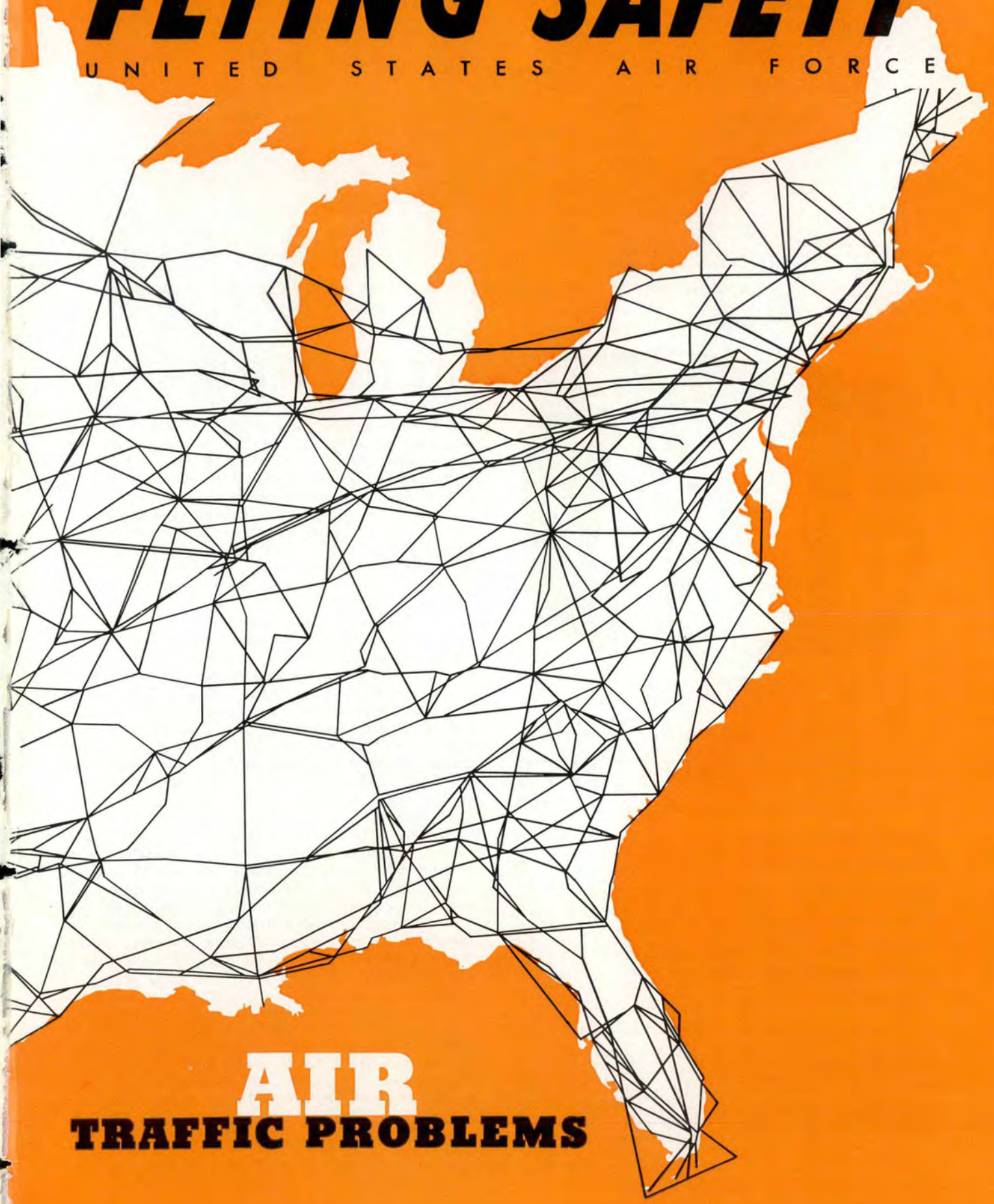
MAY 1959

FLYING SAFETY

UNITED STATES AIR FORCE



AIR TRAFFIC PROBLEMS

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VOLUME FIFTEEN • NUMBER FIVE • USAF PERIODICAL 62-1

"I had a hunch that was the way some investigators solved these accidents, Gridley!"

CONTENTS

FILE THIRTEEN

One major accident, one minor, and several incidents have occurred within the past five months as a result of canopy jettisoning by misuse of the "T" handle. In the two accidents damage was caused by the canopy striking the vertical stabilizer. Crewmembers must use extreme caution to prevent such mishaps particularly when passengers are aboard. The "T" handle area is not the proper place for storage of caps, manuals and other items. Further, special care must be observed when removing pins because streamers can be wrapped around the ejection handle . . . All base ops officers and FSOs should remind their pilots to check the latest altitude provisions and changes printed in the En Route High Altitude Flight Information Publication. These changes will probably come thick and fast as the new Federal Aviation Agency sinks its teeth into the many problems of air traffic control . . . Another C-45 ground-loop is on the books. Preliminary report indicates tailwheel locking pin not engaged, probably because of corrosion and/or rust. Pilots can check this in preflight and during taxi-out. Ask the crew chief to lubricate if pin is not working smoothly . . . Remember, it takes only three cigarettes in a relatively short period of time prior to takeoff to deteriorate night vision appreciably. That last smoke before start-engine time might make the difference . . . The FSO at George AFB reports five flameouts with successful airstarts in the F-104C and D aircraft. The flameouts all came just after the base received the new plane and were caused by maintenance people pulling the circuit breaker to the main fuel tank boost pump when external power was applied to the plane during ground maintenance. The mechanics then forgot to reset the circuit breaker and pilots weren't finding it during preflight. At high altitudes and power settings the engine flamed out . . . Aeronautical Chart and Information Center has just come through with a 24-page brochure in explanation of the new Flight Information Publications. It's entitled "FLIP and What It Is," and each FSO is getting a copy in his next Kit. Further copies will be available soon through normal distribution. On the last three pages are quizzes which will be valuable for use in squadron fly safe meetings.

CROSSFEED

LETTERS TO THE EDITOR

F-105 Jocks—Have Faith!

It was with great interest that I read in the March issue of "Fly Safe" the article, "Slam! Bam! Thank You, Sam!", written by "Chic" Henderson and Josef Miller of Coleman Engineering.

I was a bit surprised to read the boys' comments on the F-105 ejection system. They indicate that problems were encountered in clearing the vertical stabilizer. With the thought that some of the F-105 jocks might read this item and lose confidence in the system, I would like to point out that the article is in complete error on the matter of the F-105 "Thunderchief" system.

In its original report on the "Chief's" ejection system, Coleman had figured the tail clearance improperly by having the vertical tail in the wrong location. They concluded, therefore, that there would be a problem in clearing the vertical fin. This condition did not exist when Coleman used the proper figures for the tail location and so on. No doubt "Chic" and Josef wrote their article before the boys with the slip sticks had a chance to catch up with the obvious "boo boo."

The only attempt at tests above Mach 0.9 was one run at Mach 1.24, which was in excess of the design requirements for the canopy and seat ejection system. At this speed some minor problems were encountered and the corrections for the problems will be evaluated in tests this coming August.

To date, two actual ejections have been made from the F-105 and both were highly successful. The first was made at plus 500 knots and an altitude of 500 feet while the second was made at 210 knots and 10,000 feet. No better proof of a system could be asked.

Ed von Wolffersdorff
Design Safety Liaison Engineer
Republic Aviation Corporation
Directorate of Flight
Safety Research

Joe Miller at Coleman Engineering verifies Mr. Wolffersdorff's correction. So be easy. The seat does work according to specifications.

Gal Investigator

We have a good human interest story along the Flying Safety theme which I think you'll be very much interested in.

How would you like to have this investigator assigned to investigate your accident or incident? She's Miss Faye Wilson, 20 years old, about 125 pounds, 5′ 6″, blond with green eyes. Of course, she isn't really an accident investigator. She's in our Division Director's Flying Safety Office and I believe she's known as a Flying Safety technician—or clerk.

We think it is unusual for a good looking young girl to be so adept at advising pilots and investigators and FSOs on all phases of accident reporting and flying safety, but it is even more unusual and unique to see this doll climbing around in the aircraft salvage yard trying to get the right angle for a photograph, rushing into the RAPCON center to extract portions of tapes, taking statements of pilots involved in accidents right down on the line, climbing over parked aircraft in order to see damage incurred so she can help the investigator phrase it right, sitting on a table in a squadron briefing room early in the morning, with jets screaming outside on the line and monitoring a conference hookup recorder bigger than she is.

But best of all, as young and pretty as she is, we think it is most unusual for a gal to know what she's talking about, and this one does! We—around the base here—call her "Miss Flying Safety." So how about an article with lots of pictures, maybe by the same name?

A READER who wants to see a girl in a man's world get a pat on the back for doing an outstanding job.

Sounds good. What base did you say this is?

(This letter was received on plain paper; no return address and no signature.)

Coffee Call

The U. S. Air Force Cadet Wing has certain policies concerning fourth classmen. One deals with drinking coffee.

A fourth classman wishing to drink coffee must obtain permission to do so from a movie star. After he receives such permission, he may then drink coffee. I desire to drink coffee and would like to write Miss Julia Adams. I was reading your February issue and noticed her picture on the inside back cover. Would you please send me her mailing address so that I may write and request permission to drink my coffee? Thank you.

Niels D. Jensen, 113K
Cadet Basic, USAF
1st Sq, 1st Gp, AF Cadet Wing
USAF Academy, Colorado.

Coffee and *Miss Adams? Maybe Sanka or Decaf would be better for a fourth classman. But if you must, the address is: Universal Pictures Co., Universal City, California.*

T-Bird Tips

Although rated as a navigator, occasionally I cross the line and read your articles directed primarily to pilots. Such was the case when I read "Tips for T-Bird Drivers" in the February issue.

The paragraph (number 11, on page 28) which states, in part, "The number two needle of the RMI points to the correct heading that will make good a course to the Omni Station Tuned in, etc etc . . ." is technically incorrect. The needle provides a bearing from the aircraft to the station. Whenever it is desired to establish a course which coincides with the bearing, the heading must provide for drift correction. Obviously, heading and course coincide only under NO-DRIFT conditions.

Although a minor point which does not seriously detract from a most logical and interesting article, correction of the statement may be desirable.

Maj. Robert A. Myers, USAF
Hqs ACIC, (MATS) St. Louis.

Be a good navigator and cross the line anytime. Glad to hear from you.

Chart Holder

After reading Lt. Col. Samuel C. Burgess' letter in the February issue, we thought WADC or some of your readers might be interested in our solution to this chart-holder problem. The picture here of one of our Squadron SC-54 Pilot instrument panels shows the location of our locally manufactured "chart holder." It is mounted at about a 45-degree angle from the main panel and is well lighted by the installed glare shield red and/or white lights. This particular type holder was made to hold the complete Pacific and Far East Instrument Approach Book (bound type). It will also hold a single loose-leaf standard type plate (Low Altitude).

Enjoy reading your magazine very much. In the future, I would like to see another booklet covering procedures and techniques while flying on the airways during instrument conditions, similar to the one your office published a number of years ago.

Captain Joseph A. Buebe, USAF
76th Air Rescue Squadron
APO 953 San Francisco, Calif.

Air Traffic Control Problems

Are you helping to solve our air traffic control problems or have you become a part of the problem?

Major General Daniel C. Doubleday, USAF, Commander, AACS (MATS)

This article is directed to persons who use the air traffic control service furnished by the Airways and Air Communications Service, commonly referred to as AACS. I am talking to the base commander, the wing commander, the commander of a major command or numbered air force. In short, I am talking to anyone who is in a position to force his will upon the air traffic control facility or its personnel.

This is, in a sense, a complaint. More than that, it is an appeal for help. I'm talking straight talk and I'm pointing my finger at you who avail yourselves of the services which my people provide from the control towers, the RAPCONs and the GCA units. I ask you in all seriousness: Are you helping to solve our ATC problems, or have you become a part of the problem?

In September, 1958, I noted several instances where special requirements were placed upon our control towers. Although the requirements answered a particular need, they were in the nature of additional duties and often a deviation from standard practice. Prompted by the September requirements, which we found objectionable as detracting from controller efficiency, I asked my air traffic control staff to list for me those duties, procedures and practices, not directly in support of the ATC function, which user agencies had either ordered implemented or proposed for implementation in USAF traffic control facilities.

We discovered that we had received an amazing number of recommendations during the past year for changes to air traffic control procedures, practices and phraseologies, and that many of these recommendations had been implemented in spite of AACS objections. Our study revealed that the majority of the recommendations, if considered alone, could add to certain aspects of safety and efficiency of aircraft operation. However, there was a very noticeable trend toward concentrating more and more responsibility in ATC facilities for activities not clearly in support of the primary ATC function. Careful evaluation of each recommendation with respect to its direct applicability to air traffic control had caused us to object to the adoption of a great many of them, on the grounds that they were not air traffic control functions, although upon casual examination they appeared practicable and seemed to have considerable merit.

We have learned from sad experience to avoid the indiscriminate adoption of recommendations or the acceptance of additional activities, merely because they fill a particular need which you as a user feel is important to the accomplishment of your mission. The inevitable result of such adoption would be insidious weakening of the AACS capability to perform its own mission with a resultant net loss to you in safety and efficiency of aircraft operation.

Let's get down to cases. Just what kind of special duties or requirements am I talking about? Take a look at the following list picked at random from a much larger number of special requirements—often from one command or one base—placed upon us or strongly urged for implementation in USAF air traffic control facilities:

- Ten-second, gear-warning advisory before intersecting precision radar glidepath.
- Ten-second warning prior to GCA minimums.
- Withhold landing clearance until pilot replies affirmatively to query, "Is your gear down?"
- Special phraseology for gear-down check.
- Simultaneous transmission of precision radar approach instructions on VHF and UHF.
- Departure reminder to remove seat pins.
- Transmission of all current NOTAMs to arriving aircraft.
- Query all arriving tactical aircraft concerning status of armament.
- Control of aircraft using a nearby firing range.
- Insert phrase "Current weather . . ." before official weather transmission.
- Landing clearance include wind expressed in "clock system" and velocity, for example: "Cleared to land, wind one o'clock one five."
- Each controller identify himself by number.
- Phraseology at GCA minimums, "You are passing through GCA minimums. If you do not have runway in sight . . . (alternate instructions)."
- Special wind direction: "Wind twenty degrees from your right at ten knots."
- Permission for "Flying Supervisors" to use controller's microphone under certain conditions.
- Install a radar scope in the control tower for evaluation.
- Accommodate weather observers in the control tower.
- Accommodate representative of operating unit in control tower on scheduled basis.
- Install closed-circuit weather-briefing TV circuit in control tower.
- Install monitor of "Company Business" type of operational frequency in control towers.
- Install additional "hot line" between operational control rooms, base operations and air traffic control facilities.
- Issue crosswind component advisories.
- Advise jet fighters to disconnect or connect zero release lanyard prior to takeoff or landing.

Quite a list, isn't it? And each requirement was rather well justified when considered only in connection with the particular problem at which it was directed.

Taking the broader view, however, we have been forced to object to many of the recommendations. And by these objections we have gained a somewhat undeserved reputation as obstructionists or as being opposed to change. We have even been asked, facetiously perhaps but with a nonetheless serious note, if we are opposed to flying safety. We are vitally interested in flying safety. That is why I am bringing this to your attention.

How do these requirements affect the controller?

The simple fact is that when you add all these non-ATC functions to an already overburdened operator you are injecting a rather strong chance for a procedural lapse or judgment error.

We are asking more from our controllers than ever before. Precise, expeditious control of aircraft becomes more exacting with the passing of each day. We work under manpower ceilings which provide the minimum number of controllers to accomplish the air traffic control mission. Each controller function is assigned a numerical value which ultimately provides the yardsticks by which we man each shift and are authorized personnel. One hundred per cent of these functions must be devoted to the primary duty of aircraft control.

Some of the imposed requirements would take up to 30 per cent of this required 100 per cent. A tower operator, for example, cannot devote full attention to separating two aircraft when he is required to remember: "Is your gear down?" "Disconnect your zero release lanyard," "Wind twenty degrees from your right at ten knots," and accomplish all this over the babble of extraneous transmissions coming from "company business" receivers installed in the tower. Any one of these additional functions can be the straw that breaks the camel's back. By keeping the controller's efforts and attention directed solely toward his primary function—control of air traffic—we believe we are enhancing the cause of flying safety.

Now, let there be no misunderstanding of my position in this matter. We don't hold ourselves out as being perfect. We make our blunders, and we sometimes fall short of providing the caliber of ATC service that you deserve. We welcome your recommendations. In fact, we must have them. It is only through the reports, comments and recommendations from you—our customers—that we are able to keep abreast of the situation as well as we do. We adopt many of your recommendations without change. We use others as the basis for revising our concepts, practices and procedures.

We do not, however, welcome the practice on the part of some of the user agencies of taking advantage of the fact that they exercise operational control over the air traffic control facilities serving their base or their command. It is not uncommon practice for the using commander or his operations types to impose a requirement on air traffic control facilities over the objection of the local AACS commander. I object to this practice and consider it an improper exercise of the using commander's prerogative.

In the relationship between AACS and the user command, AACS normally plays the subservient and the command the dominant role. This is right and proper. In this relationship, however, subservience does not suggest a submissive behavior or an inferior position. Instead, it implies that within the limits prescribed by regulation, we will provide particular services to those requiring them.

In the execution of our mission to provide competent air traffic services to the Air Force at large, we are the sole appointed authority in these matters, subject only to Headquarters USAF direction or policy control. We alone can determine our capability to assume additional responsibility and its effect upon the air traffic services provided.

It is not that we deny the validity of your requirements. As pointed out earlier, a good case is made in justification of nearly every proposal submitted by a user agency. We insist, however, that we are the best judges as to whether or not that additional duty should be accomplished through the medium of an air traffic control facility. Often a base will place a requirement on a control tower simply because the tower offers a convenient and inexpensive means of getting the job done even though the job could in fact be done better by other means.

That, my friends, is my feeling in this matter.

Now, may I appeal to you—our customers—to help me insure that the best possible air traffic control service is provided equitably to all of our many customers? I believe that additional requirements or non-standard procedures should be satisfied or implemented only after review and concurrence by the AACS Area or Independent Region commander concerned.

I earnestly solicit your assistance in this approach toward greater safety through effective air traffic services. ▲

ABOUT THE AUTHOR

General Doubleday became Commander of AACS in January 1958 after serving as Deputy C.O. for six months. His service career started at the U.S. Military Academy where he was graduated in 1929. He took flying training at Brooks and Kelly and is today a Command Pilot. His early flying days were spent in fighters and he was active in the early application of the first command radio sets in these aircraft.

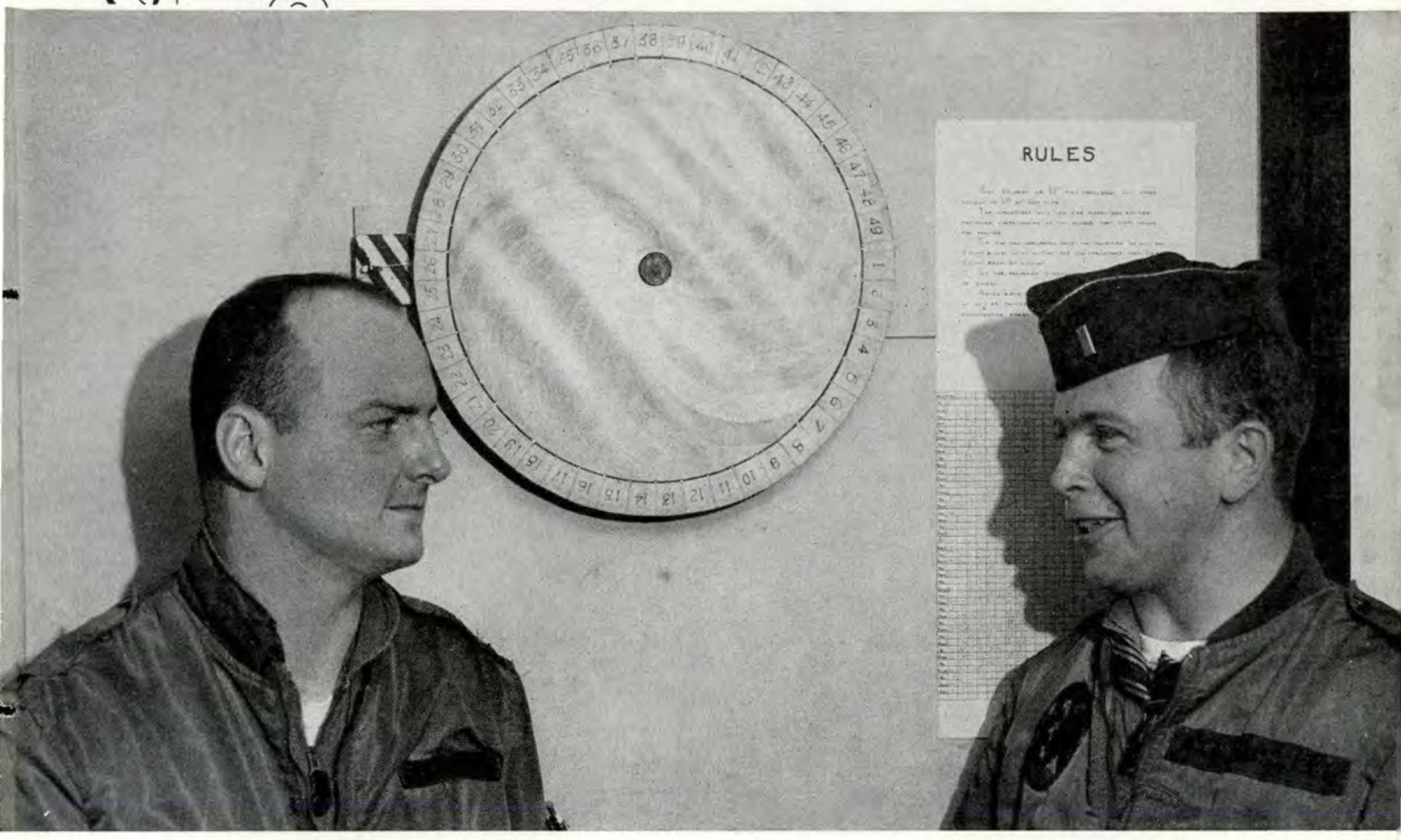
At Selfridge he built and equipped what was probably the first modern control tower on an Army air field. Later, at Wright Field, he helped in the early development of the automatic radio compass, the ILS, and airborne radar. During World War II he served in the U.K. and North Africa on a technical mission involving VHF; in AAF Headquarters, Washington; and later in the Far East Air Force.

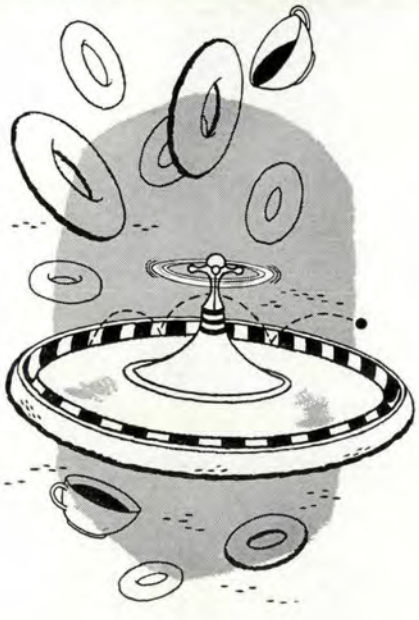
Since the War he has attended the National War College, served at Sandia Base, N.M., and commanded the Rome Air Development Center. He has spent much time in the research and development field of Air Force communications and electronic equipment.

General Doubleday holds the Distinguished Flying Cross and Legion of Merit for his research and test flying in communications, and the Order of the British Empire for his U. K. and North Africa wartime work.

The General is the son of Mrs. A. G. Doubleday of Johnstown, N. Y., and is married to the former Charlotte Donaldson of Mt. Clemens, Michigan.

Wheel of Fortune





Pilots of the 3640th Pilot Training Squadron at Laredo Air Force Base are taking plenty of chances these days. Oddly enough, the gambling in this outfit is expected to pay big dividends in flying safety.

As you can see in the illustration the chance taking is all done on the ground, not in the air where the stakes are too high. Two pilots of the squadron, Lieutenants Richard T. Snell and James L. Russell, Flying Safety Officers, "A" Flight, came back from Las Vegas one weekend with the idea for the gimmick pictured here. It occurred to them that the usually dull recitation of standard and emergency procedures could be turned into a game which would appeal to that bit of gambler born in all of us. So they came up with the wheel of fortune.

The wheel is marked with the numbers one to forty-nine around its outer rim. As is standard, there is a pointer which selects the lucky number, in this case the procedure to be recited. Anyone present in the flight briefing room, student or instructor, may be challenged by anyone else to demonstrate his knowledge of procedures at any time. Rules and a score sheet are posted next to the wheel. Once a person is challenged he is allowed one re-challenge.

A boner system is used with the students to determine the biggest goof-off in the class. If the student cannot answer a question he is charged with two boner points. He, in turn, can reduce his boner total by four points if he is able to successfully challenge an instructor. By strict accounting of turns of the wheel, it was found that over one hundred chances were taken in a fifteen-day period. This is learning on a voluntary basis.

The pilots of the 3640th say that this method of taking chances is educational and stimulating, and furthermore, a great way to settle who gets the tab for morning coffee and doughnuts. ▲

Colonel L. S. Lightner
Chief, Flight Division
Directorate of Operations, DCS/O

The Defense Rests . . .

The Air Force, on occasion, has been accused (however responsibly or irresponsibly) of various delinquencies in the area of air safety and air discipline. It was publicly accused on one occasion of failure to take the necessary leadership in tackling the Nation's air safety problems.

Now it is not feasible to comment on every statement made, and it isn't easy to keep from feeling that we are "Damned if we do and damned if we don't." However, the public has been found to be quite reasonable when it understands, because through understanding it recognizes that others have been reasonable too.

Yet, take a recent letter to the Secretary of the Air Force from a certain civic group. This group had heard of three near-misses between Air Force aircraft and airliners, and commented that, "We the people here in the USA expect these three pilots are already out of the service and have had a going-over they will always remember."

Or, other comments such as, "The Air Force is invading the airways reserved for commercial airlines" . . . "The Air Force should be strongly censured" . . . "The USAF has never assumed an adult responsibility for discipline in the use of the airspace . . ." Some of this talk is pretty difficult to comprehend.

One must assume that it originates from the uninformed. Therefore, the only course that can be taken is to explain, educate and inform people that the Air Force is dead serious in its efforts to provide for the highest degree of public safety and welfare, as well as to defend the country against an enemy. In so doing, actions speak louder than words.

The purpose of this article then is to permit a better evaluation of the situation. Let's look at it.

It is generally recognized that the overall degree of air safety that prevails at any given time is a combination of such things as:

- The type of aircraft being flown.
- How, when and where operations are conducted.
- The rules governing flight.
- The adequacy and efficiency of the air traffic control system, and
- The ability of all operating personnel to comply with the rules and procedures.

Now, what about the Air Force pilot? He undergoes a system of training, upgrading and continuous qualification which is as stringent and demanding as that imposed on any pilot in the air today. He is checked and double-checked constantly. He is "standardized" and examined at periodic and frequent intervals in all phases of flight, both in the air and on the ground. He rapidly becomes and must stay a true professional. If he can't "cut the mustard" he is removed by action of the Flying Evaluation or Flying Status Selection Board. And, he is constantly finding it tougher rather than easier.

During the years of 1957 and 1958, a total of 531 rated officers, most of whom were pilots, were suspended from flying status by the Flying Evaluation Board. For the same two-year period, the Central Flight Status Selection Board removed from flying status an additional 1515 rated officers, and most of these men were pilots. This does not include the 579 rated personnel who were permanently disqualified for physical reasons during the same period nor those who were temporarily removed from aircraft commander status for additional training.

In regard to disciplinary actions, since 1954 the Air Force has taken official corrective action against an average of 422 pilots a year for flight violations. Actions have ranged from administrative reprimand for minor infractions, to Article 15 (UCMJ), to removal from flying status or courts martial for major violations. If anyone wishes to compare standards with any other segment of aviation, military or civil, he is welcome to do so.

As for "leadership" in tackling the Nation's air safety problems, the Air Force has been highly active in the field of air safety for many years. Moreover, it has played a very significant and, in many respects, a dominant role in the development of improved safety of operations in our Nation's airspace.

The Air Force has for years conducted one of the largest, most comprehensive, singular and continuous flying safety programs in the world. While accident prevention is one of the predominant responsibilities of commanders at all echelons, the Secretary of the Air Force and the Chief of Staff are assisted in flying safety matters by The Inspector General through his Director of Flight Safety Research. The organization is composed of many specialists who work collectively with the common aim of attaining the highest possible degree of air safety. The DFSR also works closely with industry. A great deal of constructive effort has been directed to the problem of air safety from which *all* aviation has benefited.

The Air Force, faced over the past several years with operating advanced types of military aircraft in a lagging system of air traffic control and national rules of flight, has actively and forcefully pushed for those measures which it considered necessary for rapid improvement. The fact that the rules, techniques and machinery for adequate air safety were not in existence made it imperative for the Air Force to follow certain courses of action during the years prior to 1958.

First, *the Air Force has supported the Civil Areonautics Administration in its efforts to improve the air traffic control system. (The CAA is now the Federal Aviation Agency.)*

For instance, for the past several years the Air Force has reimbursed the FAA for procurement, construction, installation, maintenance and operation of air traffic control services and facilities. Funds ranging from 6.5 million to 8 million dollars annually have been allocated for this purpose. These services and facilities were negotiated as Air Force requirements, but inasmuch as the FAA could not provide for pure defense requirements or was limited by budget cuts, it was reimbursed accordingly.

Further, the Air Force has assisted the Federal Aviation Agency in its flight facility inspection and safety programs by the loan of B-57, T-33 and F-80 aircraft, and by expediting the procurement of C-131s for its use.

The Air Force has also supported annual FAA budget requests for increased funds to the Department of Commerce, the Bureau of the Budget and to the Congress, either in personal testimony or through submission of written testimony.

Second, *the Air Force has introduced and supported new air traffic control procedures and national rules of flight, to meet national requirements more effectively.*

For example, in 1954 it introduced a proposal to improve the air traffic control handling of high altitude jet aircraft, out of which grew the plan that was implemented in December, 1957. Included as a part of this plan was the procedure for standard altimeter setting at altitude which went into effect November, 1958.

Further, the USAF supported the concept of segregating certain flying activities which were not adaptable to control by the air traffic control system.

Since World War II it has continuously encouraged the expanded use of radar for air traffic control by such action as,

- Transferring radar equipment to the Federal Aviation Agency for this purpose;
- Establishing some 60 radar approach control facilities in the United States;
- Implementing a program involving joint use of Air Defense and air traffic control radars;
- Implementing various programs providing radar assistance to all aircraft, military and civil, such as inflight emergency and severe weather advisory service.

To reduce inflight identification by Air Defense interceptors, an extensive program known as the Aircraft Movement Identification Service (AMIS) was implemented many years ago to obtain flight data from the FAA on

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The Air Force has for years conducted one of the largest, most comprehensive, singular and continuous flying safety programs in the world.

.... the Air Force has desired even more stringent

friendly aircraft movements. This greatly reduced the requirement for association between interceptor and civil aircraft for purposes of identification. In this respect, Air Defense Command regulations absolutely prohibit practice intercepts on civil aircraft.

The Air Force has supported designation of High Density Air Traffic Control Zones to provide greater safety in the terminal areas and around air ports. In fact, the Air Force has desired even more severe restrictions than those advocated by civil aviation.

We have revised our own operating procedures wherever necessary and have adopted more stringent rules of flight governing Air Force operations than existed in National rules.

In addition to adhering to the existing Civil Air Regulations (CAR Par. 60), the Air Force, since 1956, has voluntarily applied more exacting flying regulations for its own pilots in regard to the following:

- Inflight visibility conditions under which visual flight is permitted.
- Proximity to clouds and ceiling minima.
- Flight over the top of clouds.
- External aircraft position and identification lights.
- High speed/high rate descents by jet aircraft on federal airways. These are prohibited.

We have placed Air Force funds and efforts into the development of improved techniques and equipment for control of traffic.

This was necessary for two reasons: first, the rapidly growing volume of high-performance military aircraft was out-stripping the capability which provided the necessary control support. Second, it was necessary to provide adequate control support for our aircraft operations on a world-wide basis.

The USAF actively supported and participated in the program of the Airways Modernization Board during its existence. Furthermore, with Executive approval, approximately 11 million dollars of Air Force appropriations were transferred to the AMB in the interests of national improvement.

It was realized that by this action the Air Force might suffer some delay, at least in the development stage, in having some of its requirements satisfied. However, the over-riding consideration here was the larger scale research and development effort that would be possible through a single concentrated national program, and the assurance that the solutions would be compatible and, moreover, adopted.

The Air Force has supported the establishment of a Federal Aviation Agency having a statutory responsibility for meeting military requirements, to replace the former Civil Aeronautics Administration which had only a collateral responsibility in this respect.

The U. S. Air Force World-Wide Flying Safety Officers Conference of 1956, recommended "the establishment of a single national agency to plan, direct and control a unified system designed to meet all the air traffic requirements of national defense, air commerce and private flying." Support of the concept of a Federal Aviation Agency became an official position of the Air Force long before legislation was introduced.

Many additional actions have been taken in the interest of safety during the past year, some of which were actually initiated in prior years but did not mature until 1958. It will be recalled that the former Administrator announced that the air traffic control system was able to handle only about 17,000 flights per day as traffic was distributed. He estimated that there were over 200,000 flights per day of all types in the United States. The current system capacity has been estimated at around 23,000 flights per day.

While recognizing the limitations of the air traffic control system, it is equally necessary to appreciate that action by one agency or department cannot by itself create air safety. While the Air Force can do much toward this end, it actually takes cooperation and joint effort on the part of all aircraft operators, all airspace users and all agencies having responsibilities in this area. This is evident in the following paragraphs describing the actions taken. Some were initiated solely within the Air Force; some were sponsored jointly with other users, and others constitute an across-the-board implementation by all the agencies involved.

Voluntary Restrictions. The Air Force and the Navy adopted certain voluntary restrictions on jet operations which were beyond those imposed by national rules of the air. They were adopted to reduce the collision potential between aircraft by reducing exposure. They are:

- All jet aircraft engaged in training or itinerant flights are prohibited from landing or taking off from civil airports, except for those aircraft of units occupying facilities at a civil airport under a joint-use agreement, or except in an emergency.
- Non-tactical jet aircraft will not take off or land VFR, except for those flights to be conducted above 20,000 feet or off the Federal airways, or on flights specifically approved by the Civil Aeronautics Administration (now, of course, the FAA).

To date, there have been no significant revisions in the foregoing restrictions, even though in respect to jet aircraft on civil airports, there has been considerable pressure by certain civic interests to make exception to those restrictions.

★ ★ ★

The Air Force pilot undergoes a system of training as stringent and demanding as that imposed on any pilot in the air today.

rules than those advocated by civil aviation.

Calendar Year	Military Number of Millions	Military Per Cent of Total	Air Carrier Number of Millions	Air Carrier Per Cent of Total	General Aviation Number of Millions	General Aviation Per Cent of Total
1957	3.03	38	4.52	56	.50	6
1958	3.73	41	4.73	53	.55	6

FIGURE ONE

Maximum number of operations under control of Air Traffic Control. The Department of Defense, on behalf of the Air Force and the other Services, stated its desire to increase the number of flights operating under control of Air Traffic Control. It also stated that it was prepared to require maximum possible Instrument Flight Rule flying by both conventional and jet aircraft commensurate with mission performance. The Department of Defense further suggested, in the interest of the highest degree of order and management, and in order to keep participation within the bounds of system capacity, that the FAA Administrator coordinate the separate-user programs (both civil and military) for increased IFR operations.

One outcome was the joint agreement by Military-FAA-Airline representatives to require all aircraft flying via the Federal airways between 10,000 feet and 20,000 feet, to fly IFR flight plans and to operate at altitudes assigned by Air Traffic Control. This requirement served to reduce the amount of mixed IFR-VFR flying along airways. However, it adversely affected the operation of unpressurized, conventional aircraft in the western United States where the minimum safe altitude is over 10,000 feet in mountainous terrain.

The Air Force did, in fact, increase its IFR operations during the calendar year 1958 (especially during the last half of the year), and placed as much of its traffic under control of ATC as the system could handle, as far as delays to Air Force mission accomplishment were concerned. The annual traffic counts for 1957 and 1958, released by the Federal Aviation Agency, show the comparative percentages of total IFR traffic handled by the FAA for the two periods. (Figure One.)

The FAA handled almost a million more IFR operations in 1958 than in 1957, and the military accounted for approximately 740,000, or 75 per cent of the increase. The Air Force is the largest military user and therefore accountable for the increase in operations.

This increase took place despite two outstanding deficiencies in the air traffic control system, as far as the Air Force is concerned. These are: inadequate and highly complex IFR departure procedures serving USAF bases, and the limited IFR capacity of the system in the high altitudes where a large portion of Air Force aircraft must operate.

The Air Force Inspector General's Office has indicated that increased IFR flying has created many highly undesirable and unnecessarily hazardous situations for many military aircraft, particularly jets. Some of the problems cited are:

- Excessively complicated departure procedures.
- Excessive requirements for communications reporting during critical phases of flight.
- Excessive re-routing after being airborne.
- Assignment of altitudes much lower than planned.
- Excessive holding.

The Air Force is initiating a nation-wide survey of its operations to pin-point and high-light these problems so that timely corrective action may be taken.

Improved management of the airspace to accommodate certain military flying activities which are not adaptable to control by the present air traffic control system.

In 1957, the Air Force sought to establish caution areas, through the Air Coordinating Committee machinery, where it could conduct certain types of training activities. These activities by type or volume did not lend themselves to control by ATC. Such military activities as these were involved:

- Basic flying or transition training.
- Combat maneuver and tactics training.
- Aerobatic maneuver training.
- Volume Instrument training.
- Air Refueling Operations.

The Las Vegas mid-air collision lent impetus and urgency to the matter, and the FAA, acting jointly with the Air Force and Navy, visited all training bases of both services to set up certain safety measures which would reduce collision potential, pending development of longer range plans.

Following this action, a new concept was jointly developed to provide a greater degree of safety in airspace use. This concept was one of segregating certain training activities from other operations, both civil and military, either by procedural means or by designating joint-use reserved airspace.

THE DEFENSE RESTS . . .

The initial phase in the establishment of procedural safety measures was handled rapidly. However, enforcement of the joint-use reserved-area concept has lagged because of factors beyond our control.

SAC-TAC Air Refueling Areas. In cooperation with the FAA, the Strategic and Tactical Air Commands have been changing their air refueling areas to reduce the potential for collision which exists during aerial refueling operations.

Century Series Interceptor Climb Corridors. During 1958, climb-corridor restricted areas for use by ADC Century Series interceptors, such as the F-102 and the '104, were developed in coordination with the FAA. Ten corridors have been designated and an additional thirty-one are now in various stages of planning by FAA. These corridors will provide added safety to air traffic around the critical air base areas by providing the ATC facility with a means of controlling all traffic within the corridor while maintaining a capability to launch interceptors on minimum notice.

Use of ADC Radars to Provide Radar Monitoring of Civil Turbojet Aircraft. The need arose for a practical alternative to highly restrictive, complex and uneconomical, positive-control airways at high altitudes. To meet this need, the Air Force volunteered the use of ADC's long-range radar to assist in providing increased air safety for civil jet transports. This program involves the use of selected long-range ADC radar facilities by FAA controllers to provide radar-separation service to civil jet air carrier operations above 24,000 feet in the continental control area. Expansion of this program will continue as jet air carrier services are increased.

VFR Radar Traffic Advisory Service. During the year 1958, the Air Force and FAA, to improve safety in terminal areas, expanded their control procedures to provide radar traffic advisory service to all pilots, whether operating VFR or IFR.

At present there are 70 Air Force terminal facilities providing VFR radar traffic advisory service, including 28 joint Air Force-FAA-operated facilities. Also, 44 FAA-operated civil terminal facilities are providing this service.

Quadrantal Separation of VFR Traffic from IFR Traffic During Level Cruise Flight. The Air Force strongly supported the Civil Aeronautics Board's proposed rule to provide safer separation of VFR from IFR traffic while in the level cruise phase of flight. In 1958 the Board adopted the quadrantal altitude separation of 500 feet in the altitudes from 3000 to 29,000 feet, and 1000 feet for all altitudes above 29,000.

Standard Altimeter Settings Above 24,000 Feet. Action was initiated in 1955 by the Air Force to improve altimetry use for safer vertical separation. This proposal was adopted by the Civil Aeronautics Board in November, 1958. The rule calls for using a 29.92 standard setting for all flights operating above 24,000 feet.

Aircraft Conspicuity Marking Program. This program was initiated in May 1958, with the objective of marking aircraft with a day-fluorescent paint in order to improve visual detection in flight. Approximately 13,000 USAF aircraft are programmed to be painted. So far, approximately 3000 aircraft have been marked. The effectiveness of this conspicuity painting has been thoroughly substantiated.

Near-Collision Reporting and Investigation Program. This program was initiated by the Air Force in 1958, complementing one set up by the Civil Aeronautics Board. The purpose was to identify areas of high collision potential so that appropriate corrective action could be taken. However, the Air Force program goes further, in that a follow-up, detailed investigation may be required and, where warranted, a collateral investigation conducted to determine what disciplinary action should be taken.

Assignment of FAA Resident Inspectors to U. S. Air Force Bases. In conjunction with the FAA, the Air Force has developed a program whereby FAA resident inspectors are assigned to certain air bases. This is designed to provide improved air traffic control service through closer supervision of training, facility operation and maintenance standards. In addition, it permits the ATC facility to expand its jurisdiction to include nearby, low-density civil airports. It also increases the area in which control service can be provided and resolves many coordination problems associated with bases located nearby. To date, 30 resident inspectors have been assigned under this program.

★ ★ ★

. . . the Air Force cannot by itself create air safety.

★ ★ ★

If space permitted, a longer and more detailed article could be written about the many actions taken by the Air Force during the past several years to improve air safety. To mention a few, there are the special studies by personnel of the Directorate of Flight Safety Research . . . the emphasis placed on air safety by commanders at all echelons, from the Chief of Staff on down . . . the fostering of more automatic methods for coping with advanced aircraft operations and increased traffic requirements . . . and the early work on anti-collision devices, improved communications, radar advisory service, altimetry, all-weather landing systems, and automatic traffic scheduling equipment.

The Air Force, like many other users, is affected by past inadequacies and has pledged its support to the Federal Aviation Agency. It will continue to work for increased air safety and an ATC system capable of contributing effectively to the accomplishment of its National Defense Mission. ▲

SCOPE SCORE

Major Ross A. Beckham, Air Traffic Control, Operations & Facilities Branch, Directorate of Flight Safety Research

For years many pilots in the Air Force have gratefully accepted Ground Controlled Approach with little reservation, and with high praise for the skill of the operators who guided them down through some pretty low ceilings. But most of us know all has not been sweetness and light between the GCA operator and the pilot. And unfortunately, there has been an occasional absence of cooperation between some of the principals involved. As a result, many accidents are on the books. Others are caused by simple error on the part of the ground and airborne personnel. Technical limitations of the equipment and disregard of established procedure come in for their share of the blame also. But perhaps it's best to take a look at the record and pin down the cause factors of GCA-involved accidents.

For the calendar year 1958 there were 35 GCA-involved accidents within the Air Force. Of this number, 32 were serious enough to be classified as major. Sixty per cent of these accidents occurred in single-engine jet aircraft. The rest were spread around in the bomber and cargo types, both conventional and jet. The factors and conditions affecting these 35 mishaps have been segregated as follows:

- Descent below established GCA minimums during IFR conditions: 10 major accidents.
- Technical limitations of GCA equipment: three major accidents.
- Inadequate control procedures and/or GCA personnel error: seven major accidents.
- Gear-up landings following GCA approaches: three major accidents and one minor.
- Failure of aircrew to properly monitor the position of the aircraft during VFR conditions: four major accidents and two minor ones.
- Inability or failure of pilots to follow GCA instructions: 11 major accidents.

As you can see, some of the accidents involved two or more factors and the above figures do not total 35. For all but the technical limitation category, the operator and supervisor on the ground or airborne can certainly apply corrective measures. As usual, training seems to be the key to the solution. The trouble areas are clearly shown. The rest is up to you. ▲

MAJOR ACCIDENTS

F-84	2
F-86	3
F-89	1
F-100	4
F-102	4
B-47	4
B-57	1
B-52	1
B-66	1
T-33	5
KC/C-97	3
B-25	1
C-119	1
C-47	1
Total:	32

MINOR ACCIDENTS

F-86	1
B-66	1
T-33	1
Total:	3

Ejection!

Last December, while flying an F-100D, I experienced an engine explosion and subsequent failure. For this flight I was wearing a type MB-2 flying suit, a type P-4A helmet, a type LPU-2/P life preserver, leather flying gloves and low quarter, two-eye lace shoes. To my parachute I had attached a seat-pack MOD: MD-1 survival kit which contained a one-man PK-2 life raft. Although the explosion occurred at an altitude of 26,000 feet, I did not immediately abandon the aircraft. I spent considerable time attempting to determine the nature of the difficulty and also in trying to restart the engine which I had shut down because of excessive temperatures.

In anticipation of a bailout, the first thing I did was to unhook my MD-1 survival kit. This was done without unfastening my lap belt. I did this to rid myself of the extra weight and, because of a thought that on landing, I might fold my legs under the pack, with disastrous results. Although my mission was planned to be as much as fifty miles out over the ocean, I was over land at the time and had no intention of going out over the water.

When the altimeter read 9000 feet, I began serious preparation for bailout. I pulled down and locked my helmet visor. I zipped up the thigh pockets on my flying suit, and disconnected my G-suit hose and oxygen hose. At that time—as an afterthought—I hooked my "zero time" harness hook to my parachute D-ring. I pulled my bailout bottle (although apparently I didn't pull hard enough because it didn't work), and noticed my altitude passing through 8000 feet. My indicated airspeed was 210 knots.

I placed my feet in the stirrups and leaned as far forward as possible. I grasped both seat-ejection hand grips, and pulled. The canopy blasted off and there was an enormous rush of air in the cockpit. Papers started blowing from the open shin pockets of my flying suit, and pages of the Form One were swirling around in the cockpit. I straightened up in the seat and put my head against the headrest.

The blast of air seemed to be trying to whip my head from side to side but there was no tendency for my helmet to come off. I pulled my elbows tight against my sides, reached down with my fingers and squeezed both ejection triggers simultaneously.

The ejection seat blasted me out of the cockpit with a force that is hard to describe. There was nothing painful involved, but I felt as though I were suddenly about two feet tall. The air now whipped at me all over as it had my head and chest before I ejected. I started a slow, forward somersault and I sensed my automatic lap belt release.

After my first half somersault, I gained speed and tumbled over and over. I still held the seat grips and I'm sure my eyes were closed. I don't know why I closed my eyes unless it was an involuntary reaction from the blast of air. I cannot explain why I held the seat grips. Possibly I forgot, or maybe there was a subconscious reluctance to release the last tangible bit of the aircraft. Perhaps though, without realizing why, I refused to release my grip until I slowed down to where I could control my arms. At any rate, there was no tendency for the seat to separate from me and I decelerated rapidly. I could tell each time I came face into the wind, and after about four somersaults I pushed the seat away.

Almost instantly after the seat separated, the parachute opened. The opening shock was impressive but not severe. I was swinging back and forth and noticed that I was in an area of considerable debris. Papers and maps were floating around and I saw, about 200 feet away, that my survival kit was about level with me and floating along in an upright position. As I watched, the survival kit drifted slowly away and upward.

I looked down at the ground and saw that I had several thousand feet to descend, so I looked back for the survival kit. It was now well above me and as I looked up I saw the edge of the parachute canopy. It occurred to me that I should look the canopy over, and I leaned back for a better view. As I leaned back, I started swinging violently from side to side and I immediately bent forward and looked down to see if this was an illusion. I discovered that I was swinging about 45 degrees to each side of vertical and I pulled the risers and quickly stopped the swinging.

I looked at the ground and tried to determine where I was going to land. I was still quite high but aware that I was drifting rapidly. At this point the thought came to me that there was something unusual about the way my canopy looked—in the fleeting glance that I had taken. I tried again to look up and see the canopy and as I leaned back, I started a violent swinging from side to side. I leaned forward quickly, looked down and stopped the oscillation. I decided to leave well enough alone.

I wondered where my aircraft was and started looking for it in the vicinity of where I had "intended" for it to crash. I saw the streak of fire it was creating on the ground about five miles away. It had turned at least 180 degrees and was pointed generally in my direction on impact.

The wind had now drifted me about five miles and I was approaching the ground. I got set for what I thought was going to be an uneventful landing. I bent my knees and had my feet straight ahead and about a foot apart when the ground started to rush at me with fantastic speed. I struck the ground with a terrific crash and my head and face smashed into the ground with a blinding force. I am certain my helmet saved my skull from being crushed.

My parachute immediately started to drag me along the ground. My first thought was that I must be seriously injured and that I had to collapse my parachute. I reached for the quick release on the left strap and my hand was immediately dragged away. I fought with the chute until I finally got the cover removed from the quick release. Each time that I felt the release buttons on the quick release, my hand would be dragged away by the ground. I was being dragged across what appeared to have once been a grain field. It was hard, black gumbo land covered with weed stalks and grass.

I became discouraged in trying to trip the tiny quick release and decided to try spilling the canopy by pulling the risers and the nylon cords. Each time I made a little headway, a gust of wind would pull the cords through my hands. I went back to the quick release and tried again but the thing was so small that I was never able to release the catches.

My strength was beginning to ebb and I was making no headway, so I decided to go for my red handled switchblade knife and attempt to pull back up and cut the risers. I was worried by the thought of stabbing myself as I was being yanked along the ground. My parachute was flying off the ground about half the time, and on two occasions it almost lifted me clear.

As I was reaching for my knife, I saw that I was approaching a fence and I decided to wait and try to spill my parachute over the fence. The parachute was flying as it approached the fence and I was barely able to pull it down and snag the bottom foot of the canopy on the top wire. The canopy quickly spilled over the fence and I came to a stop.

I removed the parachute and life preserver harness and took off my helmet and oxygen mask. About three-fourths of the visor was broken away from the helmet, and the bar that had held the visor was bent. There were marks of a blow on the left front side of the helmet. I had lost my right shoe while being dragged and my right foot was bothering me. In all, I had been dragged about a quarter of a mile. I tried to get up but could not, so I lay where I was until some local people came, helped me up and took me away. ▲

This factual narrative is written by an experienced flying officer. At the time it was being considered for publication, the F-100 project officer in the Directorate of Flight Safety Research pointed out some errors of procedure.

The story is presented to the reader without embellishment so that he may decide for himself the rights and wrongs of the steps taken by this pilot. It should provide for interesting discussion in ready rooms throughout the Air Force.

Your letters with comments, pro and con, will be welcome. In this way we can pass your ideas to other readers through the medium of the Crossfeed column, a regular feature of this magazine.

—The Editor—

WELL ☆ DONE

First Lieutenant

WILFORD E. DEMING

49th Ftr. Bomb. Wg., Ramstein AB, Germany

After checking the 781, preflighting and climbing aboard, Lt. Deming cranked up and taxied out for another practice mission in his F-100D. Shortly after takeoff, the heat and vent overheat light came on. The cockpit became excessively hot and smoke appeared. Deming climbed through the overcast, reduced power and tried to control the cockpit temperature. The control was inoperative and no ram air cooling available.

Then the AC generator failed and the oil pressure began to fluctuate between 20 and 40 psi. Deming declared an emergency and asked the tower for GCI-GCA aid for descent and landing. While descending, the No. 1 flight control system failed. Although the standby inverter was on and the No. 2 flight control system appeared normal, the ram air turbine was actuated because of the probability of related hydraulic fluid and instrument power loss.

On the GCA final approach, intense heat and smoke filled the cockpit and the continuing electrical failure caused illumination of practically all warning lights. In spite of the overwhelming difficulties confronting him, Lieutenant Deming elected to remain with the aircraft. With a higher than normal airspeed on final to compensate for the excess of fuel aboard, he completed his landing successfully, saving a valuable first-line aircraft. There was no further damage to the F-100D.

The post-flight inspection showed that the secondary heat exchanger had failed in an area that quickly affected both electrical and hydraulic lines. For cool thinking, sound judgment and the save of costly Air Force equipment, Well Done, Lieutenant Deming!

Captain

ROBERT W. GRISWOLD

48th Air Rescue Sq., Eglin AFB, Florida

On May 15, 1958, Captain Griswold and his crew took off from Kindley Air Force Base, Bermuda, in their SA-16 on a seven-hour standby rescue flight. Their mission was precautionary coverage and navigation assistance for the return flight of Vice President Nixon from South America. The SA-16 carried maximum fuel to permit the widest possible search in the event their "ward" was forced to ditch.

The SA-16 reached its planned position at the designated time and proceeded into orbit 300 miles southwest of Bermuda. The mission proceeded uneventfully and radio contact was made with the target aircraft. "Only a few hours and we'll be back to Bermuda and home," someone said over the interphone. Then the trouble began. No. 2 engine lost oil pressure and power, and finally had to be feathered. Because of the maximum fuel load, the SA-16 could not maintain its altitude on single engine. The altimeter showed an alarming rate of descent. Captain Griswold decided to jettison the external fuel tanks in an effort to lighten the load. As the tanks dropped away and the aircraft continued losing altitude, he realized there was only one alternative left—dump internal fuel.

Despite the fire hazard involved, the skipper knew it was either dump or risk the dangers of ditching on the rough Atlantic Ocean. The navigator calculated fuel requirements; the excess was drained away. The SA-16 leveled at 3500 feet and three weary hours later landed at Kindley—a save of a $500,000 aircraft and perhaps the lives of its crewmembers. Well Done, Captain Griswold and crew!

Major
FAIN H. POOL

Captain
JACK HAMMER

Captain
BYRON D. MILLER

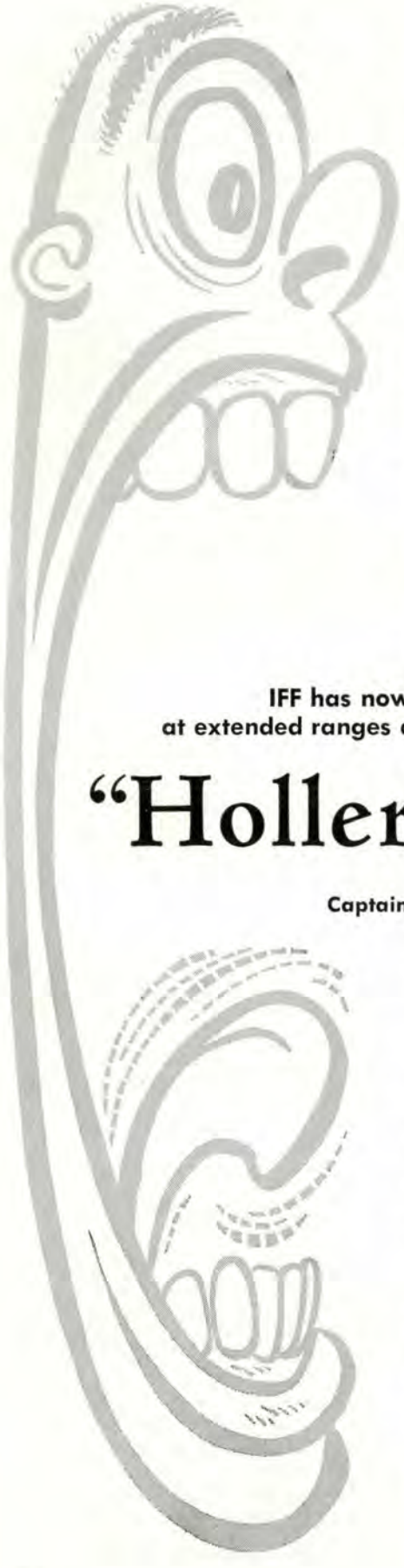
Captain
DAVID L. GRUNDT

4927th Test Squadron, Kirtland AFB, New Mexico

In April 1958, Captain Jack Hammer, pilot of an RB-36, took off from Eniwetok Island on a routine test mission. Major Fain H. Pool, Instructor Pilot, flew right seat. Captains Byron D. Miller and David L. Grundt operated the engineer's panel. At unstick speed during takeoff, the left wing dropped, throwing the aircraft into a 35-degree bank toward a group of buildings. Both pilots immediately placed the ailerons full right against the stops and cranked in 10 degrees of right rudder. With great effort, they regained a level attitude. A gentle right climbing turn was established by skidding the aircraft with rudder and decreasing power on No. 3 and No. 4 jet engines. This achieved directional control and kept the aircraft climbing.

During this time the crew tried to diagnose the difficulty. They decided to transfer fuel from the left to the right wing and to adjust fuel controls so that all engines would feed from the left wing. At 10,000 feet, high power settings reduced fuel rapidly. When a 20,000-pound weight differential was established, various flap and gear-down configurations indicated enough directional control to attempt a landing. Several simulated patterns were flown at varying airspeeds. At a gross weight of 275,000 pounds, the '36 entered final at 160 mph and landed without a flutter.

The cause of the emergency was a broken torque tube in the trim tab jammed against a longeron. This resulted in a left aileron up condition. The immediate professional response of the crew to this malfunction averted a major disaster. Sound training, knowledge and teamwork paid off for Captain Hammer and his crew and for the United States Air Force. Well Done!



IFF has now been added to terminal areas radar to provide control at extended ranges and also more rapid identification. Read on and learn how to . . .

"Holler when you're hurt!"

Captain John M. Foster, Directorate of Flight Facilities, Hqs AACS.

"I wasn't lost. I was just temporarily uncertain as to my exact position."

With this defensive assertion, the speaker leaned back against the bar, allowed the soft lights to reflect off the wings on his left breast and fervently hoped that his copilot would keep his big mouth shut about their last flight. What had started out as a routine flight had developed into a nightmare of fog, rain and ultimate confusion.

Fortunately, with the assistance of an understanding soul on the ground, a DF fix had been obtained at the height of the panic. Operating quickly and efficiently, the AACS controller at the DF console had located our friend, fixed his position, brought him over the station, and handed him off to GCA for a routine GCA approach.

So now the intrepid birdman was alive, albeit somewhat battered in the vicinity of his pride, but not a fraction so battered as if he had been forced to bail out or ride the aircraft down. Behind his defensive attitude was a deep thankfulness that "somebody down there likes me."

This situation has been experienced by many birdmen, and there is every reason to believe that the future will see someone from the moon asking whether he is abeam Mars or just south of Venus. This in turn means that the guy on the ground must be continuously striving for more and better equipment to bring errant birdmen safely in.

Perhaps few pilots ever think of the problems of the man on the ground or realize that his equipment has limitations. The general belief that "you turn it on and it does the job" isn't quite right. For instance, did you know that radar is:

• Subject to Radar Cancellation Speed commonly referred to as "Blind Speed?" Boiled down to "you" and "me" language, this means that when your aircraft is flying at certain speeds and in certain directions in relation to the radar site, the controller cannot see you.

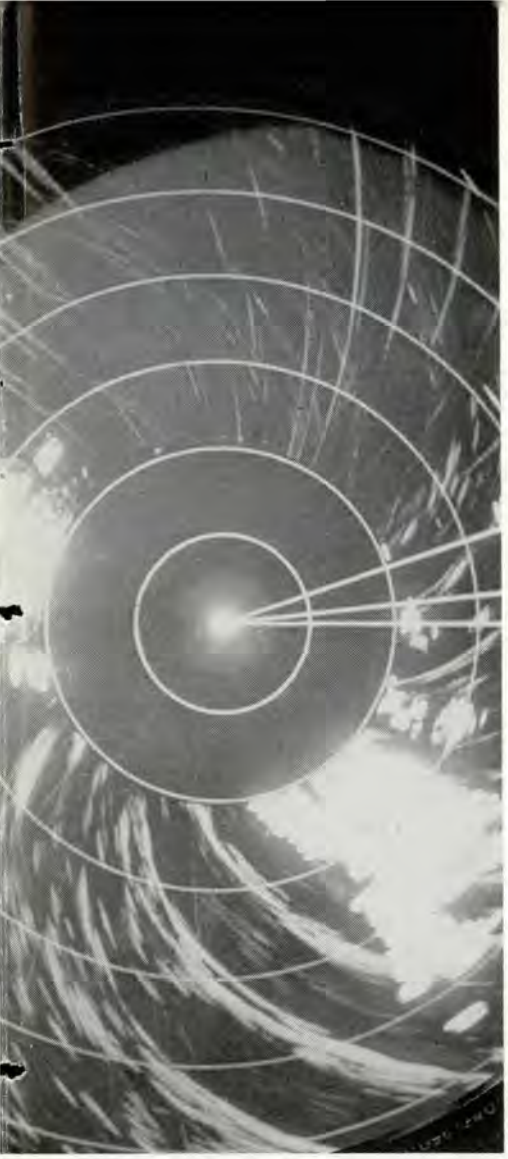
• Limited as to range and altitude? The majority of terminal area surveillance radars have a scan range of 40 miles. The altitude to which they can scan is dependent upon the tilt angle of the antenna.

• Unusable in heavy precipitation? A popular misconception among some pilots seems to be that the presently used radars can "see" through heavy precipitation. This is not true except for radars equipped with circular polarization. This assists the controller to see through precipitation, but at a loss of strength of the radar target. If the precipitation is sufficiently dense the radar target may be obliterated or reduced to a point where it is difficult to interpret.

But take heart, weary flyers, all is not lost. A little jim-dandy has been converted to air traffic control use and assists the radar controller considerably in surmounting the radar shortcomings listed above. IFF has now been added to terminal area radar to give you the additional features of control at extended ranges and rapid identification without time consuming turning maneuvers.

Many other conveniences are extended to the pilot by the boost which radar receives from IFF. Installations equipped with IFF Mark X are provided the capability of observing IFF returns from aircraft within a 200-mile radius, and to altitudes in excess of 40,000 feet, as determined by line-of-sight limitations. Consequently, when adequate communications and procedures are used in conjunction with the capabilities of the Mark X equipment, a more efficient and orderly flow of traffic is possible.

The additional identification and extended range capabilities of IFF minimize time spent in holding patterns at low altitudes. It provides a means of locating and identifying "emergency" aircraft and allows the radar controller to track an aircraft



through heavy precipitation. The IFF returns can serve as a radar return, in event the primary radar system fails. Also, in event of radio transmitter failure, pilots can acknowledge ground instructions by displaying modes requested by the controller.

However, you can't just turn it on and expect it to do the job. It must be used properly.

For example, just because the radar controller can see your IFF return at 200 miles doesn't mean that he can zip you all around the countryside at will. Remember that 40 miles or so is the normal range for most radars. Beyond that range the controller can see only returns of aircraft having functioning Mark X equipment. Since other traffic is operating out there too, the controller must maintain close coordination with the area control center to avoid conflictions with aircraft not having a functioning transponder.

Also, unless pilots use the IFF controls properly, there is a possibility of creating considerable confusion at the ground station. Here is the situation. You start the IFF working by turning the master control to "normal." In this position the aircraft transponder will reply to Mode 1 ground interrogations only. If the Mode 2/IP switch is turned to Mode 2 position, the transponder will alternately reply to Mode 1 and Mode 2 ground interrogations. If the Mode 3/OUT switch is turned on too, the transponder will reply to interrogations on all three modes.

The Special code words, below, will be used with ATC/IFF procedures:

CODE	MEANING
PARROT	IFF MARK X
SQUAWK	Turn IFF on Normal (Mode 1)
SQUAWK 2	Turn IFF to Mode 2
SQUAWK 3	Turn IFF to Mode 3
SQUAWK EMERGENCY	Turn IFF to Emergency
SQUAWK FLASH	Turn IFF to I/P Position
SQUAWK LOW	Turn IFF to Low Position
SQUAWKING	Showing IFF in mode and position indicated.
PARROT LAZY	Turn IFF to Standby Position
PARROT BENT	IFF Inoperative
STRANGLE PARROT, MODE 2, etc.	Turn off IFF, Mode 2, etc.

Now here is where confusion can result. Controllers will identify aircraft by requesting the pilot to change modes. It must be remembered that IFF returns of Modes 2 and 3 will only be displayed when the ground interrogator and the aircraft transponder are operating on the same Mode simultaneously. The pilot of the suspected aircraft will be requested to "Squawk 3," while the ground interrogator is on the Mode 3 position. After observing the Mode 3 target, the ground interrogator will be changed to Mode 2. The target should disappear. If so, the pilot is requested to "Squawk 2." The target should then reappear. If no other target follows the same sequence the aircraft is considered to be identified. But—the pilot, in changing between Modes 2 and 3, must remember to turn off the previous mode.

As pointed out before, the aircraft transponder will reply to any ground interrogation if all switches are on. The radar presentation, therefore, will not change regardless of the ground interrogator setting, and identification is—to say the least—difficult. To prevent this confusion, the controller will remind the pilot to "Strangle 2, Squawk 3," etc., etc., meaning turn off two, and turn on three. So, when you hear it, do it!

There are other limitations of the system caused by interference. When a number of ground interrogators are operating in close proximity, interference may be generated and displayed on the radar scope as clutter which can be misinterpreted as aircraft returns. Under saturated conditions these spurious returns can cause the system to become unusable.

"Ring Around," another form of interference, may occur when an aircraft IFF target is being worked close in to the station. The signal will be displayed at the range of the aircraft and may resemble a fat, irregular range mark. This type of return is useless for determining the relative azimuth bearing of the aircraft since it goes clear around the scope. Controllers overcome these conditions by judicious use of their interrogators, and by requesting pilots to turn the transponder to LOW position or to turn it to STANDBY or OFF when conditions warrant. These actions reduce the number of replies from aircraft and consequently reduce interference.

You and the radar controller have a nice implement here if the necessary coordination and cooperation is employed to make it work.

Of course, the basic Mark X IFF is not the ultimate in navigational aids, but it is a step in the right direction. Constant improvements are being made in the navigational aid field and the possibilities of the IFF system are not being overlooked. Here is an improvement which will be available in the future.

Selective Identification Feature (SIF) is coming up. The basic Mark X is being improved by the addition of a system of coders and decoders. A little black box for transmitting coded replies is being added to the airborne transponder, and another black box for decoding the replies is being added to the ground receiver. This setup provides the system with the capability of identifying any one of 64 aircraft, all on the single ATC Mode 3.

The new system works the same as the old, i.e., aircraft transponder replies to ground interrogation. The pilot, however, can manipulate controls as requested by the ground station, causing a coded reply to be transmitted. When the controls on the ground are set on the same code, the reply is allowed to pass through the receiver and is presented on the scope as a single blip.

The present 64 possible codes of Mode 3—more to come later—can be used in several different ways.

For example, codes can be assigned in a manner to identify aircraft by altitude, direction of flight, arrival and departure streams and so on. *If the volume of traffic permits, an aircraft could be assigned a discrete code to be used throughout an entire flight.* The exact use of the codes is not firm at this writing. Tests will be conducted to determine the best procedure. You will be hearing more of SIF in the near future.

So that's the story on this particular navaid. As in the case of all others, it is merely an assist. It won't take the place of brains. You've got them—use them.

One way to use them is to anticipate your requirements along planned routes of flight, including possible emergency requirements.

Information on navaids, including IFF assistance, is listed in Flight Information Publications. By using these publications for the intended purpose, you will stay ahead of the situation and the possibility of being caught with your drawers at half mast is most unlikely. You will also be allowed to converse freely in the local pubs without fear of being tripped up by some unsupporting statement from the copilot. ▲

This article appeared in the MATS Flyer several months ago, and was titled "RIFS."

The following comments directed to flight controllers were written by a T-33 pilot attached for flying to Andrews Air Force Base. They were forwarded to the Directorate of Flight Safety Research from Headquarters AACS. For the purpose of showing the other side of the coin, they are presented here.

• Surprise commands from a RAPCON controller to a pilot engaged in an instrument jet penetration can be sufficiently distracting to jeopardize the penetration dive, tracking and turns. For example, the pilot may be interrupted by a controller saying, "Squawk mode one on your parrot." After an interval there may be a request to "Squawk mode something else." Still another command may follow, "Squawk mode one again."

• It may be well to review with controllers just what this requires of a pilot. Let's take the T-Bird for example.

The pilot executes a penetration dive with his left hand on the throttle where the mike button and the dive brake controls are located. His right hand is on the control stick feeling for the proper pressure and trim tab control. He continually scans the instruments to arrive at the right aircraft altitude and airspeed. He also attempts to keep on—or get to—the correct penetration track by comparing ADF pointer indications and gyro compass headings. Steering corrections for wind drift are made while the altimeter unwinds, four to six thousand feet per minute down. About this time the controller may break in with several requests about the "parrot."

To comply, the pilot's right hand must leave the stick, and the left hand must leave the throttle to go over to the stick. The left hand may not know what the right was doing, and it takes a few seconds for it to adjust to the feel of its new job.

Now the right hand has to feel along a ledge to the right and somewhat to the rear for the squawker controls. If our jet jockey is real proficient, he may remember, by feel, the desired positions for the wafer and toggle switch controls of the "parrot." However, if he is better accustomed to feel for a pencil in his desk than to pet a "parrot" in a jet, he may have to turn his head and body around to get an awkward squint at the "parrot control."

The oxygen mask protrudes over his nose in such a way that he has to hold his head and body askew even to see the control box. When he turns back to his instruments, he may find that his penetration dive, which he had intended as a thing of beauty, has degenerated into the gyrations of a wounded duck. If the controller requests several rounds of this game of cockpit paddy-cake, it can follow soon that neither party will know where the jet has gone.

• I believe that safety and procedures would be improved if the controller would tell the pilot what APX mode is desired before or during the time he issues the clearance to penetrate. The pilot could then arrange for the chore of setting up the "parrot" when it would best suit the interest of safely monitoring the instruments. This would eliminate the element of surprise and "back seat driving" which happens when such instructions hit a pilot at an inappropriate and critical stage of his flying. Basically, the pilot is responsible for the safe attitude of the aircraft and for proper execution of the penetration. Once he has received his clearance, he should be allowed to pursue his duties with the least possible disturbance and distraction.

Tips for T-Bird Drivers

In April, 1958, a world-wide conference on the fuel system of the T-33 aircraft was held at Lockheed Aircraft Corporation, Burbank, California. Two of the major items discussed were the need for a change in fuel management procedures and a rapid, effective low-altitude airstart procedure.

In 1956, 11 major accidents resulted from fuel system mismanagement, and in 1957, 10 major accidents resulted from the same factor. Nineteen of these 21 accidents involved flameout shortly after takeoff or during maneuvers below 5000 feet (GCA, touch-and-go landings and so on). In several of the accidents, malfunction of the liquidometer or fuel low-level warning light played a part.

As a result of the conference, Safety of Flight Supplement T.O. 1T-33A-1EG was issued 23 April 1958, and later modified by T.O. 1T-33A-1EK, 24 July 1958. This T.O. required gangloading fuel switches of all tanks containing fuel when taking off—except in aircraft equipped with the old deep-well fuselage tank cap—when landing, or flying below 5000 feet.

In May, 1958, during a GCA without gangloaded fuel switches, another fuel mismanagement accident occurred. For the next 10 months, not a single major or minor accident was attributable to fuel mismanagement. In fact, not a single accident occurred that even resembled the usual fuel-mismanagement-type accident. Two such mismanagement incidents occurred wherein fuel switches were not gangloaded, but successful flameout landings were made.

In March, 1959, a major accident occurred during a low-angle gunnery mission. Flameout occurred at 2000 feet and a crash landing was made. The pilot was uninjured. As you would expect, the flameout was caused by fuel mismanagement; fuel switches were not gangloaded and the flameout resulted from fuselage tank starvation, even though considerable fuel was aboard the aircraft.

As a result of The Handbook Review Conference of June, 1958, Safety of Flight Supplement T. O. 1T-33A-1EL was issued 27 August 1958, containing revised low-altitude airstart procedures. The first reported instance where the procedures were used occurred in February, 1959.

A brief of the incident follows:

On GCA final at 700 feet and 85 per cent rpm, the pilot experienced a rapid loss of RPM. As it dropped below 50 per cent, the pilot gangloaded fuel switches, turned the airstart ignition switch ON, and placed the emergency fuel switch in EMERGENCY POSITION.

The engine accelerated to 80 per cent rpm and remained at this setting regardless of the throttle position. As the aircraft touched down on the runway, the throttle was stopcocked and RPM went to 100 per cent. The engine was shut down by closing the main fuel shut-off. Investigation revealed a turbine bucket broken, throttle linkage broken, several engine bolts and brackets broken. The engine will be repaired and returned to service.

The important thing to remember is that the aircraft Dash-One is your final authority and a good life insurance policy. Know it and adhere to it. If it's in error, UR it. But until such time as it is proven wrong, follow it. It may save your life. ▲

A SLIGHT CHANGE IN PLAN

Captain John A. Smith,

A low, wet ceiling hung over the air base. Taxi and runway lights gleamed mistily, outlining this pilot's haven tucked away in the foothills of the Rockies. A "Follow Me" jeep chugged dispassionately along the ramp, leading a transient T-33 aircraft to the parking area. The T-Bird braked to a halt, chocks were slipped snugly against the wheels and the engine unwound into silence.

In the warm coziness of base operations, a young lieutenant was completing his AF Form 175. He re-checked his entries noting his altitude request for 35,000 feet, and his Victor Airways Route to Dallas, then direct to the home base. He listened to the T-33 unwinding, somewhere out on the ramp.

"By the way," he asked the Airdrome Officer, "could I have a copy of your jet departures?"

"Sure, right here," the AO replied. "Since your departure is to the east, I'll see if I can get the tower to clear you for takeoff on runway zero eight." He looked through the door at the Weather Officer. "The wind is calm and a zero eight departure would make it a lot easier for you."

"Thanks," the Lieutenant replied; "on a night like this, I'll take all the help I can get."

The AO and the Lieutenant discussed the jet departures, checking the radio fixes and the surrounding terrain. Satisfied that the Lieutenant had been properly briefed, the AO signed the clearance and gave him the carbon copy.

"I noticed," he said to the Lieutenant, "that you're flying an F-100; that bird really scampers, doesn't it."

The Lieutenant felt a glow of pride. Yes, it really did scamper, and he loved flying the big bird.

"Well," he said, "it beats the heck out of a trainer, that's for sure. Anytime you get in trouble with this bird, just slap it into burner and awayyyyy we go!"

The AO smiled his understanding of the Lieutenant's exuberance. The young F-100 driver tucked his copy of the 175 into his pocket, clipped his flight log to his knee board, picked up his helmet and flashlight and walked out into the dark and the mist to make his flight home.

Several minutes later he had completed his preflight and was strapped into the cockpit. The power unit purred noisily as he turned on the radio, waited for it to warm up, and then called the tower for his ATC clearance. A cheerful voice invaded the cockpit as the tower operator answered: "Roger, Air Force jet two-eight-two-two-five, Carrville tower. Your clearance in on request at this time. No delay expected."

The Lieutenant turned on the VOR set and selected the local VOR frequency. He turned on the radio compass, checked it, turned it off; checked pitot heat on, navigation lights on—and ran through the full checklist. In the left-leg pocket were his WAC charts; the right-leg pocket contained the jet departure sheet. He jotted down two nearby VOR frequencies, "just in case."

Minutes passed. Then, "two-eight-two-two-five, Carrville tower. Your ATC clearance, ready to copy?"

"Roger," he answered, "ready to copy, Carrville."

Headquarters Twelfth Air Force

"ATC clears Air Force jet two-eight-two-two-five to the Easton airport via airways Jay twenty Victor to Dander City, thence flight plan route. To climb to and maintain flight level three-five-zero."

He jotted down the clearance. Short and sweet. An easy clearance for a change. The Lieutenant keyed his microphone and read back the clearance, the cold mask moving on his face as he spoke.

"Roger, two-two-five, your readback is correct. Cleared to taxi for runway zero-eight."

As he taxied out he set the departure heading of 107 degrees on the slave gyro. Nice, straight, on-course departure heading.

His position lights blinked brightly in the chill Christmas Eve air, as he rolled along the taxi strip for the active runway. He thought to himself that it looked like snow would be falling soon, but by then he should be home and unwrapping the brown paper covering for the Christmas presents he had picked up for Jean and the baby.

"How quickly," he thought, "how very quickly the last year had passed." First, graduation; then his assignment to the fighter wing at Easton Air Force Base. Now he was a First Lieutenant with over 600 hours of flying time to his credit and he was flying one of the best jet fighters in the world.

He had indeed been lucky. But it was more than luck, he was sure. He was known as a cautious pilot, thorough and accurate—a "professional pilot." Take this flight, for instance. He needed more instrument time, knew that he needed the practice and wanted to get as much weather time as possible. Here was this made-to-order chance to get it while delivering some paper work for the "old man." Get the flying time and do a little "off-by-himself" Christmas shopping, too.

Jean would like the soft-leather squaw moccasins that he'd bought for her. Really "jazzy" for those informal evening get-togethers with the gang. But what to get for a six-months-old boy! That had been a real problem, but one that was solved when he bought a tiny plastic jet airplane that threw sparks from the tailpipe when you pushed it along the floor.

"Quite appropriate for a future rocket pilot," he thought, smiling to himself. He stopped short of runway 08, quickly re-checked the trim-for-takeoff switch, then every item in the cockpit received a double check. He keyed the mike: "Carrville, two-eight-two-two-five ready for active."

"Roger, two-eight-two-two-five, I have your departure instructions."

Departure instructions? But the AO said they would give him an on-course climb. Well, probably just a slight change, and he had the jet departure sheet for the field, anyway. "Okay, Carrville, ready to copy."

"Two-eight-two-two-five, you are cleared for takeoff. Make a right turn immediately upon reaching a safe altitude. Climb to eight thousand feet on the one-six-nine radial of the Carrville VOR. Proceed to the Huston inter-

A Slight Change in Plan . . .

section, then proceed Victor one-four-six to the Juno VOR, climbing so as to pass the Juno VOR at an altitude of 15,000 feet. Do not climb above 17,000 until past the Juno VOR. Contact Carrville Center on frequency three-zero-one-point-four immediately upon becoming airborne for further instructions. Call when passing the Huston intersection and when over the Juno VOR. Squawk three low after takeoff."

He scribbled it all down, furiously. Damn! this wasn't going to be so easy after all. Well, he thought to himself, just take your time. Slow and easy, old son. He keyed his mike:

"Roger, Carrville, stand by one while I check for this Huston intersection. Did you say the Huston intersection, tower?"

His eyes scanned the departure sheet as the tower operator came back, sounding a little exasperated as he repeated: ". . . to the Huston intersection. Huston. Contact Carrville Center on channel six, frequency three zero-one-point-four becoming airborne."

He was on the active now, running up and checking the departure sheet at the same time. Huston intersection, Huston intersection. Where the hell is the Huston intersection? Burning fuel at a hell of a rate, he thought. Well, I'll find my way out of this place one way or another. No sweat.

"Carrville, two-two-five, ready to roll. . . ." And then a "Roger, cleared for takeoff."

He released the brakes, checked the nosewheel steering and engaged the afterburner. The firm shove of the afterburner pushed against his back as the F-100 hunched its shoulders and rumbled forth into the wet, cold darkness of the night. In a few seconds the blinking wing lights rose from the runway, winked swiftly, and misted out as Air Force jet 28225 hit the bottom of the weather and began clawing its way toward the clear, cold darkness that would begin at 20,000 feet.

The operations officer in departure control put down his cup of coffee and cocked an ear to the speaker.

"Sounds like someone is a little confused," he thought to himself. He listened to the seemingly calm, but slightly irritated voice that came from the speaker:

"Roger, two-two-five. The Huston intersection is on a heading of one-six-nine degrees from the Carrville VOR, and on the two-two-five degree radial of the Juno VOR, frequency one-one-four-point-four."

"Roger, Carrville," the quick voice replied. "Roger. Understand the Huston intersection, frequency one-one-four-point-four. Stand by one. I'll check this departure sheet again."

Someone in departure control was getting quite vexed about the whole thing, by this time. The next voice on the speaker seemed to go up a few notes as the answer came back:

"Negative two-two-five. The Juno VOR is frequency one-one-four-point-four. After reaching the Huston intersection, proceed via airways Victor one-four-six to the Juno VOR and notify when passing."

"Roger, Carrville, two-two-five here. Stand by one. . . ."

What the devil, the Lieutenant thought. Fine time to have to look for some intersection. Angry now, he began rummaging through the map case for the Jet Fac Charts covering the Carrville area. He seemed to recall that it was chart No. 2. He gripped the stick between his knees.

Finding chart No. 2, he flipped it open. Salt Lake City. No, turn the page. Want them to think you're the village idiot? Ah, now then, Carrville. There's Juno Zenith, Blue two, Foothill FTH, frequency 233. Black Forest marker beacon. Huston? Huston?

Where the devil is it? "Overlaps chart No. 4" written along the border. Great! Now let's check chart No. 4.

He flipped through the other charts, found No. 4 and crammed the others into the pocket of his flying suit. As he stuffed them into the pocket, the free chart—No. 4—slipped from his fingers and fell to the floor of the cockpit. D---****!!!! . . . . . !

He leaned to the left, looked down and saw the chart on the floor. He leaned forward to pick it up and was pulled up short by his shoulder harness, which he had locked on takeoff roll. Unlocking the harness, he leaned down and to the left to pick up the all important "Chart Number 4."

At 2210 Mountain Standard Time, 24 December, there was a rushing, gigantic, grinding crash as Air Force jet 28225 slammed into the ground—left wing low, position lights blinking brightly in the chill, Christmas Eve air. ▲

This story, though fictional, is based on an incident which occurred to the author recently at a western Air Force Base. Captain Smith, unlike the fictional Lieutenant, simply refused the changed departure instructions and was given a much simpler route to follow: the published plan which was handed to him in base operations. This then is the obvious solution to many situations confronting the jet pilot.

On the other side of the picture is the fact that all agencies concerned are aware of the problem and are moving toward a solution. In a recent message to the Chief of Staff from the Directorate of Flight Safety Research, it was pointed out that "numerous instances have come to the attention of this office which indicate that ground control personnel, both military and civilian are dangerously unaware of the problems confronting jet fighter pilots during IFR operations. . . ."

In answer, the Office of the Deputy for Operations says, in part, that "Problems confronting jet pilots during IFR operations are currently being studied by this office and the Federal Aviation Agency. Action will be taken with the FAA to jointly resolve each problem." With such cooperation, the solution cannot be long in coming.

SPLASH department

VFR and IFR flying in the same area at the same time just don't mix. Here's a case in point. A jet took off VFR flight plan, with a highly skilled pilot at the controls. His passenger, a non-rated airman, was getting a taste of jet flying with a view to becoming a candidate for the Aviation Cadet program.

The flight proceeded without incident for about 20 minutes. After a 180-degree turn, the pilot rolled out on an easterly heading and began a slow 1200-foot-per-minute climb. At 1029 EST, the jet collided with a transport aircraft at 8000 feet and disintegrated on impact.

The transport had been traveling in the same general direction as the jet. Apparently, neither pilot saw the other. The jet pilot, sole survivor, testified that he was conversing with his passenger via intercom and had a clear view above, in front and to either side, when suddenly there was a tremendous noise, and he was in the midst of flames and debris. Then he was falling through the air, without having fired the canopy or ejection seat. He pulled the D-ring, deployed the chute and landed safely in a wooded area. As a result of losing his helmet in the crash (it was not securely fastened) he suffered second-degree burns on the head, face and neck. The passenger died in the plane. The jet transport was severely damaged on impact and went into a flat spiral. All aboard were killed in the crash.

The Board, in reconstructing this accident, concluded that the jet was to the left of the transport aircraft, traveling about the same speed and converging at a 30-degree angle. The transport was descending, the jet ascending. The right wing of the jet hit and adhered to the transport cabin. The thrust of the engine plus the lift of the left wing caused it to roll over the transport's fuselage. From this moment on, all events were ballistic because of explosion and loss of control.

Air traffic control deficiencies were listed as the primary cause factors

in this accident. It was recommended that the system which permits VFR and IFR flying in the same area be changed to provide positive control of both by one agency. Absence of a collision warning device on the aircraft, and inadequate radar equipment in the traffic control center involved, were contributing factors to this tragedy. The Board also listed as a possible cause factor the complacency induced in pilots by an IFR clearance, when operating under visual flight conditions. They thus feel immune to collision. ▲

★ ★ ★

The C-119, with three crewmembers, was on a cargo-transport mission. The crew filed from Sheppard AFB to Carswell via V-61 to Fort Worth Omni, direct Carswell at 4000 feet. As the aircraft was taxiing out, ATC gave the following clearance:

"ATC clears AF 12345 to the Fort Worth Omni via Victor Airway 61, maintain 8000, maintain 6000 'til 15 miles southeast, over."

The pilot read back the clearance and said he was ready for takeoff.

Two minutes later climb restrictions were delivered to the C-119 which was still waiting off the runway: "Roger, turn right after takeoff, climb to seven, climb on the 144-degree radial of the Wichita Falls Omni to 7000 before proceeding on course, and maintain 6000 until 15 miles southeast, over."

The pilot read back the climb restrictions as given and was released for takeoff. He reported leaving 6000 as requested by Wichita Falls Approach Control at 1600 CST. This was the last contact Sheppard Tower had with AF 12345.

At 1614 hours the C-119 reported in to Fort Worth radio at 7000 feet, estimating Fort Worth at 1620.

At 1617, as determined from clocks and watches taken from the wreckage, the C-119 collided with another transport enroute from Kelly to Tinker at an assigned altitude of 7000 feet. Flight visibility was zero. Both aircraft were cleared and were flying under instrument flight rules. They disintegrated as they descended and the Air Force lost two more airplanes.

The C-119 pilot did not maintain his assigned altitude of 8000 feet. He apparently interpreted the climb restrictions as a clearance change. The Form 175 recovered from the wreckage revealed that a crewmember had copied the clearance on the cover. The "8" in 8000 feet had been overwritten by a "7," indicating that there was a misunderstanding by the crew of its assigned en route altitude. An experiment was conducted at Carswell AFB, in links and simulators, to determine the reaction of ten varied-experience pilots to the ATC clearance given the C-119 crew. Five of the ten pilots tested either requested clarification of the clearance or selected the wrong en route altitude.

Among other things, the Board recommended the following:

- That no clearance be given while an aircraft is taxiing.
- That ATC repeat the assigned en route altitude after any amendments to the original flight plan.
- That pilots be required to report when reaching assigned en route altitude.
- That the development and installation of proximity warning devices for aircraft be expedited. ▲

Major Donald J. Forsythe, Bomber Branch, Directorate Flight Safety Research

Did you ever turn on final after a series of practice landings or low approaches, settle down with that magic combination of altitude and airspeed for a smooth ride down to the numerals, only to cry out mentally, "Oh, my gosh, did I put the gear down or was I dreaming?" Or have you ever ejected, only to find as you went into orbit that you had not fastened the leg straps? Of course not! You wouldn't be reading this. One's last fleeting thought in such an instance might be, "Well, I'll never do THAT again."

As you sometimes tell your wife, it's all in your mind. The brain, that is. The most complex thing in our universe, the brain. Experts estimate that it is capable of containing some 15 trillion separate bits of information. This is more than can be found in the nine million volumes of the Library of Congress. Now here's a good question for the almost defunct quiz shows: With that much capacity, why do we invariably forget something we certainly already know? The answer may be that 15 trillion bits of information requires a pretty good indexing system, and most of us just don't keep ours up to date.

People who know such things tell us that the cerebrum is that part of the brain to which man owes his intellectual capacity. It is the seat of memory, complicated learned or acquired reflexes, and some types of habits. Some people are all seat; no memory. At any rate, the larger size of the cerebrum is the greatest difference between us *homo sapiens* and the lower animals.

Yet no matter how big the cerebrum is, and no matter how well you know something, the answers and responses you give to certain questions or stimuli depend a great deal on the influence of your emotions. For example, you know where Grant's Tomb is, and you may even know who's buried in it. And you've certainly demonstrated time and time again that you know where to put down your gear in the traffic pattern. But when you get into the soundproof booth and your brain begins to perspire, you may even forget who the heck Grant was! Or, say you're on a downwind leg after a long mission or a series of landings. You may be tired, concerned with the sun in your face or some guy trying to cut you out on base leg. You're so preoccupied with other things that when gear-down time comes, you say in the back of your little mind, "No problem, fellow, you already put down your gear—two landings ago!" The thinking man, under conditions of stress, may even forget which filter to smoke.

And that's the point. Under certain conditions of mental stress our reasoning, judgment and habit patterns will get mixed up in this neurological maze of ours and make us revert to paths of action that are the easiest or most predominant in our memory. We literally select, from our mental card file of solutions for problems, the closest solution at hand. And it is not always the solution required. Indeed, it may be the exact opposite of what is required.

Take the case in point of the late B-47 driver, who, while on alert duty, was asked to preflight an airplane which was to replace one on the alert line. Several incidents had piled up on this fellow recently to plague his life. His crew was tired after just going through a practice alert. The aircraft he was to preflight was not located in an area where the alert signal could be easily recognized. This necessitated special ad lib procedures to notify him in case of the real thing. Otherwise he might be too late to be a hero.

The aircraft was being worked over for an Assisted Takeoff installation, among other things, and was not ready when the crew arrived. In fact, someone, in the press of meeting the

Be on guard during periods of mental stress. It's just possible the wrong solution to a problem will come out of that neurological maze, the human brain. Practice will lead to correct automatic responses. Remember . . .

...IT'S ALL IN YOUR MIND

... the thinking man may even forget which filter to smoke.

alert schedule, had left the ATO fire and arm switches, circuit breakers, pullout plugs, the whole shooting match, in the ready-to-go position. The only thing the thirty bottles of ATO needed to fire was electricity. And then, for reasons known only to himself, the pilot asked for external power as he ascended the ladder—before he had even checked the cockpit. And the bottles fired — with him standing on the ladder.

He had no reason to suspect the ATO was hot. But if he had followed the well established and thoroughly tested procedure of preflighting the cockpit before application of power, he would have found the switches ON, and he'd be here today. And so would the rather expensive aircraft.

The procedure contained in the Alert Checklist was something he knew as well as his brand of cigarette. He had studied it, practiced it, used it. Yet he forgot it. That one lapse cost him his life. What made him forget? Probably the degree of mental stress occasioned by the run of several vexing incidents, one after the other, had put him in an other-than-normal state of mind. This fact, coupled with being presented with a slightly more-than-average complexity of activity requirements, resulted in his reverting to a habit pattern which was normal in every other respect but alien to alert procedure. He asked for power out of sequence with the checklist.

Here's another recent example to illustrate the point. A student flight crew plus two instructor pilots and an instructor navigator checked aboard a B-52 for a training mission.

The preflight and engine start were uneventful and everyone was ready to go. However, because of an alternator and hydraulic-pack discrepancy, the engines were shut down. The flight crew got out to allow maintenance to correct the problems. During this maintenance period it became necessary to start the No. 5 engine to provide pneumatic air to check out the alternators and hydraulic pack. Prior to starting the engine, the wing flaps were raised to full up, and the flap handle placed in the off position in accordance with prescribed procedures for ground engine-runup.

After completing the operational check, the engine was shut down and the maintenance people got out. They did not return the flaps to the down position prior to leaving the aircraft.

The flight crew then re-boarded and resumed the Before-Starting-Engines checklist. The engines were restarted, and the aircraft taxied out. No one noticed the flaps up, not even the ground crew.

Prior to taking the active runway, the crew accomplished the Before-Line-Up portion of the checklist. This included specific item No. 5: Wing Flap Lever and Air Brake Lever—DOWN and OFF. The IP read the item and the pilot in the left seat responded in the affirmative.

Takeoff data and aborted takeoff procedures were reviewed and the fuel totalizer was read. The takeoff roll began one hour and thirteen minutes after the scheduled takeoff time. Shortly thereafter, this eight-million-dollar-bird lay smoldering off the end of the runway. Scratch one.

Why? Because the flaps were up. Having added satisfactory acceleration and line checks to the unsatisfactory fact that the machine hesitated to fly, the IP elected to abort. There were certain other conditions attendant on the ruination of this flying machine. The brake chute failed because of airloads; the aircraft left the end of the runway 11,600 feet from start of roll going like a dandy, at approximately 70 knots; it used up the 1000 feet of overrun and went through the inevitable drainage ditch. This was more insult than this big beauty could stand and she broke up and burned. The pilot's pride and reputation were badly bent.

The ironic factor here is that although several people knew the flaps were up, the interruption of the otherwise normal sequence of events compounded by the pressure of time resulted in some erroneous assumptions being made. Checklist item No. 5 was read and responded to, affirmatively, "Flaps DOWN." The flaps, we know, were not down, but in their mind's eye these pilots could clearly see, vividly remember the act of putting the flap handle in the down position. The marvelous cerebrum functioned, and the wonderful index came up with an answer, but the index hadn't been kept up to date. The answer was wrong.

Operating these modern high performance aircraft is certainly complicated, no matter how you slice it. Thus, the necessity for checklists. Fifty years of aviation progress prove their worth.

Checklists are based upon the best experience available in the world. It behooves each of us to realize that we cannot remember all of the myriad steps of operation necessary to safely and effectively operate these intricate aircraft. It takes many, many hours of engineering development and four thousand average taxpayers like us to build a weapon system like the B-52. A moment of forgetfulness can be the means of reducing it to rubble. Using a checklist is part of our insurance against this.

But even though we use a checklist religiously, that too can foul us up when we interrupt the sequence of events, or break the chain of habitual actions or procedures. There is the danger of resuming our check at the wrong place, or skipping items. And the item we forget will always be the dastardly little one that kills us.

We are especially prone to this kind of error when we become complacent and robot-like about what we are doing. We must take time, make certain, double check, never assume, if we are not to destroy these birds and lose our reputations.

Above all, we must be cognizant of the fact that the brain, being what it is, will invariably remember something—but that under the influence of emotion or stress, that something may be the wrong thing, or even the right thing at the wrong time—too late. ▲

In response to a request from the Directorate of Flight Safety Research, the Air Route Traffic Control Center at Albuquerque comes up with some helpful notes on how to work better with. . . .

The Man in the Center

John R. Kennedy, Air Route Traffic Control Center, Albuquerque, N. Mex.

H. H. Mark, Chief, Air Traffic Control Center, Albuquerque, New Mexico

Hard at work in the Air Route Traffic Control Center, Albuquerque.

The difficulties encountered by the Air Route Traffic Control Center in handling USAF aircraft are generally classed in these categories: Communications, Flight Planning and ATC Clearance. The degree of difficulty experienced in each category varies appreciably with the different kinds of military operations, such as Strategic Air Command (SAC), Tactical Air Command (TAC) and Military Air Transport Service (MATS).

Communications difficulties are unquestionably our most serious problem with USAF aircraft. As you know, communications between pilots and ATC facilities are a basic requisite for effective air traffic control. With good communications, safe and expeditious movement of aircraft is possible; without good communications, air traffic control chaos is inevitable. We cannot emphasize too strongly, therefore, the importance of good communications techniques by all pilots.

Some of our communications problems in this Center are not chargeable to the pilots. Rather, they are inherent in a communications system that is growing almost day by day.

For example, some of our peripheral communications sites have not yet been commissioned and some of the commissioned sites do not yet have all the required frequencies. Also, during busy periods, our controllers cannot possibly answer all calls from pilots promptly. These situations, however, should improve in the near future with the installation of additional frequencies and an increase in personnel. Along this same line, we feel that many USAF pilots can do much to facilitate the safe and expeditious movement of air traffic and to lighten our controller's workloads. We offer these recommendations for such improvement:

- Pilots of enroute aircraft should maintain a continuous listening watch on the appropriate ATCS or center frequency unless they first request and are granted permission from the center to leave the frequency temporarily.

We are frequently unable to contact SAC aircraft because the pilot has changed over to work a bomb plot site, a GCI site or to accomplish refueling without first advising us of his intentions.

- Pilots should report over or abeam all required reporting points along their route of flight.
- Pilots should make all requested special reports as soon as possible. It seems incredible, but it is a fact that many pilots still do not comply with requests from centers to "report reaching on top" after takeoff. This results in needless delay to other aircraft awaiting approach or departure clearances and generally adds to the confusion and congestion at busy terminals.
- SAC pilots who have been cleared to fly locally at an enroute fix should contact the center immediately upon initial arrival at the fix and again just before leaving the fix. Controllers spend much time trying to contact an aircraft that is supposedly flying locally at Gage, Oklahoma, for example, only to find out that the aircraft has been flying the bomb plot at Denver for some time, having failed to report at Gage or advise intentions.
- Pilots of jet-type aircraft should contact the nearest ATCS *(or center when requested to do so)* when approximately 100 miles out from destination airport for possible further clearance. The center will usually be trying to contact inbound jet flights when they are about 100 miles from destination. If a pilot does not receive such calls, he should initiate action to establish communications by any means possible with the center or with any ATCS. Failure of the pilot to do this frequently results not only in his delay at destination, but frequently results in delays to other aircraft.
- It would greatly simplify the controller's job if pilots of jet aircraft particularly would state their approximate position with their initial call to the center. Because of our necessarily complex fix-posting arrangements and the large number of flights posted at each fix, the controller frequently has difficulty locating a particular aircraft's flight posting strip.

This problem is further complicated by the fact that an aircraft over Amarillo, for example, may be received on the Raton peripheral site, and these two locations are not on the same sector. Inauguration of this practice of stating approximate position with initial call would save much controller time spent trying to locate the flight's strip posting, and it would save the pilot's time for the same reason.

- Before starting transmission, a pilot should first listen for a "clear" channel to preclude blocking out another aircraft's transmission.
- Pilots should keep transmissions as brief as possible.

Flight Planning Difficulties. SAC aircraft, because of the nature of their operations, at times present particularly difficult flight plan problems. In the first place, the routes are usually long and complex. They seldom pass directly over an enroute radio fix, and they frequently involve local flying at one or more enroute fixes. Personnel assigned to the Center and to Air Force base operations make their share of errors in transmitting and copying these flight plans, but our investigations indicate that pilots too make their share of errors in writing out their flight plans.

Sometimes a pilot will leave out one important fix along his route of flight, or he will fail to add that he plans to spend some time flying locally at an enroute fix.

This kind of error, particularly when compounded with poor communications practices on the part of the pilot, results in unimaginable confusion. Since SAC pilots who operate on individual flight plans usually operate "VFR on-top," traffic hazards are seldom created by these errors. A controller, however, may have to spend fifteen minutes correcting the erroneous route, thereby taking his time from other important duties.

Another frequent difficulty we have in handling SAC flight plans pertains to changes made after departure. Frequently, a pilot will call in, almost immediately after departure, and file a revised flight plan that takes two minutes to copy by radio. Infrequently, we have had one pilot make as many as three complete flight plan changes within a one-hour period. Not only does this saturate the radio frequency but it saturates control center personnel. It takes up to fifteen minutes to get revised strips posted and the obsolete strips removed from control boards. New flight plans must be transmitted to adjacent centers and coordination, as necessary, must be effected within each center. In each case, a new clearance has to be issued.

We realize that some changes of this kind while enroute are unavoidable. We recommend, however, that they be kept to an absolute minimum.

The following comments apply particularly to pilots of itinerant jet-type aircraft:

- ATC cannot normally, because of traffic, approve random routes (off jet routes) for aircraft flying at assigned altitudes (29,000, 33,000 and so on). Only "VFR on-top" will be approved on random routes.
- ATC cannot approve even thousands of feet as cruising altitudes above 29,000. For example, 30,000, 32,000 and so on, are not available for use.

ATC Clearance Difficulties. Generally speaking, most USAF pilots seem to be well informed regarding ATC clearance requirements. There are, however, a few exceptions.

- Some pilots still do not understand that a clearance "via flight-planned route" does not include approval of flight-plan altitude.

Just the other day, a pilot departing from Cannon Air Force Base filed for 35,000 feet. He was cleared "via flight-planned route, maintain 31,000 feet." The pilot subsequently climbed "through" two other aircraft at 33,000 and reported at 35,000 feet. He said he thought his clearance approved his entire flight plan. Pilots should understand that ATC will *always* specify approved altitude or altitudes, regardless of how the route is approved.

- Pilots who contact GCI sites for steers around thunderstorms or for other reasons, should advise the center that they are changing to work a specific site, and request ATC approval before making any deviation from approved route.

Up to this point we have not mentioned pilots of reciprocating-engine aircraft, such as the C-47, C-124 and B-25. Generally, these pilots do an excellent job from an ATC viewpoint. We do, however, have one comment about the operations of these pilots. This pertains to their reluctance to accept altitudes above 10,000 or 12,000 in mountainous terrain.

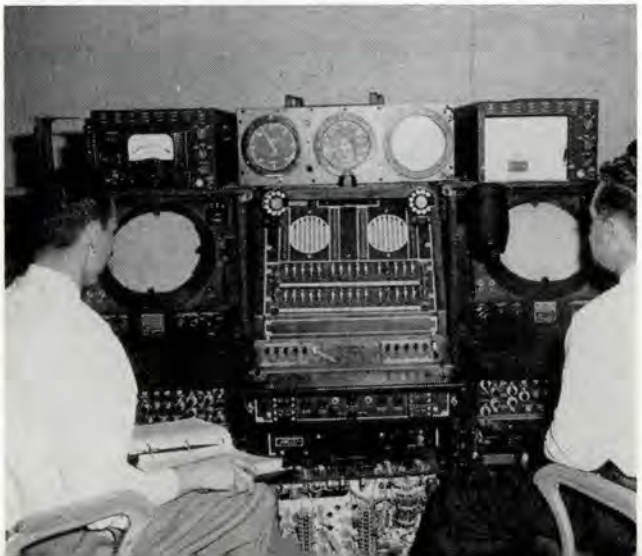
As you may know, the minimum safe altitude on Victor Airway 12 between Otto and Albuquerque, New Mexico, is 12,000 feet. During busy traffic periods it is usually essential that we use 12,000 and 14,000 westbound, and 13,000 and 15,000 eastbound. We try to keep the C-47 and B-25 types at the lower altitudes, and when necessary we try to get the C-124 and C-54 types at the higher altitudes. When possible we give a pilot the option of holding temporarily rather than forcing him to take the higher altitudes, but sometimes we have no option. When two or more successive aircraft at the same altitude are approaching Otto, New Mexico, for example, at 12,000, and when we cannot let them proceed over Albuquerque at that altitude, we must get the first aircraft up, or have the second one reverse course, which is not always possible.

We have had numerous instances during the past few months in which C-124 pilots have stated that they could not accept 14,000 feet because they did not have oxygen for their passengers, or they did not have oxygen for passengers and crew. This practice really works a hardship on our controllers and it is usually resolved only after rather prolonged discussion and sometimes with apparent hard feelings by the pilots concerned.

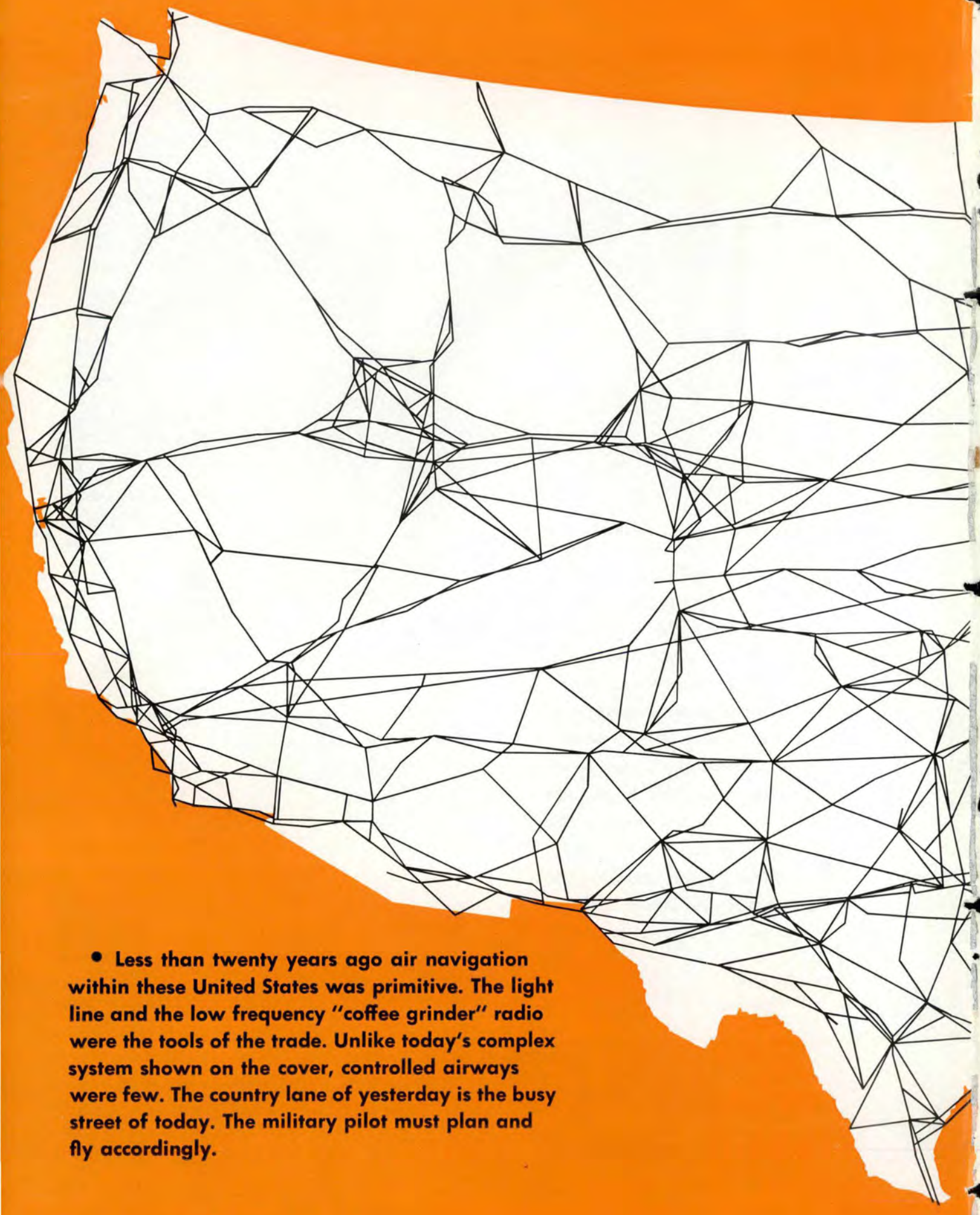
We feel that any pilot who intentionally files an IFR flight plan to conduct flight in mountainous terrain should be properly equipped with oxygen for the crew at least, and that he should understand and expect that we may have to assign altitudes as high as 15,000 feet.

It is our sincere hope that this article may be of some service in the effort to improve USAF-ATC procedures. For our part, we welcome this opportunity to inform pilots of the difficulties we have been experiencing in our handling of USAF aircraft. Likewise, we do welcome any criticisms an agency or pilot may have regarding our operations. ▲

Air Traffic Communication Station and Radar Approach Control at Albuquerque.



Got a pin problem? If so, chances are you're creating it yourself. Pins in aircraft, whether they be of the seat, canopy or landing gear variety, are put there for a good reason. They are designed for safety of ground operations. Their use at any other time can be embarrassing, if not fatal. Any pilot who fails to include pin removal in his checklist before opening the throttle, starts his roll with the dice loaded against him. So, remember, this pin-up has a point—*a pin point!*



• Less than twenty years ago air navigation within these United States was primitive. The light line and the low frequency "coffee grinder" radio were the tools of the trade. Unlike today's complex system shown on the cover, controlled airways were few. The country lane of yesterday is the busy street of today. The military pilot must plan and fly accordingly.

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