remember — our installed thrust is 5600 pounds. With a 25 per cent loss because of high ambient temperature and another 5 per cent for altitude we now have but 4000 pounds static thrust, or 1600 pounds less than we would have on that so-called standard day at sea level. Boy, that ain't hay! Now the trick in figuring this out so that you don't fool yourself is to remember that even this 4000 pounds isn't all available to kick you in the pants. On takeoff there is rolling friction of the wheels and the air drag of the airplane to overcome just to hold speed, let alone accelerate. These factors eat up another 2000 pounds at the average speed during takeoff roll. Sooo, now, if you're still with me, you will see that my fine engine specification kick in the pants of 6000 pounds is down to a measly 2000 pounds! Why I can hardly feel it push at all.

I move ahead slowly — the acceleration is less than one tenth of a G. It should have been three times as good on a normal day. I roll past the 5000-foot point and my speed is 60 mph V_1. Ordinarily, I would be preparing to hoist the old girl off after rolling this distance at a comfortable 160. The lake bed stretches ahead as though it were endless. The heat waves and mirages have everything floating above the ground and they look to be ages away. I roll on. My speed indicates 130 and I'm past the 10,000-foot marker. Now I'm sitting erect and my mind is starting to calculate my percentages. The indicator appears to hardly move as I start easing back on the stick at 150 mph, indicated. At this speed the old girl would have lifted off, but I knew that I would have settled back and my chances would have been shot. I'm approaching the point of no return — I like to lift off at 165 — I lift into the air at 160 — I'm skimming the dry lake bed barely inches high. Suddenly I realize my mistake trying to be a hot test pilot and get that test flight off at any cost. I know what it's like to clobber an airplane. My record is far from lily white. I raise the gear lever and say a silent prayer. Hang on, LeVier, this is going to be a close one. Gear up. Flaps still down — don't dare to raise them now. The large expanse of the main test base looms up smack on the nose. I ease into a very gentle left turn to avoid the base and skirt the full length of old Roger Dry Lake. Gad! What a wonderful place to have. I pass the main base runway at 185 mph indicated. I'm six miles from start of roll and three miles from lift off. You figure it out, boy! I'm shaking all over again re-enacting this incident. Needless to say, from that moment on, we all, and I mean all, started to get our heads together a little closer and start using them. The immediate answer was JATO. It solved our problem until afterburners were installed and we went on with our testing without trouble.

Okay, let's pick up from where I left off on the figuring. The conditions during roll were lousy, but let's look and see how *really* sorry they got at the 15,000-foot marker at 160 mph indicated when I started to fly. Having lifted the old girl into the air I managed to lose just about all the excess thrust I had, which wasn't very much. Why? Because now I'm airborne with flaps and gear down and a grand old lift-drag ratio of about six. Now a 25,000 pound airplane less all the fuel I had burned at this point and with an L/D of six has just about 4000 pounds of drag. Just exactly all I had in thrust.

At this point — and I wish to make my greatest impression on whomever may be interested: *"I had not one single ounce of thrust left to do a thing with.* All I could do was hold 160 and an altitude of perhaps a foot or two above the lake bed." The next act — that of raising the landing gear — pulled me out of the hole. I must admit, however, that I had many more advantages than the average jet jockey. I was then and still am in the test flying racket. I had the use of a dry lake bed some 12 miles long. I knew before hand approximately what the distance would be, but not exactly. I figured it could be made and it was — but my neck, for some 10 or 15 seconds, was out a mile!

Now! Let's cool off and talk about some sensible kind of flying.

So the old XF-90 didn't turn out to do so good when summer weather set in. Neither do a whale of a lot of other jet jobs that I have seen grunting to get off with a full load. Name any one of them and you have a "dog" in hot weather, coupled with poor takeoff technique and too short a runway, and you spell "busted aircraft." Just remember this — you're planning a cross-country flight. Perhaps it's only from Willy down Phoenix way to Webb AFB, Texas; or from Albuquerque to Oke City. Wherever you are, you're in Base Ops. It's not too lively, most of the guys are wishing it was 1700 hours so they could break it off and get a cool one at the club. Some poor guy is sweating out a flight plan at the plotting table trying to figure how he can get home in one jump. He's sweating but it isn't from the flight, it's warm in there and all the fans and coolers are in high blower. Boy! Check that old runway temperature. Get a look at the runway length again. Pay a visit to the front desk and ask the guy in charge of the joint for a look at the takeoff performance chart again. Maybe you're flying a T-Bird or an F-86, F-84, or what have you. Remember they all have different takeoff speeds and distances. Some are worse than others, but that doesn't make a bit of difference. They will all make it, providing they have enough excess thrust to accelerate to takeoff speed and there is enough runway distance.

You look at the charts and according to the numbers you can make it with a thousand feet to spare. You are cleared to take the runway and question yourself again. Did you figure right? Did you use the right column—the one without wind? You were in a hurry at the time and anxious to get airborne and enjoy the cool air from your refrigerator.

You're cleared to roll, 100 per cent rpm, exhaust gas temperature normal, oil pressure normal, fuel flow appears a little lower than it did earlier this morning—Natch! It's hot, boy! Release brakes — the old girl starts rolling — you pass the intersection of runways 3 and 210, you have noticed before climbing aboard that it was 3000 feet from the end of your runway. The airspeed indicator reads 90 and not moving up too fast, matter of fact it's awfully slow. You pass the 4000-foot marker, the indicator reads 120; you want to start pulling the nose up but you know that she isn't ready to make like a bird. You haven't even reached the stall speed yet; the 5000-foot marker flashes by and you start to wonder, "What's the matter with this old tub." At 5500 feet you ease back on the stick and the nose comes up to a respectable angle as you watch the airspeed indicator read 150. That's my speed and the old girl becomes airborne. She doesn't seem as perky as she was that morning, but there's a little life left in the old girl, and the 7000-foot marker flashes by. You make a mental note and raise the gear lever. The end of the runway flashes by and then sage brush and boon docks. After a while when you have settled down to the humdrum of your climb, you notice on your knee pad a number "6000+ feet." It was your note on runway distance and by gosh, it took it, but you did it right and that's why you cleared the sage brush.

Now let's look at a couple of illustrations that will show your problems for standard and not-so-standard days. Figure 1 shows how soft your life is when it's cool. With a 10,000-foot runway in front of you and lots of engine thrust over airplane drag, you get a solid .3G acceleration at the start. As your drag increases

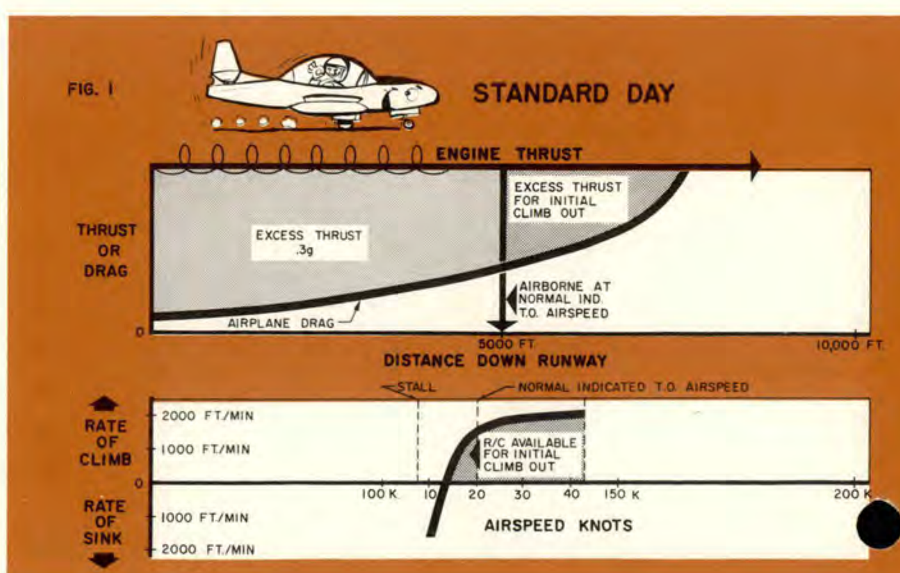
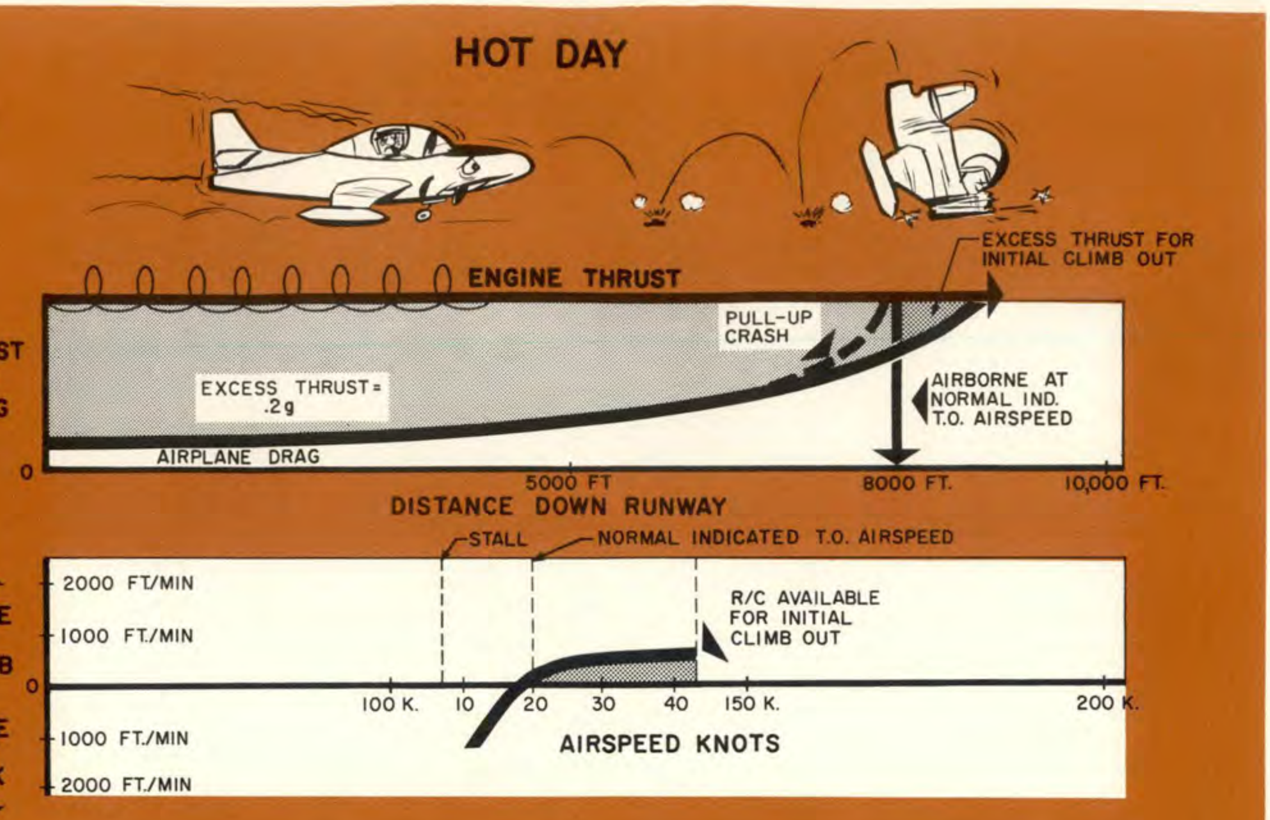


FIG. 2



down the runway to takeoff speed the excess thrust gets less. But notice, it's still real, real good and we have lots of excess for climbout. Now look at your rate of climb shown on the bottom of the chart. See how just above stall you get a good climb and anywhere up to your flap retract speed, things are great. If all days were like this, you'd never have any sweat.

Now, look at Figure 2 for a hot, hot day. The engine thrust is way down and your initial acceleration down the same 10,000-foot runway is only .2G. As the distance flashes by, your speed picks up slowly and by the time you're ready to haul her off you've used up 8000 feet of runway. The excess thrust for climb is a lot smaller now and everything is a heck of a lot stickier. Looking at your rate of climb shows you haven't got much! And you can lose it all by pulling her up the least bit too steep. So you hang on tight, let your speed increase slowly and don't pull the old nose up too much. Look at the difference in the size of those shaded areas of thrust left for climb on the first chart and the one for this hot day. You've hardly got any excess thrust left at all and *it* is only at a narrow speed range. So now that you are all experts and will never have a bit of trouble with hot day takeoffs, here are some helpful rules you can apply in everyday flying.

- Four to five per cent loss in thrust per 10°F. rise in ambient air temperature above sea level standard.
- Two to three per cent loss in thrust per 1000 feet elevation.
- The rated thrust of a jet engine is not your net thrust because of the installation loss.
- The static measured installed thrust is not all available to accelerate with.
- Excess thrust is what is available above what is being used at the moment to hold speed.
- Excess thrust is the thrust that takes the big loss due to high ambient air temperature.

Check these figures and you will see that they come close to your takeoff performance charts.

- For each 10°F. ambient air temperature above sea level standard of 60°F. increase your rolling distance by 10 per cent.
- For each 1000 feet elevation above sea level increase your rolling distance by 10 pér cent.
- For clearing obstacles, convert obstacle height in feet to per cent. Add this to the takeoff distance. For example: a 25-foot obstacle increases takeoff distance 25 per cent.

To wrap this all up let me sound off about one more thing. If you keep coming back on the stick before she's ready to fly, you're in real trouble. I know it sounds basic but records show that guys have used up 10,000 feet of runway and 500 feet of sage brush country without ever getting off. They felt that they should have become airborne someplace way back there and kept bringing the nose up higher and higher. Remember that old back-side of the power curve?

So get that takeoff distance down pat, and don't get all "shook" and try to haul her into the air until you KNOW "by the numbers" that she's ready to fly. ●

the Little Drifter

The Coast Guard Cutter COOK INLET, one of the OSVs stationed to help you, the pilot.

APPARENTLY Mr. Webster wasn't familiar with the United States Coast Guard when he defined the word "drifter." However, we can't hold that against him for it wasn't until recently that we realized that drifting is a genuine profession.

We picked up a bit of first hand information on this subject some weeks back when, upon invitation from the Coast Guard, we put to sea aboard the Cutter COOK INLET. In spite of the lack of adequate sea legs, we picked up a lot of information worth passing along. It's all important to you as a pilot, too.

This business of drifting is no gag. It's part of the system of keeping ocean station vessels in an assigned area of responsibility. Like sentry duty, a ship must man its post until properly relieved and that means 21 days "on" at a stretch.

Being in the neighborhood of 1000 miles from land, it is not possible to throw out a hook and just sit fast, nor would it be economically feasible to constantly cruise under power. The compromise then is to stop in the center of an assigned area, shut down and drift. Upon drifting to the edge of the area, fire up and chug back to the center.

The COOK INLET is a 311-foot Cutter, under the command of Commander G. F. Schumacher and manned by slightly over 100 highly trained officers and men. It is one of the 19 ocean station vessels currently assigned to Atlantic waters to man the four ocean stations which are Uncle Sam's responsibility. Day and night the COOK INLET and her sister ships provide radio beacon assistance for guiding our trans-oceanic aircraft and the friendly voices coming from the ocean, far below, always lend a bit of moral support.

Each cutter has a Combat Information Center (CIC) that is manned by radar personnel. They stand ready and willing to render aid, information or any special services that a pilot may require.

A Flight Data Card is filled in by the operator at each contact and maintained in an active file until the aircraft has passed over the next check point. Some of the information contained in this card system includes the type and serial number of the plane, radio frequency of contact, point of departure and destination, time of departure and ETA, present position, cruising speed, altitude and hours of fuel remaining.

Some of the services that a pilot may request are radar fixes, his ground-speed, true track, winds aloft in the area of the ocean surface vessel, surface weather or conditions at his destination. Such information is immediately supplied.

The OSVs are charged particularly with assisting aircraft in distress. Military or civilian, it makes no difference. Each is accorded all possible help.

We all tend to think, "It can't happen to me," and in some ways that's a good healthy attitude. Nevertheless, we do not leave our preflight planning to luck and by the same token shouldn't assume that we'll never need that helping hand. This then, is how to work with an ocean station vessel if the chips are ever down. If you know their procedures it will aid them in their mission of helping you help yourself.

The problem of assisting a distressed aircraft which finds it necessary to ditch in the vicinity of an OSV is three-fold:

- Effecting a rendezvous between the aircraft and the vessel.
- Assisting the aircraft in ditching.
- Rescuing survivors.

In addition to the foregoing, the problem may be further complicated by other little details such as darkness, poor visibility, lack of ceiling or adverse wind and sea conditions. Somehow it just isn't possible to fly your airplane alongside a vessel, drop it gently into the sea and then say, "Come and get me, please." It isn't possible, that is, unless many variables are fully understood and taken into consideration.

The situations encountered by an ocean station vessel may include one or all of the following:

- Establishing and maintaining communications with the distressed aircraft.
- Advising and alerting other interested agencies.
- Locating and positively identifying the distressed plane.
- Vectoring the aircraft to the surface vessel.
- Advising weather and sea conditions at the ship's position.
- Assisting the aircraft in making a low visibility approach.
- Providing sea lane markers.
- Providing suitable illumination for night ditching.
- Rescuing survivors.

If that sounds like quite a chore, you're right. And, it's only by close coordination between a pilot and the OSV that a successful ditching may be accomplished.

Ordinarily, if you, as an aircraft commander, contact an OSV to report a distress, you will have contacted your ground control station and advised them of the difficulty too. By all means do this, for you want every bit of aid going for you that it is possible to muster.

The ocean station vessel personnel will not assume that you've made shoreside contacts however, and will proceed with an established communications plan to spread the word, thus each contact enhances the rescue possibility.

Experience has shown that once communications are established between a distressed aircraft and an OSV, pilots will hang tight to the original contact frequency, regardless of whether it's an HF, UHF or VHF. One can't be blamed for feeling that way either but, if it's possible to establish contact with more than one radio, so much the better. Once contact is firm, the vessel will immediately describe the steps that are being taken to assist.

If there is any doubt about a distressed aircraft being able to reach the vessel, such as being low on fuel, the OSV will immediately head on an interception course at maximum speed. However, if time is not a critical factor, the ship will start to prepare a sea lane for ditching if conditions require it.

One big problem in this rescue business is the fact that aircraft commanders will, in many cases, be uncertain of their exact position, but will seldom declare themselves lost until they are completely so. Aircraft may be giving positions considerably in error while believing them to be more or less accurate. This, of course, is just asking for unnecessary trouble.

The OSV is prepared to locate a distressed aircraft by one or a combination of the following means:

Radar—provides accurate fix but is limited to an average range of 50-80 miles and has certain limitations because of weather.

Ship's Radio Beacon—The beacon is always readily available and provides homing facilities for aircraft out to about 150 miles, but is sometimes not readable in heavy atmospheric conditions. In case the plane's ADF is inoperative, the beacon is of no use.

Above, Air Plotter calculates aircraft heading as Air Controller, below, works the aircraft.

Below, bridge is kept supplied continuously with the position of the distressed aircraft.

IFF — Can be picked up at ranges greater than a radar target without it.

HF/DF Net—At the earliest possible moment, the shore DF net is alerted. Under favorable conditions, a fair to good fix can be obtained in this manner.

Aircraft's Navigational Data—The navigator may be able to read one LORAN rate (otherwise he might be lost!) and if this is the case the OSV will give the plane a course that will change his reading to that of the ship. When the LORAN readings of the plane and the ship are the same, the bearing of the plane is either the direction of the LORAN line or its reciprocal.

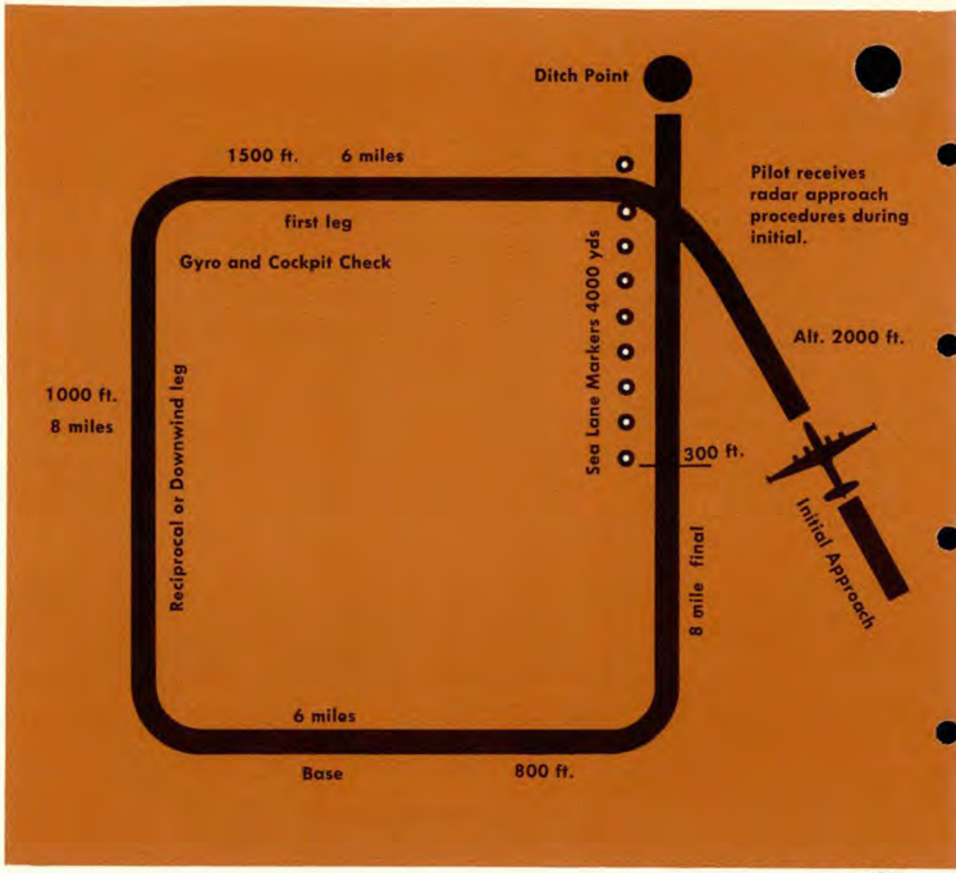
Weather Data—A complete report of weather at the plane's position, plus any unusual weather such as fronts that it has encountered, may be an aid in determining the plane's general position.

Visual Signals — During daylight, the ship will use black smoke, searchlight (blinking) and other means to facilitate sighting. Often the ship will cruise at high speed to create a wake that can be seen from altitude. At night, the OSV will use searchlights, star shells and pyrotechnics.

The preceding methods of location may be used singly or in combination and will vary with the situation. The important thing for the pilot is that he will be located and vectored to the ship, provided he does his part.

Once the general bearing of the aircraft from the ship is known, the pilot will be given magnetic vectors to bring him toward the OSV. Remember, the steers that are given will be magnetic, rather than true. Normally, the pilot will be informed on what basis the vector has been calculated, i.e., by radar, DF bearing, line of position or other.

Practice runs are made to insure that each man is alert and knows his job thoroughly.



Rectangular Traffic Patte

With positive contact established, an interchange of information must commence while the pilot is flying inbound. The OSV will give him the ship's position, the ceiling, visibility, type of weather, surface wind, altimeter setting and sea conditions. They, in turn, will want to know if the aircraft can maintain altitude, how many persons are on board (including crew) and remaining fuel in hours. If not already established, the OSV will need all the information relative to the nature of the emergency. They will suggest an alternate radio frequency in the event of a communications failure.

Naturally, a pilot will be most concerned with sea conditions if a ditching appears necessary. Prior to his arrival over the ship, he will be informed as follows:

Direction from which primary swells are coming, their height, speed and distance between crests. Direction from which the secondary swells are approaching, height, speed and distance between crests. The direction from which wind-driven chop is coming and height.

Inasmuch as it is virtually impossible for the average pilot to accurately determine the most feasible direction for a water landing, the OSV will suggest the landing direction if desired and then lay out a sea lane accordingly. Of course the pilot is in charge of his machine and if he disagrees with the suggestions, he can tool off and land any way he so desires. Frankly, we do not particularly recommend the latter course for rather obvious reasons.

Although there are several different approaches which may be used, depending on weather, day or night and other factors, the one that we have found to be the most interesting is known as the *Radar Assist Approach* which to all intent and purpose is a PPI run.

After the aircraft is positively identified, the pilot is vectored toward the ship and told to descend at his discretion so as to be at 2000 feet when over the vessel on initial approach to the pattern.

As he approaches, sea marker dye or float lights are laid out (depending on whether day or night) and the OSV positioned at right angles to the sea lane. Now the first stage is set. A runway has been clearly established.

When over the ship on initial approach, the pilot is vectored on a heading plus or minus 90 degrees to the ditching heading, depending on whether he desires a left or right hand pattern. As he moves out on this first leg of four miles, he is told to descend to 1500 feet.

When four miles out, he is given a 90-degree turn to a course which is the reciprocal to the ditch course and while on this heading is told to descend to 1000 feet. This reciprocal leg is eight miles in length and is in reality the downwind.

On completing this leg, the aircraft is turned another 90 degrees to a heading perpendicular to the ditch course and while on base descends to 800 feet. The base leg is so planned that it intercepts the final at just eight miles out.

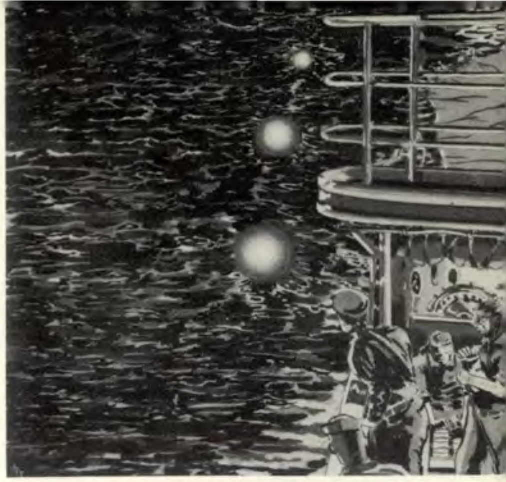
As the aircraft is turned onto the ditching heading, the pilot is told to descend, at his own discretion, 100 feet for each mile. In other words, at seven miles the altitude should be 700 feet. At six miles, 600 feet and so on. A constant flow of headings and ranges to touchdown is given. When one mile out he will be told to take over visually as shipboard radar is unreliable after that point.

If the aircraft is having difficulty maintaining altitude or control, it may be necessary to eliminate the usual pattern and bring the plane in on a straight-in approach. This is accomplished by bringing the plane onto final approach at eight to 10 miles from the ship. The initial approach is so planned as to intersect the final approach path at this point.

At night, mortar flares are provided over the ditch point, starting when the aircraft is five miles out on final and the vessel is illuminated also. With a lighted sea lane and adequate overhead illumination, the chances of a successful ditching are very high and many have been made without a hitch. You will note from the diagrams that the actual touchdown point is beyond the last open flame light. However, electric float lights are scheduled soon and that may change procedures a bit. By the time an aircraft has reached this point it should be almost on the water, speed reduced to near-stall and the pilot's depth perception will be considerably augmented by the overhead flares.

We reiterate that the pilot must remember that the final 100 feet of altitude, prior to touchdown, must be governed and judged by the driver himself. Radar will continue to monitor insofar as possible but it should be borne in mind that a ditching isn't quite the same as dropping one in on a runway. The height of swells will vary a bit from time to time and banging head-on into a swell is about on par with ramming the side of a ship. If one of those sneakers should rear up just at the flareout, it would be necessary to stretch the glide a bit, no matter how one accomplished it.

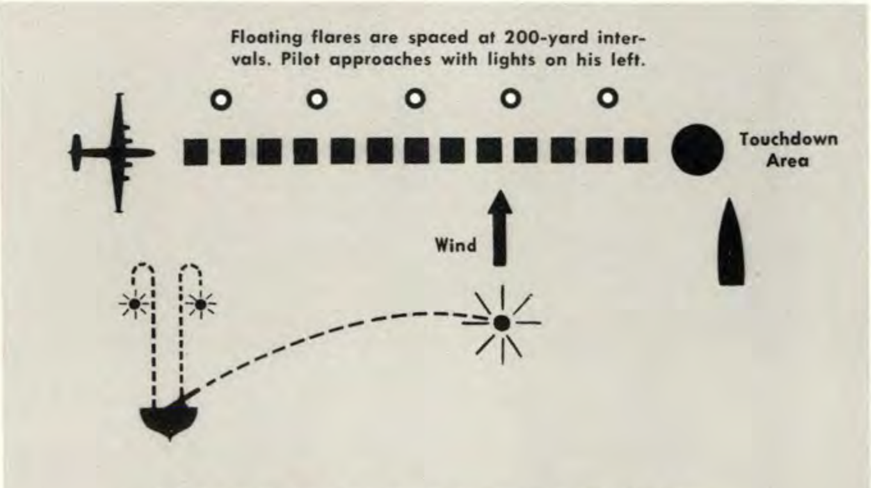
Normally, the OSV will lay out a



The Executive Officer is responsible for laying out emergency landing sea markers.

Emergency Straight-In Pattern.

Mortar shells illuminate the ditching area.



Flares are put up when aircraft is five miles out. This illumination assists in judging height and aids in touchdown. Starshells furnish an "artificial horizon" in the event of go-around.

ATLANTIC OCEAN STATIONS (Manned by U. S. Coast Guard)

OCEAN STATION	ASSIGNED RADIO FREQUENCIES (For Details of Use and/or Limitations See Eastern Area ComPlan)				
	Beacon	Route Comms.	Air/Surface Comms.	Ship/Shore Comms.	Emerg./Distress Comms.
(a) BRAVO 56°30'N 51°00'W	391 kc/s	2987 kc/s 5671.5 kc/s	3023.5 kc/s(V) 118.1* Mc/s(V)	Ckt A-3	500 kc/s (CW) 2182 kc/s (V) 8364 kc/s (CW) 121.5 Mc/s (V) 243 Mc/s (V)
(b) COCA 52°45'N 35°30'W	385 kc/s	2987 kc/s 5671.5 kc/s	3023.5 kc/s(V) 118.1* Mc/s(V)	Ckt A-3	500 kc/s (CW) 2182 kc/s (V) 8364 kc/s (CW) 121.5 Mc/s (V) 243 Mc/s (V)
(c) DELTA 44°00'N 41°00'W	350 kc/s	2987 kc/s 5671.5 kc/s	3023.5 kc/s(V) 118.1* Mc/s(V)	Ckt A-1	500 kc/s (CW) 2182 kc/s (V) 8364 kc/s (CW) 121.5 Mc/s (V) 243 Mc/s (V)
(d) ECHO 35°00'N 48°00'W	362 kc/s	5611.5 kc/s 13354.5 kc/s 8947.5 (Alt.) 6567 kc/s	3023.5 kc/s(V) 118.1* Mc/s(V) *To be replaced by 127.9 Mc/s on 1 January 1956	Ckt A-1	500 kc/s (CW) 2182 kc/s (V) 8364 kc/s (CW) 121.5 Mc/s (V) 243 Mc/s (V)

PACIFIC OCEAN STATION VESSELS (Manned by U. S. Coast Guard)

OCEAN STATION	ASSIGNED RADIO FREQUENCIES (For Details of Use and/or Limitations See Western Area ComPlan)				
	ND Beacon	Route Comms.	Air/Surface Comms.	Ship/Shore Comms.	Emerg./Distress Comms.
(a) NECTAR 30°00'N 140°00'W	385 kc/s		5165 kc/s(V) 121.5 Mc/s(V)	Ckt A-4	500 kc/s (CW) 8364 kc/s (CW) 121.5 Mc/s (V) 243 Mc/s (V)
(b) VICTOR 31°00'N 164°00'E	391 kc/s		5165 kc/s(V) 121.5 Mc/s(V)	Ckt A-5	500 kc/s (CW) 8364 kc/s (CW) 121.5 Mc/s (V) 243 Mc/s (V)

Additional Data Included In Supplementary Flight Information Document

sea lane of 2000 yards in length under VFR conditions, whether day or night. Under IFR the length is doubled. It has been found that the longer lane is necessary following an IFR letdown so that the pilot can get himself completely oriented after coming off the clocks.

Of course it would be possible to effect a ditching without a lighted lane but the advantages more than offset the extra time and trouble. The lights provide the pilot with a visual presentation of his heading and aid him in planning the approach. It provides the pilot with an aid to depth perception and is an invaluable help in shifting from instrument to visual flight. In addition, it provides the ship with a reference point for maintaining position.

While aboard the COOK INLET we watched the Combat Information Center in operation during many ditching drills and were extremely interested in the close teamwork and coordination required.

Whether it's a drill or the real thing the evaluator is the sparkplug behind the entire operation. This job is manned by the Executive Officer and he is responsible for laying the sea lane lights, positioning the ship, initiating illumination at the proper time and basically riding herd on the whole show.

The Air Control Officer is responsible for all instructions given to the aircraft and for all decisions relative to headings for the plane to steer. He talks with the aircraft direct. No middle man here.

Then there is the Air Plotter, the Air Search Radar Operator and the Surface Search Radar Operator. Together they all work as a team and it is only by a great deal of practice that efficiency is an assured fact.

We sincerely hope that you'll never have to call on one of these little drifting vessels to get you down. As a matter of fact, we hope the same for ourselves, but the fact remains that it's comforting to know that you don't always have to get to land to derive the benefits of GCA—or SCA (Sea Controlled Approach).

The next time you happen to spot any one of our ocean station vessels bouncing around in that vast expanse of sea, just give 'em a tip of the hat. It's a lonely life, and remember, they're out there for us. ●

Keep Current

NEWS AND VIEWS

The crabbing position of the aircraft appears unusual, however, it is characteristic of the cross-wind landing gear of the Stratofortress.

Unique Landing Gear—One of the most unusual features of the B-52 is the cross-wind landing gear installation. This unique landing gear makes it possible for the B-52 to utilize many more existing airfields than would be possible with a standard uni-directional gear. The new gear can be pre-positioned from the cockpit to permit the aircraft to take off or land in a crabbing attitude that cancels out the effect of any cross-wind.

All four of the dual-wheel main-gear units swivel to either side so that the pilot merely has to continue a correct heading for the runway, allowing for whatever cross-wind component exists at the time.

Pilots have already dubbed the device "the pilot's friend." Most of them feel that this is the answer to the cross-wind landing problem.

New Air Traffic Rules—New rules applicable in the Washington, D. C. air traffic zone have been established by the Civil Aeronautics Administration. Without exception, all aircraft must be equipped with two-way radios regardless of weather conditions. Another provision prohibits operations under VFR which assume that the pilot can see and be seen by other pilots, unless ground visibility is at least one mile. In addition, the new rules limit aircraft speeds in the zone to 180 mph, or to the minimum safe speed in cases where a higher speed is required for flight.

The rules are all designed to minimize potential collision hazards, without placing undue restrictions on light planes. The rules will remain in effect until November at which time the results will be evaluated.

The XF-84H—The Republic XF-84H experimental turboprop fighter recently completed its first flight. The 84H is said to be the fastest single-engine propeller-driven aircraft ever built. It can attain even higher speeds when fitted with an afterburner. The economy of fuel permits extensive aerial endurance at altitude and it has the capability of carrying extremely heavy armament loads. The aircraft has wings swept back at a 40-degree angle with air intake ducts in the wing roots.

The Republic XF-84H is a new experimental turbo-prop fighter designed to carry a heavy armament load, get maximum endurance performance.

Helicopter Simulator—A simulator to help train helicopter pilots quickly and safely has been developed by Bell Aircraft. As the pilot moves the controls and flies the helicopter simulator, scenery projected on a panoramic screen changes just as if he actually were in the air.

The equipment is so efficient and the effect so realistic that the student can collide with buildings on the ground and even get airsick. Fuselage vibration is built in, as are engine and rotor noises, rough air and actual control forces.

Winding Up the F

Lyle Monkton, Chief Test Pilot Republic Aviation Corporation.

BEFORE I GET into the meat of "Winding up the F" I would like to clear up a couple of points, real quick-like.

First, when I was assigned to the F-84F spin project I had not spun an aircraft in over four years. I'd merely been boring holes in the blue just like any of you. Oh, maybe I did some testing maneuvers that you may not get around to doing, but all in all I was performing controlled flight maneuvers in the F-84. I bring this up only to impress upon everybody that it doesn't take a special type of expert to spin the "F" and recover, with no sweat. If I can do it, you can do it too. The airplane is soundly designed and as such reacts to spins just like any other good, conventional fighter. If you've checked out in the airplane and possess the required number of arms, legs and heads, the "F" isn't going to give you fits if you happen to end up in a spin.

On the other hand, I'd like to get it straight that I don't advocate going out and spinning this bird just for laughs. This job was made to go fast and carry a load, for tactical purposes. It wasn't built to compete with PTs in a flying circus.

We had one reason for intentionally spinning the 84F and that was to check on the recovery response, just in case some day you find yourself in one of these crazy, earthbound gyrations. Maybe some guys like to spin aircraft just for fun, I don't know. What I do know is that I spin them for only one reason—to see how to stop the darn things.

To start out, let me go on record as saying the F-84F will spin and recover with no nasty little tricks attached. I've performed spins in all types of configurations and under the most extreme conditions. This bird recovers by just following the few rules I will outline here.

I performed all spins in the two-piece tail aircraft because we feel that it is more critical than the slab tail "F". I tested the aircraft clean with forward and aft CG, upright and inverted, and upright with gear, flaps and speed brakes out. I also performed spins with two 230-gallon pylon tanks both full and both empty and with two 450-gallon tanks, also full and empty. All of the spins were started from about 30,000, held for at least five turns and practically all were recovered by 20,000 feet.

Standard entry was with idle RPM, slowing down to about 150 knots with one to two degrees nose-up trim. Although most of my entries were from the level position I did some pulling 2G left and right turns. As soon as the buffet started I would feed in full rudder and back stick and away we'd go. Here a fella has a tendency to get a little "shook" because for the first turn or two the nose will oscillate, that is, come up, then go down. This was more predominant during spins with pylon tanks installed. Even an experienced pilot may feel as if he is in a flat spin, but after the first turn or two the nose does not come up as high and the aircraft settles into a more or less nice, sickly, normal spin.

The rate of altitude loss is about 1000 to 1200 feet per turn, which isn't bad at all.

For recovery just feed in opposite rudder and keep that stick full back and slightly with the spin until rotation stops. Don't expect immediate response to the rudder movement. Just bang it in and the airplane will do one to two turns before stopping; then neutralize the rudder. As the airplane starts to recover release the back pressure and fly her out, neat as a bald head.

If you just remember two important things you really will be on top of this spin racket in the 84F. First, you will recover faster if you feed in about one-third aileron, with the rotation during the spin and recovery. I ran plenty of tests with the ailerons every which way and found that this slight amount with the spin resulted in a faster recovery. Now there is a very good reason why I say slight amount and it leads right into the second important thing to remember, and it's real important.

All during the spin, get and keep that stick back in your gut. Keep it there throughout the spin and during your recovery until the aircraft starts to fly out. You will notice that when the rotation stops you will be in a somewhat vertical position and the airplane will start to fly out even with the stick back. So the stick must be eased forward from full back in the subsequent pullout. If you are

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premature in the forward stick movement the nose will drop through and you may end up on your back.

In the early part of the program when I was fiddling around with the amount of ailerons to use, I figured if a little is good, a lot is better. So, one bright smoggy day I gave 'er the full aileron treatment with the spin. Now I don't know if you have ever thought about it, but it's not easy to hold full aileron and at the same time keep full back stick. The reason is that your leg is usually occupying that spot in the cockpit, unless you have legs with 90-degree angles in them. As a result I had to ease forward on the stick in order to get full aileron. What happened? — flipped onto my back, into an inverted spin.

This was somewhat discouraging because I was supposed to be conducting an upright spin program at the time, but at least something was learned. That being, *it is all important to keep that stick full back until you are into the pullout stage of recovery*. You can do this and still get about one-third aileron; so that's why we recommend the small amount of aileron with the spin for recovery.

Don't kid yourself about aileron position in a spin. Ailerons against the spin won't slow the rotation. As a matter of fact the airplane spins faster, is more erratic and it just refuses to recover. Even a small amount of ailerons against *prevents* recovery. So, concentrate on getting the stick on the "with" side of neutral. With the ailerons held neutral the reactions to recovery aren't too bad; however, she winds up a lot more and as a result is slower to respond to recovery action. So, by all means, put in about one-third aileron with the spin.

I mentioned getting into the inverted spin phase of our testing somewhat prematurely but it presented no problems. Actually the inverted portions of the tests were the easiest part of the whole program. You really recover fast here because the "F" rudder seems more effective in an inverted spin than in an upright one.

Recovery is a cinch, just opposite rudder, and neutralize the stick. During the accidental inverted spins I got into, I experienced about 3 negative G. That's one way to identify an inverted spin. Your hands and feet have a tendency to pull away from the controls. Something else I might mention is that I know full well that even you old hands sometimes have trouble determining the direction of rotation during an inverted spin. The answer is simple, if the rotation doesn't stop with the left rudder full in for at least two full turns, throw in the right one and out you come.

Like I said, I performed the tests with various types of pylon stores. The recovery technique is the same with or without them. In general, the initial oscillations, rate of descent and loss of altitude are comparable to a clean airplane.

If you happen to be carrying outboard external stores, I recommend getting rid of them. In fact, if the bird doesn't respond to recovery efforts with inboard pylons installed, kick 'em off and try again.

Just for the record I made some one-turn spins in the landing configuration. The airplane was reluctant to stay in the spin when the ailerons were held with the spin. The rotation was very slow. In fact the only way I could get it to really spin was by using ailerons against the rotation. Recovery was normal, ailerons slightly with the spin, stick back and opposite rudder.

All in all, in reading back through other articles on other jet fighter types, it is interesting to note how closely our spin characteristics compare with those of other jet fighters. In the "F", it's just a case of

- Full back stick
- $\frac{1}{3}$ aileron with the spin
- Abruptly apply full opposite rudder.

When rotation stops, neutralize rudder and ailerons and when the pullout is well under way ease the stick forward slowly. ●

How Well Can You Remember?

JULY • AUGUST • SEPTEMBER

The answers are in the box below but don't peek. If you miss more than four, better dig out those back issues.

JULY

1. If your final landing approach is steeper than normal, your airspeed should be:
   a. Faster than normal.
   b. About the same.
   c. Slower than normal.

2. The first F-84F Cockpit Procedure Trainer is located at:
   a. Bergstrom AFB.
   b. Luke AFB.
   c. Turner AFB.

3. During a hurricane evacuation, condition four means:
   a. All flight crews take off immediately.
   b. All but essential flight crews take off.
   c. All personnel are alerted.

4. The Flight Director is commonly referred to as the:
   a. Attitude Indicator.
   b. ILAS Indicator.
   c. Zero Reader.

5. The AN/ARN-14 provides reception of between:
   a. 108 to 135.9 kilocycles.
   b. 136 to 236.5 megacycles.
   c. 108 to 135.9 megacycles.

AUGUST

6. Tests indicate that minimum speed for insuring barrier engagement in the F-86 with 120-gallon pylons installed is:
   a. 20 — 25 mph.
   b. 30 — 35 mph.
   c. 45 — 50 mph.

7. If you lock the left wheel on landing, the aircraft will yaw to the:
   a. Right.
   b. Left.

8. You can create a sonic boom in straight and level flight but it will not be heard on the ground:
   a. True.
   b. False.

9. Information relative to Flight Service boundaries, telephones and interphone facilities are available in the:
   a. Pilot's Handbook.
   b. Radio Facilities Chart.
   c. Back of WAC Charts.

10. The Two Parallel Row approach lighting system results in pilot confusion during low visibility approaches because:
   a. Fighter pilots cannot see the center row of lights under the nose of the aircraft.
   b. The approach lights cannot be differentiated from the runway lights.
   c. If a pilot can see only one row of lights he would not know if it was the right or left row.

SEPTEMBER

11. In operation Gyroscope, each aircraft airlifted_____ fully-equipped troopers.
   a. 75
   b. 90
   c. 110

12. A great improvement in analyzing engine instruments in the Boeing 707 is that:
   a. All engine instruments are on a consolidated, square panel.
   b. At normal readings all needles are parallel.
   c. When any engine instrument has a reading other than normal, a red light glows.

13. The Ocean Surface Vessels are not charged specifically with assisting aircraft in distress, but will provide aid whenever practicable.
   a. True
   b. False

14. In jet aircraft the greatest cause for long takeoff rolls due to hot weather is:
   a. Loss of engine thrust.
   b. Loss of lift.

15. To effect spin recovery in the F-84F, hold the ailerons:
   a. Neutral.
   b. With the spin.
   c. Against the spin.

ANSWERS

1. a	6. c	11. b
2. b	7. a	12. b
3. c	8. b	13. b
4. c	9. b	14. a
5. c	10. c	15. b

Play it Cool

Swimming is fun and a good way to cool off. But the big advantage in being able to make like a mermaid is in case you, as a pilot, suddenly have to take an unexpected plunge into the briny. While we're on the subject of unexpected plunges, don't miss "The Little Drifter" on page 20.

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