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THE MISSILES

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T-33 PILOTS

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IN THIS ISSUE

• TWO POINTS OF VIEW •

"Yes sir, I always carry my checklist."

"Sure he has a checklist—for the P-47, F-51, SPAD and NIEUPORT."

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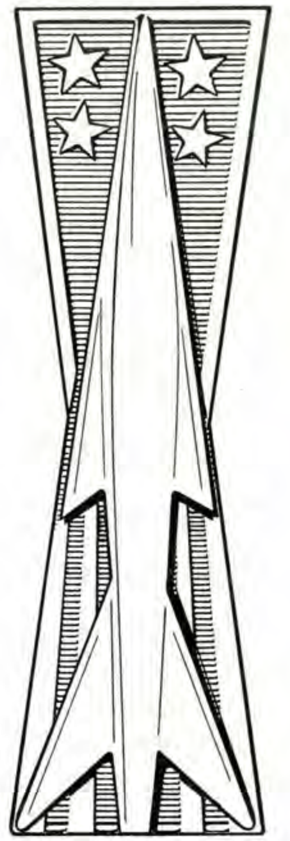
MISSILEERS

Seldom if ever has a military group had such a critical responsibility as rests on the shoulders of the missileers. In your care are some of the most vital instruments of the nation's deterrent force. Whether your charge is the Atlas or the smaller Falcon, you are dealing with the most advanced piece of technology produced by man. With the thermonuclear warhead added, you have the mightiest aggregation of sheer power ever devised. This enormous destructive force is kept leashed for possible combat use, but can be crippled or eroded away through accidents and carelessness. Without safety programmed into the very core of missile operations, the Air Force might experience an accident that could set the missile program back by years. You must not let it happen.

There is no blinking at the potential hazards and very real dangers in handling such a weapon system. But so far, you missileers have done phenomenally well. Respect, not fear, has characterized your approach to the multifold problems involved; you have succeeded beyond expectation. Not a death has marred Air Force progress into the missile age. No nuclear yield from a missile accident has imperiled our esteem in the public eye. You have performed creditably and well.

But even though we are just in the beginning of the missile era, when compared with the time we have been flying, think of the complicated mechanisms we are handling, especially the bigger birds. The engineering difficulties involved would have defeated the finest designers and builders of 20 years ago. Consider what might be called the "gangload" hazards of the countdown where the presence of high-pressure gases, tremendous hydraulic pressures, liquid oxygen, hundreds of volts of electricity, toxic low-flash point RP-1, all add up to a potentially dangerous situation unless the strictest safety standards are imposed. Conceive the precision of control required to accelerate the missile to its final velocity when, if the control device is off by one foot per second, the missile will land a mile off target. Electronic devices must sense and function, valves must open and close, and relays must respond at speeds almost beyond comprehension. This elaborate apparatus of microsecond automation demands near perfection, of men and equipment. There can be no corrections, no fixes, no mistakes. Such is the temper and mettle of the demanding mechanisms entrusted to your care. None but the best can serve. The missile badge is the measure of their high professional skill.



But even though our safety efforts on the pads have been rewarded with a remarkable safety record, and though we have made our missile systems as goofproof as humanly possible—therein lies the rub: we are still dealing with human beings. Try as we may, we still have Murphy's Law with us, working inexorably toward our defeat. Our safety endeavors must be postulated on this fact of life: if something *can* be done wrong—no matter how remote the possibility or how ingenious the effort required—it probably *will* be done wrong. Give no one the chance.

All of us hope for the best, but the wise man prepares for the worst. With a safety program that is anticipatory rather than merely reactive, you will spot any potential dangers before harm can be done. The professional hazard hunters tell us that every accident announces itself unmistakably long before it occurs. A disabling injury, for instance, has been preceded by 300 narrow escapes from the selfsame act that resulted in the injury. Similarly, a person hurt by a mechanical hazard has usually been exposed to it hundreds of times before the laws of chance catch up with him.

The laws of chance, however, are no guarantee of protection. For no seer, gambler, or statistician can foretell whether the first, last, or some intermediate unsafe act will exact the inevitable penalty for carelessness. Take the case of the missile worker who had a 3½-pound wrench dropped on him from a height of 15 feet. The wrench struck the visor and the front half of the safety helmet which fell forward on the worker's face. The impact of the wrench put a 3-inch split in the hat, but didn't even bruise its wearer. Had this man failed to wear his hat the results might have been disastrous. Without going into the mathematics of probability, this worker is unquestionably grateful that he trusted his hard hat instead of the laws of chance for his protection.

It is my earnest hope that you missileers will maintain your extraordinary safety record. I and my colleagues here at the Deputy Inspector General's Office for Safety are well aware of the difficulties you labor under. Without the chance to flight test the equipment, as we do with aircraft, it is difficult to discover deficiencies and correct shortcomings. It is next to impossible for you to evaluate your efforts in the meaningful terms of a mission accomplished or a system debugged. But you have the satisfaction of knowing that, through your excellent safety efforts, the missile strength of this country will not be squandered through accidents . . . nor will the lives of your fellow missileers be forfeited to negligence or unsafe acts.

Major General Perry B. Griffith, Deputy Inspector General for Safety, USAF ★ ★

DYNA-SOAR SAFETY

Everett J. Hodapp, Jr., Dyna Soar Engineering Officer Wright Air Development

With the dawning of a new age in aviation history—manned space exploration—it is essential that an active, vigorous safety program be established for each of the numerous space research projects scheduled or contemplated. The hazard potentials attendant to boost the vehicle into space, orbital flight and re-entry necessitate a redirection of safety efforts common to conventional aircraft.

Of immediate concern to the Wright Air Development Division is the development of the Dyna-Soar Military Test System. This system consists of a piloted hypersonic boost-glide air vehicle, a booster to place the glider in flight conditions, the ground launch complex, the ground support systems, and the ground tracking and communications facilities.

The overall objectives of the program are to demonstrate piloted boost-glide flight up to orbital speed with hypersonic re-entry into the atmosphere, maneuvering to land at a preselected conventional air base, and to identify groundwork for those military systems which will employ these technical advantages. This is to be accomplished by a flight test program at two sites and will encompass two distinct phases.

First, the full scale piloted glider will be tested at Edwards Air Force Base, California, by a series of drop tests from a specially modified B-52 aircraft. Performance will be limited in these tests. However, the glider handling characteristics will be evaluated as well as basic subsystems performance.

This test phase will be followed by a series of ground launched unmanned and manned flights from Cape Canaveral on the Atlantic Missile Range. In these tests glider response in the hypersonic flight regime to a maximum velocity capability of the booster will be learned.

Following successful completion of these sub-orbital flights, the same glider thus far developed in the program will be boosted from Cape Canaveral to velocities which will enable the glider to circle the earth and land at Edwards AFB.

It is readily apparent that the Dyna-Soar safety program must encompass many areas of activity. At this stage of the program primary emphasis is being placed on formulating a system design which minimizes the possibility of such hazardous conditions as fire, explosion, release of toxic vapors, and inadvertent or abnormal component actuation. Such hazard preventing activities are common to all manned vehicles; however, a greater emphasis has been placed on the manned space vehicles for these reasons:

- Pilot survival has been emphasized and programs to insure the safe return of man have been given high priority in both the NASA Project Mercury and Dyna-Soar Programs. Escape of man from orbital vehicles has not been perfected to the point that successful escape from the primary vehicle can be assured. For this reason the primary vehicle must be designed for maximum operational safety which may necessitate performance compromises.

- The possibility of a catastrophic failure at any point in the mission profile could result in pilot escape and landing in remote land areas or at sea. The ability to search and recover represents a serious problem. An active program during the development period to design and install highly efficient and reliable subsystems will markedly reduce the necessity of initiating escape action.

- To develop the required system in the time period allotted, it has been necessary to anticipate state-of-the-art advances within this period and to utilize such breakthroughs in many design areas. This action is justifiable in light of the existing competition between world powers; however, such action limits the amount of testing which can be conducted prior to integration into the production article. For this reason design safety analyses form an important part of the development cycle. Modification to improve overall safety and reliability must be made early in these programs.

- Many "grey" areas exist as to exact conditions which the space vehicle will encounter during orbital flight. A part of any effective safety program is to analyze the anticipated hazards through a careful review of existing data obtained from programs such as the X-15, Discoverer series, and the other exploratory NASA and military projects. From this information, certain potential hazards can be appraised and appropriate safety precautions taken.

To present a detailed account of the Dyna-Soar Safety Program at this time is not possible due to the newness of the program and the numerous design changes which occur daily. A fundamental operational concept, however, has been formulated by the Fire Protection and Safety Section of the Dyna-Soar Engineering Office as have the requirements for basic protection devices. The primary objective is of course to provide a military test system capable of exploring the hypersonic and orbital flight regime which will assure the ultimate in pilot safety. To accomplish this, a continuous coordination effort is being accomplished within the Dyna-Soar System Project Office to insure that adequate consideration is given to the safety implications involved when design approaches are finalized.

This same approach is being followed by the Boeing Airplane Company, prime contractor on the Dyna-Soar program, its subcontractors and the USAF associate contractors. The mechanics of the safety programs involve safety and reliability groups at management level. Boeing has established a Fire Protection and Safety Office to maintain surveillance of the fire and safety aspects of the overall Dyna-Soar System. This function is complemented by individual safety engineers at a design level for each major element of the Dyna-Soar System. These elements include the glider, booster, launch complex, and support equipment. In many cases the reliability and safety efforts of subcontractors have been placed in one common group.

While reliability and safety are closely related there are unique differences which exist in the early stages

PROGRAM

Division, Wright-Patterson AFB, Ohio

of system development. In the selection of the best subsystem design approach, safety is influenced by the mode of operation, materials utilized, and packaging concepts.

As an example, consider the selection of an electrical power system for a short flight time glide vehicle. A battery could be designed to accomplish the desired function. Another alternative would be the use of a chemically fueled power generating device. Through design efforts and use of redundancy both approaches could achieve similar operational reliabilities. However, from a pure safety viewpoint, the battery is free of the hazard potentials of fire and high speed rotating equipment. Relative system weights may render battery use prohibitive, nevertheless it is obvious that batteries offer certain safety benefits. While operational reliability and safety are similar in nature, use of the terms synonymously may cause an oversight in the space system development phase which could result in problems when the system becomes operational. This is especially true when the degree and nature of ground support for the subsystem approaches vary markedly. Servicing a subsystem with hypergolic fuels and oxidizers presents many safety problems not common to servicing with conventional fuels and oxidizers such as RP-1 and LOX.

The safety information published and operating procedures established by the Ballistic Missile Division contractors on the ballistic missile programs and the basic research conducted by the Directorate of Advanced System Technology at WADD complement safety approaches enforced during the development of aircraft systems. Programs have been completed which analyze the hazards associated with the use of Hydrogen and work is being conducted currently to evaluate methods of suppressing fires involving propellants currently proposed for our space research programs. The safety procedures enforced on such programs as TITAN have been very effective and such procedures are to a large extent applicable to the launch site safety efforts necessary for the Dyna-Soar ground launched flights.

These design safety approaches for the Dyna-Soar glider have not as yet been finalized; however, the following programs are being developed to improve the overall system safety:

- A materials selection program will analyze all materials scheduled for incorporation into the glider. The analysis will consist of determining the thermal decomposition characteristics of each material used and a determination of the relative safety, both from a toxicity and a fire hazard viewpoint. Where materials are found to exhibit an unacceptable hazard potential, efforts will be expended to find a suitable replacement. The NASA has pursued a similar program for the crew station on Project Mercury and has changed several materials proposed by the prime contractor due to the possible effects on crew safety.

- Several areas of the Dyna-Soar glider exhibit a fire hazard potential, should propellent leakage occur during critical flight conditions when ignition potentials exist. While every effort is being made to incorporate passive safety measures to minimize such a possibility, a means of the pilot visually inspecting remote regions is necessary. It has been demonstrated that the temperature sensitive and surveillance detectors currently available do not possess a high degree of reliability.

Above, as the second stage of its modified Titan ICBM booster falls away, the glider is near orbital flight. Below, as the Dyna Soar reenters the earth's atmosphere leading edges of the craft will glow from heat caused by friction of vehicle passing into atmosphere.

The moisture, wiring and maintenance difficulties do not induce a detection system confidence which would encourage the pilot to initiate glider escape solely on the basis of a fire or overheat warning light. Recently a light weight surveillance system utilizing optical fibers has been introduced to the fire detection system industry. This system is composed of a fiber bundle which consists of glass fibers of 0.002 inches in diameter. Each fiber is capable of transmitting light from the desired surveillance point to a viewing station.

By placing several thousand units in a bundle, a picture can be transmitted from the hazard area of Dyna-Soar to the pilot's compartment. Where only the detection of flame is required, the system requires a simple type of fiber bundle construction. To obtain a picture quality image, a bundle of more fibers which are oriented is necessary. While much remains to be learned about fiber bundle performance in different environments, it is acknowledged that use of such a system will permit pilot visual appraisal of the hazard prior to his initiation of corrective action. This capability is desirable and when the fiber bundle is utilized with a conventional temperature or surveillance detector, the pilot will respond to the temperature indication by visually viewing the area of concern. The Dyna-Soar Engineering Office is also considering use of this lightweight surveillance system for checking the possible presence of fire, smoke, fluid leaks, or other hazards within remote parts of the system such as the booster and transition section.

• In regions of the glider where a high probability of fire or explosion remains after incorporation of all practical hazard prevention techniques, the use of explosion suppression systems is being considered. In general, these systems consist of a pressure or light sensitive detector which picks up the small pressure rises or light emission associated with the initiation of an explosion.

In milliseconds, the detector responds and automatically discharges chemical suppressants. The action inhibits the explosive reaction and in hydrocarbon and air explosions prevents pressure rises from exceeding approximately 3 psi. This technique eliminates structural and component damage, whereas an uninhibited explosion, which could produce pressure rises in excess of 100 psi, would have caused a catastrophic failure. As the Dyna-Soar glider design is finalized, a parallel program is planned to evaluate the effectiveness of explosion suppression systems on the fuel-oxidizer and monopropellant reactions which can be anticipated. When analyses so indicate, suppression systems will be integrated into the design.

• The technical area of glider drainage of combustible leakage is one in which a considerable effort must be expended. Fluid behavior under zero gravity conditions may necessitate development of specialized drainage systems to insure adequate drainage under all Dyna-Soar flight conditions. The complexities of such systems has currently placed greater emphasis on development of leakproof fluid systems; however, with the operational environment extremes to be encountered, a certain leakage must be anticipated. It is a design objective to prevent leaking fuels from contacting ignition sources. Prevention techniques, such as isolation of combustible areas and protection of potential ignition sources through measures such as maximum use of circuit breakers to prevent electrical circuit overloads and cooling provisions for areas which normally might exceed the autogenous ignition temperature of the leaking fluid, are to be practiced.

Design safety approaches to the complementing portions of the Dyna-Soar system, namely the booster, launch complex, support equipment, and test range, are not unique in themselves but rather are the outgrowth of a tremendous volume of development and service experience. The booster safety effort for the Dyna-Soar program is under the management responsibility of the Dyna-Soar Booster Office at BMD. Current efforts in this area include an appraisal of the TITAN configuration and its suitability for use in manned applications. A high reliability has been thus far obtained in the TITAN ICBM development program, however, the modifications to the booster necessary to accommodate the glider must be analyzed to determine their influence on the overall safety and reliability of the booster. Candidate boosters for future steps of the Dyna-Soar program are being investigated. Since these boosters are in the early development phases the Dyna-Soar Engineering Office hopes to contribute to a design safety effort on these vehicles by familiarizing the contractors with the Dyna-Soar program and the safety emphasis which is essential in the piloted advanced research system of this type. The primary protection system in the booster is the malfunction detection system. This system is incorporated to monitor selected critical parameters in the booster. Output from these monitor sensors will be summed in a logic circuit and if conditions warrant, a signal to initiate escape action will be sent to the control center. A suitable failure detecting system will include a monitoring of critical items within electrical, flight control, propulsion and tankage systems.

The engineering groups in each of these areas have formulated the sensing requirements for each of their systems. Being a research program each subsystem has been heavily instrumented. To insure that an efficient malfunction detection system is selected, it is necessary for the safety engineer to determine what abnormal operations would produce hazardous sequential failures, what available instrumentation could be tied into the malfunction detection system, and the complementary detection devices which are required. From this analysis effort a malfunction detection system for the Dyna-Soar will be designed which will advise the pilot of a pending catastrophic failure and permit automatic or pilot-initiated escape action.

Safety of operations at the launch site and test range will be emphasized through issuance of safety directives to cover each phase of the Dyna-Soar flight test program. Excellent information has been prepared for current safety programs at Cape Canaveral and will be used as a guide in establishing the program.

In the preceding comments on the Dyna-Soar System safety efforts, I have attempted to outline the various phases of our program and the precautions being considered to insure that our flight exploration is accomplished with the utmost in safety for man and material. Neither one man, one section, one division, nor one command can do the necessary effort alone. Cooperation must be emphasized and everyone who contributes to the Dyna-Soar program must develop an awareness of the hazards involved.

Thousands of individual safety campaigns must be waged if this country is to successfully conquer the challenge of space. A safety program is never completed but must continue throughout the life of the system. As the Dyna-Soar program progresses through its development, unique hazards will form and a means of neutralizing the potential must be found. Technology in the area of development and operational safety must proceed at a pace paralleling advancements in propulsion, high temperature materials, and other essential areas. The Dyna-Soar program is attempting to meet this challenge. Subsequent advanced systems programs must continue this effort. ★

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Cover: Boeing Artist Fred Takasumi's impression of Dyna Soar glider being boosted from launch pad by modified Titan ICBM booster. Fins on Titan will give rocket stability in flight.

FREE CURE FOR EXPENSIVE HABITS

Lt. Col. Waring W. Wilson, Fighter Branch, DFSR.

• • •

It was unreal—like a dream or even a nightmare. You couldn't really be seeing and feeling what had just happened. Let's see. Go back in your mind over the last few minutes. You'd been flying Number Two. It was in those dying moments of the day when it is still not dark enough to see lights well but too dark to see form and motion. Lead had made an easy turn to initial and you were holding well in position with 85%. He pitched. You count one and two, and pitch at five. Nice and easy. Boards out, speed 230. Boards in. Holding 85%, gear. Then, a voice from the tower:

"Ghost Flight, turn your lights on bright."

You reach and flick the switch. Now for the turn to base. Where is Lead? There he is. Well clear—boards out now for descent on base. Take off a couple per cent. Bleed the speed back to 200. Looks nice—good rate of descent established.

"Ghost two gear down and checked." Lead still in sight. Okay, roundout. Check the airspeed: 175. No sweat! Just leave the power on until roundout is completed. Now power off and touch it down. Squawk! Scrape! Horrors!! *No landing gear*. "Well, it's too late now. Might as well stopcock and slide it out. Yes, the handle is still up, the horn is blowing and the light in the gear hande is ON."

How did it happen? Well just as you thought "gear" after the pitchout, the tower said, "Turn your lights on bright." You flicked the switch. This action somehow filled the habit pattern which normally is satisfied when you place the gear handle DOWN. It doesn't matter that your lights were already on bright and you turned them to dim, or does it? Did your "conscious" say, "The lights are already on bright but the gear is UP," and did the "subconscious" say, "Rog," and tell the hand to move the light switch? Who knows?

You were quite busy looking for Lead until his lights came on bright at the turn to base, then you relaxed. But how could you—or worse—how *did* you? The pattern looked good all the way, but remember you never had to reduce power below 83% prior to roundout. The light just didn't come on and the horn didn't blow because the throttle was too far open. The instrument lighting in the cockpit was low and you can't explain why you didn't verify the gear-down indication in the selsyn windows when you called "Gear down and checked," another rote action which you may be doing wrong because your habit pattern does not require a close look at the indicator.

That brings us to the recommendation for the pilot: *Don't try to do more than one thing at a time because you can't concentrate on two things at once*. Do you think all pilots will now take this advice? How silly! Of course they can't. The next time someone is distracted at the exactly critical moment, he may forget the landing gear and we'll have another embarrassed jock.

Why don't we get smart? *Nobody* deliberately lands with the gear up. There is a gadget under evaluation by the Navy called the random counter. Instead of a selsyn window it has a disc which is numbered from 0 to 9 under each wheel window. The pilot must call out these three numbers when he gives the gear check. Why couldn't we paint numbers on the part of the existing windows which indicate gear down and locked? On those aircraft having green lights, outline the numbers on the inside of the light cover so it can be read only when the light is ON. Then change the base leg call to "Ghost 2, Gear Code 596" or whatever combination of numbers is painted on his bird. The pilot won't remember these numbers unless he flies that same bird every day, and unless he calls numbers of some sort he will be challenged. It's inconceivable that he would call out fake numbers. By the time this issue reaches the field, this topic will probably be a target for much comment. Let's have yours. ★

Steep ramp of '124 is a major safety problem, but one that has to be lived with. Note protective coverings on thrust chamber, fin tip, radome.

"TOGETHERNESS"

Thomas H. Pynchon, Bomarc Aero-Space Dept., Boeing Airplane Co., Seattle

Airlifting the IM-99A missile, like marriage, demands a certain amount of "togetherness" between Air Force and contractor. Two birds per airlift are onloaded by Boeing people and offloaded by Air Force people; in between is an airborne MATS C-124. One loading operation is a mirror-image of the other, and similar accidents can happen at both places. Let's look at a few of the safety hazards that have to be taken into account when Bomarcs are shipped. . . .

In the July 1960 issue of *Aerospace Safety,* mention was made of the second Air Force-Industry conference on missile safety; and of plans to create Air Force-Industry Accident Review Boards. If future emphasis is to be placed on such joint action, much can be gained from a positive, realistic—above all, cooperative—approach to safety problems.

Cooperation is even more important where the problem area is double-ended: where both contractor and military personnel perform the same job and are subject to the same safety hazards. Therefore, in the following discussion of one such area—that of Bomarc transportation—any references to slip-ups on the military end of the airlift are meant to be strictly nonpartisan and objective. As long as there have been near accidents, it's better to use them as a guide for future safety than to pretend they never happened.

As this article goes to press, the safety record of Bomarc airlifts can be summed up in four words: so far, so good. You may recall, however, the optimist who jumped off the top of a New York office building. He was heard to yell the same thing as he passed the 20th floor: so far, so good.

This is not to imply—necessarily—that IM-99A on and offloading crews have been living on borrowed

Closeup of trailer shows hand brake linkage, towing cable. Handle forward of hand brake is steering selector. Two rings support missile in plane cradles.

time. Nor—necessarily—that the end of the winning streak, when it comes, will be as tragic as impacting against a concrete surface at 175 or so mph. But then again . . .

Let's look at some of the near misses. One crew member got his foot run over by the aircraft loading trailer. But he was wearing safety shoes, as he was supposed to. Once a lifting cable failed and a missile was dropped about six inches during an offload operation. Nothing happened: no explosions, no mangled human extremities; because explosive items like squibs and initiators are shipped separately, and because the hands and feet of loading personnel were clear of the danger area. Once a failed pin in the aircraft hoist gear sent a missile and trailer rumbling down the loading ramp at a clip which might have compared favorably with airborne cruise speed to anyone in the way. But nobody, luckily, was *in* the way. Everyone had been paying attention to the 2 dash 2's oft-repeated warning (repeated an even dozen times, to be exact): "Keep personnel away from down-ramp end of trailer as it is being pulled up (or rolled down) loading ramp."

Still, if you took a dim and rigorous view of these three incidents, you would conclude that personnel were only practicing about half the safety they should have been. Otherwise we wouldn't be using the words "near miss." Good safety practices, we know, are redundant. Just as there are two or three different ways to trigger an ejection seat, so there are extra, redundant, "insurance" features associated with airlifting the IM-99A. For example: at the crucial moment when the trailer is stopped on the ramp while cargo is being shifted inside the plane, four conditions would have to exist before anyone could be hurt by a runaway missile and trailer:

(1) A hasty and incomplete preliminary inspection of loading gear: trailer, cable, snatch blocks, Pul-lift hoists, etc.;

(2) Disregard of the warning in the 2 dash 2 about staying clear of the downramp end of the trailer;

(3) Failure to attach the safety restraint chains which are normally hooked between the loading trailer and the body of the C-124; and

(4) Failure to set the trailer hand brake. Each procedure serves to back up the others. Two are physical restraints; two depend on the human element. All are essential for 100 per cent safety.

So much for near misses where "insurance" paid off. There have also been cases where survival was strictly a matter of luck. The incident that comes most readily to mind happened a short while ago, during a two-missile offloading. Normal sequence is to move the port missile all the way aft in the C-124, load the starboard missile on the offloading trailer, and steer missile and trailer on down the ramp. The manual says: "Station one man at hydraulic hand pump and gage position at right rear of trailer and one at hand brake and directional valve position at left rear of trailer. Station others as needed to observe and direct trailer loading." "Rear of trailer" in these instructions means forward in the plane; or the end closest to the ramp. On this particular operation, however, it seems there was also a man—call him Smith—on the *front* end of the trailer (aft in the C-124), riding on the chassis to control a parking brake. As the outgoing missile passed by the elevator stub of the other missile, Smith got wedged in between. Fortunately, another crewman, stationed near the back end of the trailer, had both Smith and the anchor vehicle operator in his line of vision. He saw what was happening and signalled the wrecker operator to stop towing. Smith was extricated from a squeeze which could have been fatal. To quote from a subsequent field report: "At this point the crewman is on the trailer controlling the emergency (parking) brake. His back is extremely close (brushes) the elevator stub of the other missile . . . Should anything happen at this instant, the crewman's life would be in danger."

Boeing engineers tackled the problem raised in this field report, and came up with the following recommendations:

(a) Steer the trailer with the steering selector which is closest to the front of the C-124, 'til Smith's station is clear of that elevator stub.

(b) The only break to be used during loading is the hand brake. The parking brake—required by MIL-M-8090—is only to keep the empty trailer from breaking loose, and should not be used when the missile is aboard. A lot of force has to be put on this brake to hold an *empty* trailer on a 17° incline, so it would be virtually useless as a physical restraint on missile and trailer.

(c) Finally, to quote again: "There is no T. O. requirement for a man to ride the trailer. A man riding the trailer during operation is subject to any accident that might happen to the trailer."

Before we criticize Smith too severely, however, we should note that his purpose in riding the trailer was apparently to add still another item of safety insurance to the four mentioned previously. So that the intention, at least, was good.

Technical Manual T. O. 21-IM99A-2-2 is the bible for Bomarc airlift loading procedures. Updated every three months, these 2 dash 2 instructions are the end product of dozens of on-the-spot observations at both on and offloadings, conferences with handling equipment design engineers, and coordination with Safety Engineering. The latter group utilizes extensive test facilities and works along with other groups, like Reliability and Human Factors engineering, to solve safety problems which have already arisen and to find out how future ones can be prevented. Often, solutions to local, in-house contractor problems can be applied to similar conditions in the field.

For at least two men, however, safety is consider-

One mistake and a lot of money has been wasted when you're moving a missile to its new home. It's a job requiring detailed safety on all sides. Togetherness, then, is the word.

ably more personal than anything written in the manual or in a test report. On the day of the airlift, safety of the C-124 and the missiles inside is largely up to the MATS loadmaster and one engineer from Boeing's Missile Delivery Group.

They're both out on the flight apron at 0700. Together they hold a thorough, nit-picking inspection: checking the housekeeping around the loading area and in the plane, determining the exact condition of all loading gear. The next thing is to decide *where* to put *what* in the cargo spaces. To have a safe flight, the center of gravity of the plane must stay between certain body stations. Almost always there is extra freight, like batteries and test sets, to be sent along with missiles and airfoils. Tiedown methods have to be agreed on. Both engineer and loadmaster must be able to think on their feet and make rapid decisions and adjustments in case an item of freight doesn't show up, or if more shows up than they expected. Exact placement of cargo and exact fuel requirements are therefore figured down to the last inch and gallon by two heads containing a sum total of years of air-cargo knowhow and experience. Aiding their calculations are the engineer's conventional slipstick, and the loadmaster's load adjuster, marked off in body stations and fuel loads, and serialized to his C-124 and that plane only.

Boeing personnel, supervised by the loadmaster, perform the actual onloading. Their procedures follow the lines set down by the 2 dash 2, with certain sophistications. The loading trailers here at Seattle—referred to, for some obscure reason, as "tomato" dollies—are smaller and lighter than those in use at the other end. This makes for speed and safety in loading, since less strain is put on the loading gear.

Now don't everybody yell at once. We know there aren't any of these out at the bases. And for a very good reason, too. Sure, maybe the light trailers speed things up. But they are too light for safe over-the-road transportation—too fragile, and not built to ICC specifications. This is OK at Seattle, where there is no "over the road"; only a few yards over a smooth flight apron, between the storage area and the '124. But at a tactical base, the distance between the airhead and the Bomarc site is often quite a stretch, and the trailer must be rugged enough to take a long haul.

Positive, error-proof communication between loadmaster and anchor winch is provided at onloadings by a three-light system which looks like an ordinary traffic signal. Red means "stop," green means "wind in cable," amber means "let out cable." One big advantage is that the system works efficiently even around a high noise level area. And with '707s, B-52s, KC-135s and other heavies warming up, taxiing and taking off most of the time, that noise level can get pretty high.

We are not saying that the Seattle end of the airlift is ultra-safe and can do no wrong, while the other end is a horde of accident-prones. The Boeing crew doesn't wear safety shoes. The bases don't have the three-light system. So who is safer than who?

The thing to remember is that this whole business of airlifting the IM-99A continues under a set of conditions which—let's face it—we all have to live with. For one thing, the loading ramp of the C-124 is inclined 17° to the horizontal. We can figure out from simple trigonometry that a shallower ramp would mean less pull on the hoist cable and its associated gear, and therefore safer operation. The C-133, it so happens, has a shallower ramp. Unfortunately, not many C-133s are available, nor as of this writing are they likely to be. In addition, the '133 does not come equipped with a cargo hoist, which means that even if we could get this aircraft, each missile would have to be shipped on its own individual trailer. So the '124 and its steep ramp are here to stay.

Another thing both ends must realize is that loading crews get used to working together. MATS likes to rotate loadmasters on these airlifts, to spread the experience around. But in places with a low turnover rate, missile stevedoring would be performed by a more or less integrated team, who knew each others' idiosyncrasies, who had evolved certain private hand or verbal signals valid only for the team itself. Up to a point, nothing is wrong with this approach. MATS has been in business since 1948, and airlifts have been going on nearly as far back as the Wright brothers. During that stretch, a lot of knowledge has been accumulated. The rules on missile transportation—safety and otherwise—are based solidly on common sense, and if the same crew has been working together over a period of time, such "in-group" communication can speed things up. But now, take for instance the crewman who nearly got squashed between two missiles. Suppose the man who signalled his plight to the anchor vehicle had started dancing around, waving and yelling. Suppose the winch operator had been a new man, not thoroughly briefed on signals. To him, such apparently random signalling could have meant "go faster," "the trailer just ran over my foot," "the general is coming," or just about anything. If he had thought to himself, "maybe he means I should take in more," and thereupon started reeling in cable fast and furiously, the IM-99A airlift would have chalked up its first fatality. The moral is simply that everybody engaged in the operation should be told beforehand what each signal means and the information checked and double checked before on or offloading ever begins.

These are probably the two major problems: slope of the ramp and positive communication. But when you come right down to it, the others are equally as important; areas like trailer and hoist maintenance, safety training, proper use of protective covers. Too often and too easily these areas can be dismissed with the formula: "Not applicable; this is an Air Force problem." At the risk of belaboring the obvious, it would seem that the difference between getting killed and living to a ripe old age ought, by every rule of common sense, to be everybody's problem.

Chain Robbins, Safety Engineering Group Supervisor at Boeing, has put it this way: "One of the most unpleasant things about this business is the day you suddenly realize that many of the safety codes the Air Force and Industry have were generated out of tragedy—someone killed, someone mangled for life. You might say one of the objectives of the safety movement, which got under way around 1911, is to generate codes from tests, studies of human reactions, statistical data, near misses, everything we can get, to prevent future tragedies from ever happening."

There has never been a tragedy on any Bomarc airlift. Yet. ★

C-NOTES

Several weeks ago I had an opportunity to get away from the big paper mill and spent a few days with you F-100 types. I even flew a few missions with some of you, but what seemed more important was the chance to talk shop with a few of the Ops type jocks, especially the younger pilots who had joined a tactical fighter squadron in the past 18 months or who were still in trainee status at the combat crew training schools. During the ensuing conversations, I was asked a number of times what DFSR's stand was on the use of the zero lanyard for takeoffs and landings in the '100. Our stand on this subject is cleancut and direct. *Use it!* During one flight briefing which I participated in, I heard a flight leader express his opinion on the lanyard. He said, "The book sez to hook it up for all takeoffs and landings but I personally don't use it, for I'm positive I can handle any situation and have no desire to get clobbered with the seat or have it entangle in the shrouds if I have to get out at low altitude."

Okay, everyone to his own opinion. No one can make you use the lanyard, and who is there in the cockpit with you to make sure that you take the time or effort to hook it up? No one. Once you are strapped in, lined up on the runway and blast the 'burner to the bird, the next 60 seconds are the most important. In recent C-Notes we've given you the word on the many failures of the clamp in the 16th stage bleed air, loss of flight controls, burnthrough and, of late, the continuing aft section fire and explosion problem in the AB fuel system during takeoff and climbout. The chances of pulling up the handles and joining the club are pretty darn good if any of the aforementioned malfunctions occur and, if they do, they inevitably happen immediately after takeoff at critical airspeeds and altitudes.

We know that the zero lanyard device is not the answer to all the questions and is certainly a poor substitute for a rocket type ejection seat or the man separator ("butt snapper"), but like everything else in this game, improvements on the various systems take time and money. The sled came before the wheel, and the zero lanyard before the rocket seat and "butt snapper," and it will be with us for quite some time. The F-100 fleet, along with the jet trainers, some jet bombers and interceptors, will be modified with the man separator in the near future, but don't look for the installation of a rocket seat, at least for some time to come. With the advent of the man separator system, the ol' zero lanyard will still be used. In researching the records of zero lanyard versus non-zero lanyard low altitude ejections, we came up with some rather impressive figures:

• Out of 36 ejections below 1000 feet from F-100 aircraft since 1 January 1958 to the present date, 17 pilots used the zero lanyard which resulted in 11 "no injuries"; 3 received minor injuries, and 3 major. There were no fatalities. On the other hand, those pilots who had to get out at low altitude and who didn't use the zero lanyard, ended up with some pretty startling figures to show why you should use it: out of 11 reported ejections, 6 received "no injuries," and 5 were taken off the USAF payroll—permanently. A pretty poor score for any game. (In the remaining 8 cases, data on the availability and use of the zero lanyard were not reported.)

We have heard a few diehards say they can hook up the lanyard in a split second IF the occasion necessitates its use. Buddy, try it under normal conditions. When it comes time to depart from the warmth and security of that cockpit, you won't, as a general rule, have time to do anything but GO! You'll be as busy as an English-speaking fire marshal at a Chinese firedrill. But, as we've said before: no one can make you use the zero lanyard, but a word to the wise should be sufficient. Besides, the figures don't lie. ★

by Capt. David H. Auld, Fighter Branch DFSR

Everybody loves a fat man-NOT TRUE anymore. Excess poundage, particularly for rated personnel is now a dirty word.

2400 PUSHUPS

Col. Kenneth E. Pletcher, USAF, MC, Asst. for Life Sciences, DIG for Safety

Ever hear or read the word DYSBARISM? Probably not unless you happen to be a fly-doc type. Anyway, dysbarism, as defined by the medics, means a condition of the body resulting from the existence of a pressure differential between the total ambient barometric pressure and the total pressures of dissolved and free gases within the body tissues, fluids and cavities.

Now, sir, if that isn't quite a mouthful, we'll put in with you, and what does it mean? Simply this: If you are one of the corpulent individuals still on flying status—look out! One of these fine days you are most likely to get some of that lard really squeezed either in ye olde altitude chamber or for real upstairs.

Recently a tubby pilot had a most unpleasant experience while going through the rigors of the USAF Physiological Training. He just plain couldn't take it in the chamber and had to be removed. Did he get his AF Form 1274? He did not nor will he until he sheds quite a surplus of lard.

It isn't always that easy. Last year a pilot passed out while flying a T-Bird at altitude and a nonrated passenger found himself in charge of the sizzling blow torch. Believe it or not the lad in the back seat actually landed the '33 and walked away intact. The pilot subsequently died. The cause? Dysbarism. The real cause can be chalked up to an overweight condition, that DID NOT NEED TO EXIST.

Only last month another pilot passed out in flight from the same cause. Again it was in a T-33. Fortunately, this chap recovered and was able to land the bird.

Now as you must suspect, the obese types are giving the doctors a lot of concern, and, as the author points out, it simply isn't necessary for anyone of normal frame and build to become fat in the first place. If nothing else, we suggest that your flight pay may be involved here so if you're a trifle lardy around the tummy, perhaps you'd best read on.

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A **philosopher once observed** that man does not desert his sins—they desert him! When we become incapable of sinning, we sin no more. Obviously, this desertion will vary from sin to sin in point of time as physical or mental capabilities wane. There is one sin, however, in which man can indulge beyond most others and that is overeating, with its attendant obesity. Everyone seems to contribute to the perpetuity of this regrettable indulgence. Physicians cure our ulcers, dentists give us most efficient teeth, cooks continue to prepare tempting dishes, and we continue, with these aids, to overeat. In many instances we are literally digging our graves with our teeth—either natural or artificial.

Quite aside from the psychosomatic or sensual pleasure of eating, it is now generally agreed that eating, among other things, is a compensatory mechanism or a substitute sin. Thus it is that as some other sins desert us, we substitute or accentuate overeating. This, unfortunately, usually occurs at a time in life when there is a natural physiological tendency to accumulate adipose tissue. This we do in alarming numbers and at an alarming cost to our physical well-being.

It has been proved that almost all of us become overweight by ingesting food, the caloric value of which exceeds the caloric value of expended energy. These excess calories are stored as fat, not only beneath the skin but throughout the body cavities, festooning and crowding the organs therein; along the blood vessels, and among the muscle fibers. The percentage of individuals among the general population who become obese because of glandular disorders is so small as to be insignificant when considered from the standpoint of military physical fitness.

Individuals addicted to alcohol or habit-forming drugs do not offer more excuses or alibis for their over-indulgences than do the addicts of excessive amounts of food. The old "glandular disorder" excuse has worn thin now, but we hear "heredity" blamed, and often an obese person is heard to say, "Yes, both my parents were fat so I can't escape being fat." This is arrant nonsense. Such relatively common excuses as these are often compounded by actual self-deception or absolute dishonesty as exemplified in cheating on weight reducing diets. The obviously ludicrous results of such deception are self-evident in more ways than one.

It is true that the weight and configuration of skeletal structure varies from individual to individual. This can be and most often is a familial characteristic. It does not follow, however, that even those with heavy skeletal structure have the necessity or an hereditary right to overpad this framework with tissue that is of little use to them—tissue which, in fact, is most often very harmful. On the basis of skeletal structure and muscle mass, discussed next, new weight-height tables have been evolved which do not consider any but one increment of age.

Authorities are generally agreed now that the actual active muscle mass of the body does not increase beyond the age of 25 years. Unless we stay in, or bring ourselves to, a state of good physical condition, our muscle mass quite probably actually declines as we grow older. Weight gain, then, past the age of 25 does not represent a gain in serviceable, actively metabolizing tissue, but rather a gain in adipose tissue which we can ill afford to carry about with us. On this fact is based the most recent view that from the age of 25 years onward, we should keep approximately the same weight. Most of us, perhaps, should weigh a few pounds less as our active muscle mass actually decreases.

Recently published height-weight tables based on the concept discussed are given here. These tables were worked out, not on the average of the general population, but on the basis of who lives the longest. Heights are given barefoot, and the range allows for differences in the amount of muscle and the length of torso in proportion to length of legs.

Healthy Weights (Men—Aged 24 and over)

Height	*Small Frame*	*Medium Frame*	*Large Frame*
5′4″	121 - 131	129 - 139	136 - 148
5′6″	128 - 138	136 - 146	144 - 157
5′8″	135 - 146	144 - 155	152 - 165
5′10″	142 - 153	151 - 162	159 - 174
6′0″	151 - 163	160 - 172	168 - 184
6′2″	162 - 174	170 - 183	178 - 196

Women (Aged 25 and Over)

Height	*Small Frame*	*Medium Frame*	*Large Frame*
5′0″	107 - 115	114 - 122	121 - 132
5′2″	113 - 122	121 - 130	128 - 139
5′4″	120 - 129	127 - 137	135 - 147
5′6″	125 - 135	133 - 143	141 - 154
5′8″	132 - 143	141 - 152	148 - 162
5′10″	138 - 149	147 - 158	155 - 169

As a matter of practical interest, let's consider for a moment the so-called "familial" obesity. It is predicated most often on familial food preparation and *eating habits* rather than on structural inheritance. The child of obese, over-eating parents sits at a well-filled board, from which he becomes accustomed to over-filling himself. Thus in youth he develops eating habits which will eventually lead him to obesity and its attendant effects. Had this same individual been reared in a more abstemious environment, his eating habits would undoubtedly have been such that he could easily avoid becoming obese.

That eating greater or lesser amounts of food is actually a habit can be demonstrated by example and practice. During the past war, Allied prisoners of the Germans and Japanese became accustomed to eating small amounts of food, often of poor quality. When liberated and provided with almost unlimited quantities of food, they were unable to eat large amounts without becoming ill. Undoubtedly in a number of cases physiological and even structural changes had taken place which influenced this fact. Also true, however, is the fact that these individuals had become adjusted both physically and mentally to ingesting much smaller quantities of food than perhaps they had ever been accustomed. This habit, once established tended to remain with them. In like manner, the individual who voluntarily accustoms himself to smaller amounts of food will find that his psychosomatic demands for food are much less, and it becomes quite easy for him to attain and maintain a proper and healthful weight. Similarly maintained and developed are the habits of overeating and the preference for concentrated carbohydrate or other rich, fat-producing food. Eating habits, once established, are difficult to break or change, but they can be broken, changed, and replaced by a different eating habit pattern.

An actuarial study recently reported in the United States brought out these facts:

- Between the ages of 20 and 64 overweight men have a death rate 50% higher than their normal weight contemporaries. (Overweight is defined as being 10% above the ideal weight for any given height and body build as set forth in the table given above.) Overweight women have a death rate 47% higher.
- For both men and women, the death rate goes up in proportion to excess weight.
- Deaths from diseases of the heart, arteries, and the kidneys are from 50% to 77% more common among the obese; cerebral hemorrhages ("strokes") are 60% higher; deaths from diabetes are 300% higher. When these facts are considered in the light of a military population they are significant, not only from the standpoint of mortality, but also from the standpoint of morbidity, which reflects in the percentage of non-effectives in any given organization, through a major force, such as the Air Force, to a country's total effective manpower.

The relationship of obesity to general physical well-being and to physical fitness in particular is obviously quite close. During WW II, the USAF conducted a rather rigorous physical conditioning program. There were a certain number of young individuals who collapsed from one cause or another while exercising. A significant percentage of those individuals died of coronary occlusion. Almost without exception, they were obese individuals—some of them were as young as 19 years. Here obviously is something that requires attention, particularly among physically trained individuals, for it is well known that an athlete, once he goes out of training, tends to become obese. A relatively sedentary life, coupled with the eating habits he has developed while active, militate to make him fat.

What can be done about all this? What lines of action are appropriate to take? It has been said that the best *exercise* for reducing body weight consists of grasping the edge of the dinner table firmly when you have half finished eating, pushing yourself away from the table, arising, and walking briskly from the room. This witticism is really well stated, as the solution to the obesity problem is *diet* first, *exercise* next, although

2400 PUSHUPS (Cont.)

the two should be concurrent. When we consider that in order to lose a pound of body fat it is necessary to walk a distance of 36 miles, or to do 2400 pushups, it becomes clear that exercise alone is certainly not the primary answer. On the other hand, moderate exercise plays an extremely important role in any program of weight reduction, as it will largely prevent the feeling of fatigue or weakness incident to weight loss, helps in the alleviation of nervousness and irritability and maintains muscular and skin tone.

As to the matter of diet, it is certainly improper to starve in order to lose excess fat. The ingestion of a high protein, low carbohydrate, relatively low fat of from 1000 to 1500 calories, perhaps with some vitamin supplements—particularly B-complex—combined with a moderate exercise regimen is the best accepted remedy for obesity.

It is important to remember that we can't just reduce and then forget about it. We must adjust our diets consonant with our various activities to maintain a proper weight once it has been achieved. In addition, there must be maintained that degree of physical fitness consistent with the demands of our daily work and healthy physiological body function. This can be achieved by a common sense program of physical conditioning which can be tailored to suit an individual or groups of individuals engaged in the same or similar endeavors.

We may here profitably refer to the use of drugs in weight reduction. Many have been advocated and not a few used extensively. Few, if any, are of any lasting value, and none should be used without medical advice and supervision.

We have seen that obesity is generally a voluntarily correctable condition. No program of physical conditioning is complete or even safe without attention to the correction of obesity in overweight individuals required to participate in such programs. The obese individual has a lifetime problem. He can't reduce and then forget about it. He has to keep it in mind and do something about it for the rest of his life. ★

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Rex Says

An accident report of an F-102A aircraft that was flown into the water at night, closed with the valid recommendation that Aerospace Safety Magazine publish occasional articles relating to low level intercepts to keep the pilot continuously aware of the dangers of on-the-deck interceptions. This is a good recommendation and the staff is happy to comply. Just let us have some material on which to base a story.

The accident board also stated that it had researched back issues of this magazine and The Interceptor, ADC's publication, and found nothing printed about the dangers of performing low level interceptions. A check with the Fighter Branch, DFSR, has revealed no similar accident, no incident reports, OHRs or URs on this problem, which explains why there has been no information for such an article. Probably some pilots have had near misses while performing low altitude interceptions, day or night, but have not reported them. This is, of course, regrettable, because the experience learned by an individual or a unit should be made available to other crewmembers involved in the same type of operation of the same or similar aircraft. Taking just five minutes—after a flight—to report any unusual happenings or near accidents is not excessive when one considers the payoff. The help-your-buddy philosophy is a healthy one, and—like courtesy—it can become contagious.

REX SAYS—The lesson here is that each pilot should be aware of the requirement to crosscheck flight instruments prior to, during and after lock-on to insure adequate terrain clearance during low altitude intercepts so he won't lock on to the altitude line, ground targets and/or ships. If an attempt is made to follow the steering dot, it's possible to fly into the ground or water.

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Here's more about the reduction of air/ground radio frequency congestion, a problem rather well known. A recent ALZICOM message states the FAA has informed Hq USAF that congestion on UHF channels assigned to FAA towers has reached the point where remedial action is imperative. As a result an agreement has been reached whereby FAA regions will negotiate frequency realignment for FAA control towers at the local level to resolve individual interference problems. The UHF frequencies 257.8, 263.0 and 348.6 mcs, Channels 4, 7 and 8, will be utilized on a discrete rather than common basis to provide interference free primary control tower operation insofar as possible. Hq USAF asks that its units cooperate with FAA representatives in any meetings conducted on this subject. Also that aircrews be cautioned to assure that appropriate frequencies are available in the aircraft prior to takeoff en route to civil airports.

REX SAYS—This old problem has stalked the airways for some time now and it's going to require the efforts of everyone who uses them to correct the situation. Flight Facilities at the Western AACS Region wraps it up pretty well in the article entitled "Don't Talk—Unless," on page 25.

Along this same line, Hq USAF has announced a new training film titled "Air Traffic Control Procedures" (TF-1-5350) made available to base film libraries on or about 15 November. The film, 16 mm black & white, provides current terminology, standard instrument and voice procedures to produce greater flight safety, operational effectiveness and pilot efficiency, and to improve pilot-controller relationship. Perhaps your library has it by now.

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An Assistant Squadron Maintenance Officer was all set up to make a high speed taxi check on the brakes of an F-101B, but with no intent to fly. This was one day last June, right after lunch, and some of us still remember that it does get hot in the western desert area of the U.S. That afternoon this troop made three high speed acceleration checks with heavy braking each time. Near the end of the third run the right brake caught fire and the soon-to-be-bent F-101B taxied off the runway. The hose and ladder department came to the rescue and put out the fire. Before that airplane flies again, however, it'll need a right wing, new right landing gear assembly, two new brakes, two new wheels, tires, assorted electrical wiring, hydraulic lines and most of the left hand gear assembly.

REX SAYS—If you haven't determined yet that this brake check incident was attributed to pilot error, let me assure you that it was, and rightly so. The high speed runs were started with 13,000 pounds of fuel aboard for a gross weight of 45,000 pounds. Then to make three high speed runs, one right after the other, is just begging for what happened. And what are your ground rules for acceleration and brake checks? If you have rules, will they prevent a similar incident, and do all your pilots know them? ★

CROSS COUNTY NOTES FROM REX RILEY

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Some of you may already know that Air Training Command is implementing the consolidated pilot training concept (preflight to pinning on wings) at the bases listed below. This change affects airplane drivers in their cross-country flight planning since the six ATC bases will be restricted to OFFICIAL BUSINESS ONLY. Therefore, these bases —with the exception of Webb—will not be available for refueling or RON stops nor for use as an alternate airfield. The airpatch will be open only when student flying is in progress. The bases affected are:

- Williams AFB, Arizona.
- Webb AFB, Texas. (Alternate Only)
- Reese AFB, Texas.
- Vance AFB, Oklahoma.
- Craig AFB, Alabama.
- Moody AFB, Georgia.

The restriction on these bases goes into effect 1 January 1961. However, when flight planning, you'd better take a good long look at the En Route Supplement and NOTAMS, inasmuch as ATC has requested that some of these installations be placed in this category prior to 1 January 1961.

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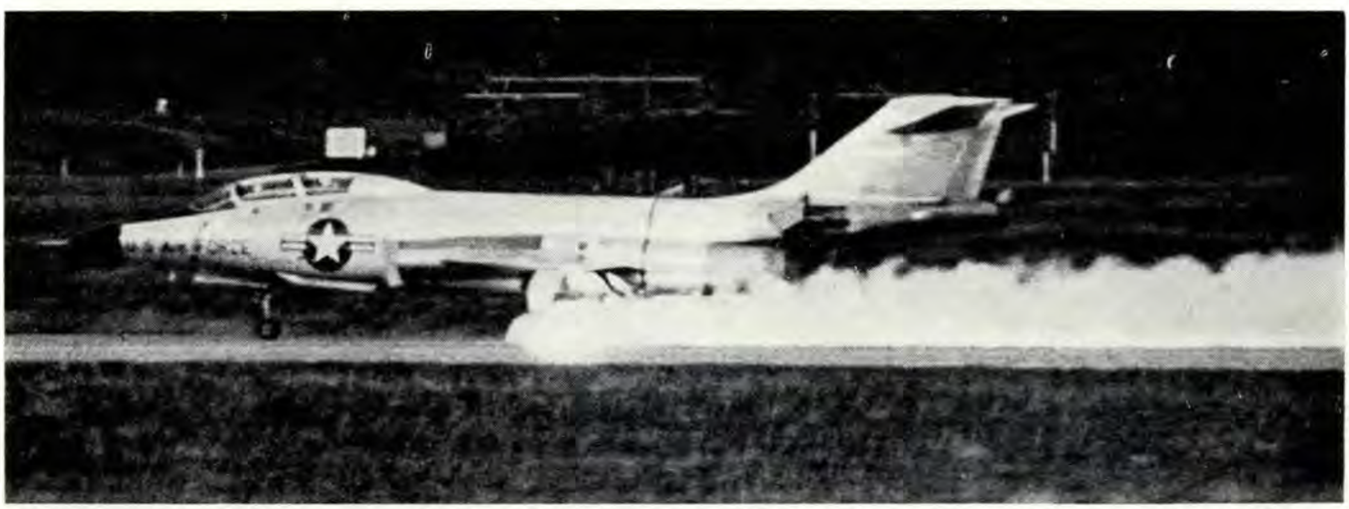


Mr. George McCain, Egress Systems Insp., demonstrates use of mockup. Do you have a similar trainer on which to practice ejection procedures?

YOU CAN READ AND STUDY EJECTION PROCEDURES 'TIL YOU'RE BLUE IN THE FACE, BUT IF YOU EVER HAVE TO GO, YOU'LL BE GLAD YOU PRACTICED . . .

IN THE DRIVER'S SEAT

Capt. Patrick H. Blue, Personal Equipment Officer, 3800th AB Wg, Maxwell AFB, Ala.

Maxwell Air Force Base—the location of the Air University and the center of USAF officer education—is home station to a large collection of rated flying personnel. For instance, in 1959, our Form 5 Section logged the time for approximately 4000 pilots and navigators; of this number only about 600 are permanently assigned. Any way you slice it, this constitutes a kingsize herd of CRT aviators, over 3000 of whom are short-timers. Needless to say, we do have checkout problems.

Some years ago when our parking area was covered with C-45s, the operation of the driver's seat was limited to a conveniently placed crank. The '45s were boneyard-bound however, and our ramp is now filled with T-Birds. Result: the handcrank seat is now an "egress system" with a maze of handles, triggers, pins, initiators, buttons, lanyards, swivel links, belts, hoses and connectors, and a "seat briefing" is considerably more comprehensive than "clockwise or counterclockwise."

More statistics: of the 4000 flyers passing through Maxwell each year, less than 50% are T-Bird qualified. Among the qualified jocks there are many who are not current. An individual briefing for each of the troops would be impossible to schedule and, in all probability, would not be standardized. Some kind of training program appeared essential.

Mr. George McCain, Egress System Inspector, was "volunteered" to build a suitable mockup. With a seat from the salvage yard, condemned initiators (inert, of course), hoses, belt, and a little touchup paint, Mr. McCain delivered to us an egress system mockup with everything but a live catapult. Personal Equipment added an S.A.-17 chute, P-4 helmet and mask, and Base Shops mounted the whole works on a small platform with casters. All that was needed now was an audience (a matter immediately taken care of by our Flying Safety Officer). The ejection seat program as it exists now runs something like this:

- Each student officer attends a short lecture as a part of his Maxwell orientation.

- Periodic lectures are part of the Base flying safety program.

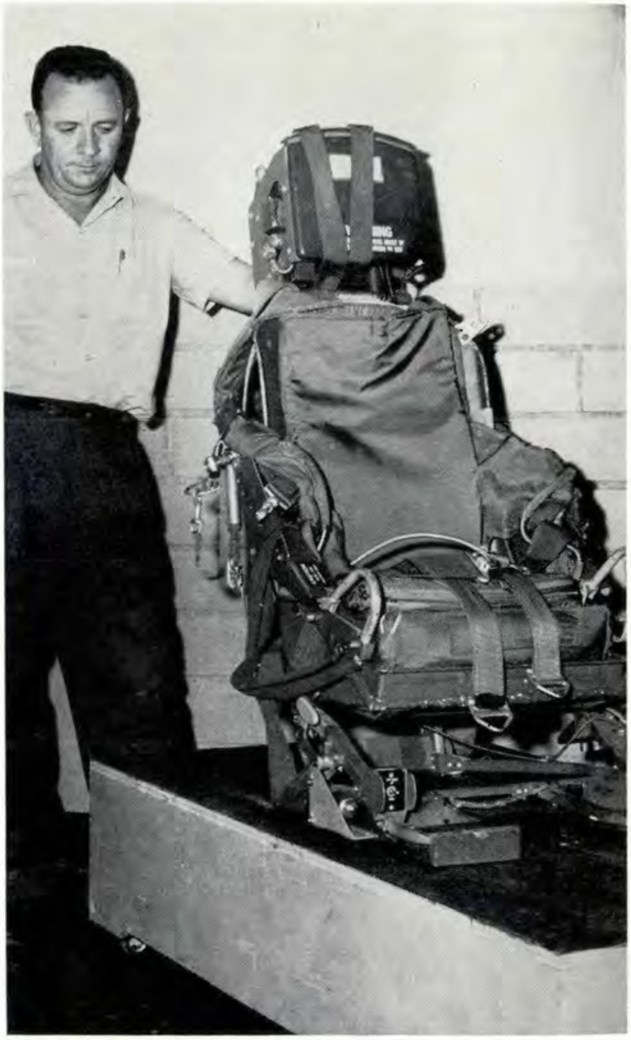
- The mockup is used in discussing items of special interest at the monthly standboard meetings.

- The mockup is available for loan to any of the tenant units for their flysafe programs.

We've discovered that teaching the ejection procedure is vastly simplified when the student can actually raise the armrests and squeeze a trigger. Operation of the auxiliary canopy remover, removal and replacement of pins, seat adjustment, proper hookup of harness, oxygen hose and zero launch lanyard are just a few items which are easily clarified through the use of the mockup.

The mockup is parked in Operations Dispatch where it is available to anyone who is curious, interested, or needs to know. It is particularly helpful to pilots who are carrying nonrated passengers. There are at least two persons on duty at all times who are qualified to answer questions on ejection procedures and personal equipment. This service is available at night and on weekends.

Besides its use in the Maxwell flysafe program, the mockup is used to brief distinguished visitors (DVs), CAP encampments, and ROTC orientation programs. Since our biggest expense was a few manhours for a training aid which is used daily, we feel it is a pretty shrewd investment. ★



Mr. McCain constructed the mockup entirely out of salvaged parts.

Did you ever have any questions as to what happens when you squeeze the trigger? In the setup at Maxwell, not only can you get the mechanics of ejection down pat, you also have the inner workings of the system explained in detail.

A GROWING

Lt. Col. John A. Briggs

When one considers the enormous quantities of highly explosive fuels, the tremendous pressures of compressed gases, the explosive quality of ordnance components, and the ever-present high level electromagnetic radiation associated with a missile launch complex, it presents an awesome safety problem indeed. The complexity of today's missile weapon systems is generally recognized. What is not clearly understood are the hazards associated with the preparation for, and actual launch of a missile, whether in research and development testing, or in combat training launches.

I wish to describe briefly some of the hazards involved, the safety procedures and practices which have been established by the Air Force and industry, and to review our safety record to date. It is an outstanding record and one of which we can be justifiably proud. As of this writing there has not been a single Air Force fatality attributable to its missile operations.

Missile Hazards—Liquid oxygen (LOX), an intensely cold liquid which boils at —297°F, and its counterpart, gaseous oxygen, support combustion violently and form dangerously explosive mixtures with combustible substances such as gasoline, oils and greases, which can be set off by shock, spark or flame. A petroleum derivative called RP-1 and highly flammable, when mixed with an oxidizer such as LOX, under a controlled environment provides the thrust required to propel a missile into space. It is also highly explosive in the combined or gel state when not properly controlled.

All compressed gases are potentially explosive. In an Atlas launch complex, for instance, oxygen, nitrogen, helium, and air are utilized. Pressures range from a few pounds per square inch in the missile tanks to 6000 psi in the nitrogen and helium tanks. Hazards associated with these gases can cause suffocation, explosion and physical maiming.

Many explosive ordnance components are associated with missile weapon systems: destruct packages, retro rockets, ignitors and separation charges. Destruct packages and retro rockets can be ignited by flame, sparks, or electromagnetic radiation. Ignitors are especially dangerous and can be detonated by being near flame or hot surface, by mechanical shock, static electricity and excessive current.

Electromagnetic radiation is prevalent in many forms and emanates from many sources. It can damage the genes, eyes, or other parts of the body. It can transform fuel vapors into explosive hazards, and most important it can cause relays and solenoid valves to operate out of sequence, which makes for a serious explosion hazard during propellent transfer and engine firing.

The foregoing represents a hazard potential of considerable magnitude. Interaction of chemicals, explosive components, and electromagnetic radiation presents a rather frightening environment to be working in. The hazard potential points up the absolute necessity for strict discipline in following established procedures, and for constant safety supervision of the launch pad area. Determined efforts in this field have resulted in the excellent safety record achieved at both the Atlantic Missile Range at Patrick AFB, and the Pacific Missile Range at Vandenberg AFB.

Missile Safety Procedures — Pad and Range Safety. An area of major concern to the Air Force, Pan American and the contractors at the Cape was the proper siting of launch facilities to insure protection of adjoining facilities, and to allow positive control of personnel. Strict control of hazard-generating activities such as propellent transfer, ordnance, handling and checkout, and pressurization of missile systems had to be established and closely supervised.

Of equal importance was the development of reliable flight surveillance equipment and the training of personnel in the interests of range safety. A positive missile destruct or flight termination capability was essential to insure protection of private and government property and human lives.

To answer this need the Air Force, in close cooperation with industry, has developed and published detailed plans which provide positive supervision of pad safety and range safety on a continuing basis. In many cases hazardous conditions were merely suspect. Unfortunately, trial and error were often the only method for developing procedures that were practical and economical which meant the exposure of large numbers of personnel to potential hazards. In spite of this, the frequency and severity of the accident rate have been consistently below that anticipated.

The Missile Safety Branch at AFMTC has published a General Range Safety Plan in two volumes:

- Volume I, Missile Handling.
- Volume II, Launch Operations.

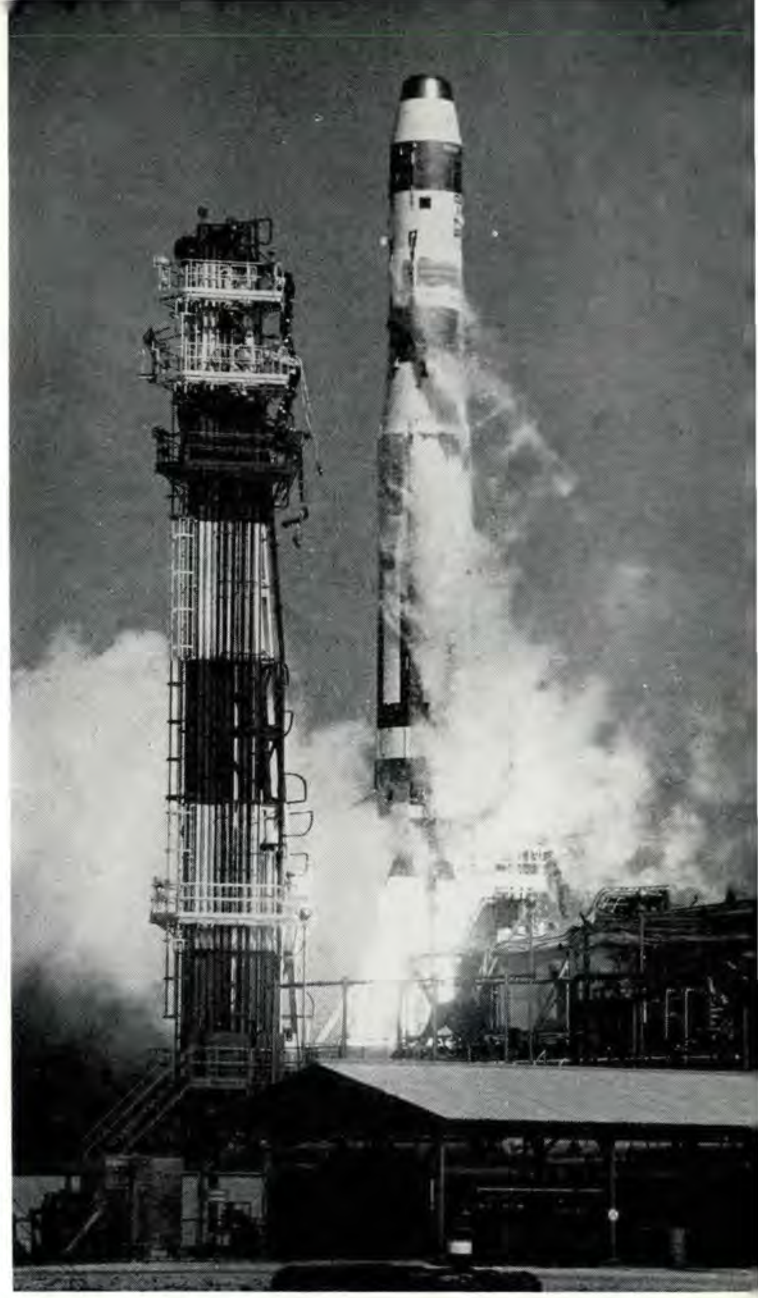
These two plans are the bibles for all personnel involved in missile operations. In addition to the Pad and Range Safety Plans, a definitive pad safety plan is published for each different missile weapon system. These plans spell out in detail the pad safety procedures to be followed by all personnel in the complex area. Of necessity, these individual pad safety plans are subject to frequent modification since research and development missiles differ considerably as the test phases progress toward an operational vehicle.

Pad Safety—At the Cape, Pan American, under contract to the Air Force, is responsible for the operation of all range ground support facilities. PAA is responsible for formulating, coordinating, and implementing safety procedures to be used in the pad complexes and launch areas.

The Pad Safety Supervisor is the senior representative of the Range Contractors (PAA), and the Range Safety Division (AFMTC). He is the chief of safety supervision during all launches, static tests, dual propellent loading or other hazardous tests. The Pad Safety Supervisor has final authority in all matters of safety within the launch complex and the land launch area, and is in charge of the activities of each missile launch impact convoy. In emergencies or incidents which may constitute a hazard his decisions are bind-

CHALLENGE

Directorate of Missile Safety Research



ing on all echelons of the military, civil service, missile and range contractors who are participating in missile handling and launch.

On the Air Force side, the Missile Safety Branch of the Range Safety Division exercises staff supervision over Pad Safety. The Missile Safety Branch establishes policies and procedures to minimize hazards involved in all missile ground operations including inadvertent impact of a missile on any land mass.

Missile contractors who are engaged in research and development test programs at the Cape are known as launch agencies. They are assisted by Pad Safety on all industrial safety problems which arise within their own launch complex. However, they are responsible for routine industrial safety problems and provide their own safety programs, which in turn are subject to the approval of Pad Safety (PAA) and the Missile Safety Branch (AF).

One of the most important functions of Pad Safety is the preparation of detailed checklists to be used by the Pad Safety Supervisor during all hazardous tests. The checklist for the specific operation is intended to prevent accidents by insuring that essential operations occur without omission and in planned sequence. These checklists must be constantly revised to keep abreast of new operational procedures or changes in the missile or support configurations. Deviation from set procedures, the Air Force and contractors have found to their sorrow, have been responsible for many mishaps that otherwise could have been avoided.

During a missile launch the Pad Safety Supervisor is responsible for clearance of all personnel from the firing pad area and assuring that they are housed in appropriate shelters. He operates all the visual and aural warning devices that indicate a launch or hazardous condition exists. He has on his safety console a "Hold" switch which he can activate at any time during a countdown when in his opinion such action is necessary in the interest of safety. If the area is clear, and all inspections, checks, and actions necessary for the proper functioning of the airborne destruct system have been completed, the Pad Safety Supervisor advises the Range Safety Officer "The launch area is clear—clear to launch."

Range Safety—When all pad safety requirements have been satisfied the Range Safety Officer (RSO) assumes safety responsibilities from start to countdown to missile impact.

He operates under a Range Safety Plan which spells out in detail safety procedures and policies during the launch operations and subsequent flight. The objective of the Range Safety Plan is to minimize the possibility of a missile impacting outside the designated range, or on any vessel, aircraft, or object within the range, which might cause damage to life or property.

With aircraft, crewmembers can take on-the-spot action and make decisions. Missiles cannot. All safety measures must be taken before launch. As the author says, it's a growing challenge.

The list of range safety surveillance equipment is extensive and it is not intended to describe the equipment or functions in detail here. Suffice it to say that range safety equipment includes ground-installed radars, airborne search radar, visual observation posts, optical tracking equipment, television, missile borne radar beacons, and impact predictors. Data from all this equipment are plotted or visually displayed in Central Control where it furnishes positive position information on the missile from liftoff to impact down range.

One of the most vital pieces of equipment to the Range Safety Officer is the safety console located in Central Control at the Cape. This console provides an 8-inch dial for display of optical sky screen data, control panels for flight termination systems, a hold fire switch, first motion light, automatic timer, and controls for all range safety communications circuits.

The Range Safety Officer in Central Control has full range safety responsibility until he transfers it to other down range safety officers. He makes all decisions regarding range safety status and range safety holds. He directs and coordinates all range safety operations. He monitors the radar plotting boards and sky screen presentations to determine if the missile is in fact performing as programmed and that it will impact within the prescribed range boundaries.

To assist him in his task, an Electronic Skyscreen Safety Officer monitors the track or azimuth of the missile and advises the Range Safety Officer when the missile behavior is abnormal or "Red." Also, the Impact Predictor Range Safety Officer monitors the impact predictor display in Central Control and keeps the RSO advised of the safety status of the missile. If at any time in the judgment of the RSO a missile is going to violate the established range safety criteria, it is his responsibility to initiate flight termination immediately.

The Air Force Safety Record—The First Missile Division, Vandenberg AFB, has patterned its safety plans and procedures on the experience gained at the Atlantic Missile Range. It also has a pad safety plan for each missile complex and detailed countdown checklists for each hazardous operation. The methods which had often been the result of trial and error at the Cape in the early stage of missile operations were now tried and proven; and they were adopted by the First Missile Division as standard operating procedures.

Has the Air Force's strict adherence to proper safety practices and procedures paid off? The answer is yes. The Air Force has had a remarkable safety record despite the potentially hazardous environment it must operate in.

The first missile, a German V-2, was launched at the Cape in July 1950. The record as of March 1960 for the AF Missile Test Center at Patrick AFB is impressive. There have been a total of 158 ballistic and 148 air-breathing missile launchings; and 45 static firings and 57 dual propellent loadings have been accomplished on ballistic missiles during the same period. In all these launches, static firings, and dual propellent loadings, only 10 mishaps have occurred. Although damage to the pad areas has been experienced, not a single fatality can be attributed to a missile accident. In major cruise and ballistic tests subsequent to launch, less than 6% have required Range Safety action. In no case has Range Safety action resulted in personal injury or damage to private property.

The cooperation given the Air Force by Pan American and the launch agencies at Patrick AFB has been exemplary. Planning for the safe siting and handling of future missile and space vehicles is proceeding well in advance of the actual arrival of the first research and development articles.

The Pacific Missile Range and the training and operational facilities at Vandenberg have been in operation only since December 1958. Up until the middle of April 1960, 16 ballistic missile launchings, 3 static firings, 52 single propellent loadings and 200 double propellent loadings have been accomplished with only 5 mishaps occurring. This record is all the more remarkable when one considers that Vandenberg is basically a training facility and most of the personnel involved in missile operations have a very low experience level.

Missile Safety In The Future—So much for the record to date. What can we foresee in the future?

Today's missiles are extraordinarly complex. They are so critically engineered that the slightest materiel deficiency or human error can result in an irretrievable loss costing millions of dollars. The protection of missile crews and the life and property at missile sites, and above all the protection of life and property of our civilian population, is a matter of grave concern to those of us in the missile safety business.

Missile Safety problems will increase in direct proportion to the growing numbers of missiles entering the Air Force operational inventory. Compounding the hazards associated with the increase in numbers of operational sites manned on an alert status will be the introduction of the second generation MINUTEMAN long range missile with solid propellent motors of high specific impulse and mass ratio, and the advanced TITAN, which will be powered by noncryogenic, storable liquid fuels. The exotic fuels used in TITAN II will be hypergolic, igniting instantaneously on contact with each other.

Both the use of large solid propellent boosters and hypergolic fuels represent a hazard increase by several orders of magnitude. There are many unknowns facing both industry and the Air Force in the handling of missile with such lethal and explosive propellents.

Intensive effort will be required on the part of industry and the Air Force to assure that from design to target, safety and reliability are inherent in missile weapon systems. Quality control of all missile components, education on hazards associated with highly volatile fuels and oxidizers, and above all the establishment of, and rigid adherence to, safe practices and procedures will provide the impetus for a successful missile program.

It is a challenging responsibility for the Office of the Deputy Inspector General for Safety. The effectiveness of the deterrent posture of the U. S. will depend in large measure on aggressive safety programs aimed at conserving the combat capability of a missile force in an alert posture ready to strike immediately if an aggressor should be foolish enough to attack the Free World Our survival depends on a strong mixed force of missiles and manned bombers.

Every accident degrades our operational capability and reduces the military resources available to the U. S. The primary objectives of our missile accident prevention program are to keep accidents to the barest minimum and the fatality rate at zero. ★

11th Air Division
Ladd Air Force Base, AAC

319th Fighter Interceptor Squadron
Bunker Hill Air Force Base, Indiana, ADC

48th Fighter Interceptor Squadron
Langley Air Force Base, Virginia, ADC

325th Fighter Wing
McChord Air Force Base, Washington, ADC

328th Fighter Group
Richards-Gebaur Air Force Base, Missouri, ADC

3615th Pilot Training Wing
Craig Air Force Base, Alabama, ATC

5700th Air Base Group
Albrook Air Force Base, Canal Zone, CAIRC

1370th Photo Mapping Wing
Turner Air Force Base, Georgia, MATS

FLIGHT SAFETY AWARDS

These units were selected to receive USAF Flying Safety Awards for the period ending 30 June 1960.

21st Tactical Fighter Wing
Misawa Air Base, Japan, PACAF

2d Bombardment Wing
Hunter Air Force Base, Georgia, SAC

14th Air Division
Beale Air Force Base, California, SAC

4th Air Division
Barksdale Air Force Base, Louisiana, SAC

820th Air Division
Plattsburgh Air Force Base, New York, SAC

615th Tactical Fighter Squadron
England Air Force Base, Louisiana, TAC

4505th Air Refueling Wing
Langley Air Force Base, Virginia, TAC

837th Air Division
Shaw Air Force Base, South Carolina, TAC

50th Tactical Fighter Wing
Hahn Air Base, Germany, USAFE

47th Bombardment Wing
RAF, Sculthorpe, England, USAFE

7272d Air Base Wing
Wheelus Air Base, Libya, USAFE

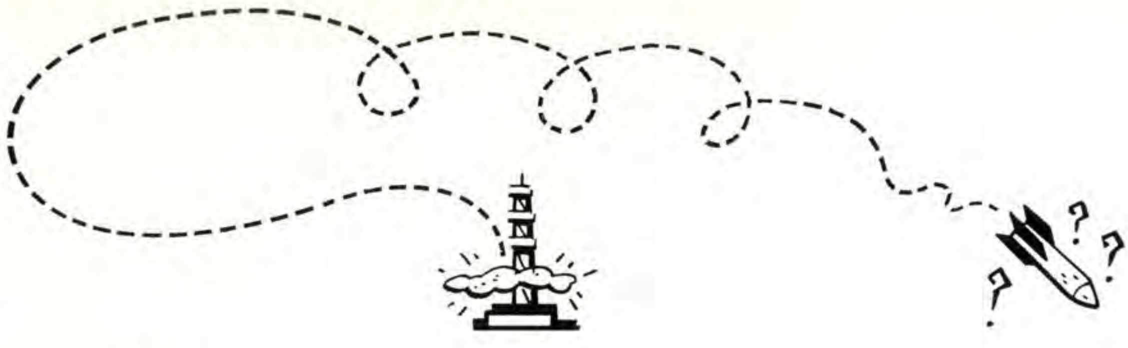
431st Fighter Interceptor Squadron
Zaragoza Air Base, Spain, USAFE

134th Fighter Interceptor Squadron
Burlington, Vermont, ANG

183d Aeromedical Transport Squadron
Jackson, Mississippi, ANG

514th Troop Carrier Wing
Mitchel Air Force Base, New York, AFRES

459th Troop Carrier Wing
Andrews Air Force Base, Washington, D.C., AFRES



CHUMLEY AND THE MISSILE BADGE

The yellow light of the television cast a more ghastly than usual pallor on the ill-shaped form slumped in a single overstuffed chair. The stacks of shipping crates, paper boxes, half-opened clothes containers and other household goods, plus the action on the late, late movie, were mute evidence that C. Z. Chumley, the World's Greatest Aeronaut, had become remiss in his duties associated with moving. And he knew that he'd get it when the ever-lovin' spouse returned from the train station with the kiddies who had been parked with grandma during the PCS. But what th' heck! It wasn't every night that he could see a movie like "Charge of the Royal Missileers."

The scene on the magic box depicted a Boy Scout-looking, brevet second leftenant standing erect in front of the desert outpost commander. Basil Rotbotom slowly unwound from his chair.

"I had hoped to meet you before you took out your first patrol, leftenant. Perhaps we might have avoided all this bloody mess."

The youngster's lip quivered but he remained silent.

"I mean first patrol and all that . . . well, you can see for yourself, even just out of Oxford . . . three men left out of a patrol of 90 . . . awfully bad taste you know . . . doing the wrong thing when the going got a little sticky. Looks bad to the front office."

Basil drew a deep breath, slapped at his boot with his riding crop, faced the huge map of "Injah" and spoke again: "I have no other choice. Six months at half rations, no pay for three months, and confinement to the post until further notice. Believe me, your punishment is not personal and feelings have not influenced my decision. Anything to say in your behalf, leftenant?"

"No sir. Nothing at all."

Basil was seated again, looking for something on his desk. The click of heels brought his eyes to the leftenant's salute. It was returned in military fashion. The lad started for the door.

"Just a minute, lad." The Lieutenant froze in his tracks. "By the by, how's your mother, son?"

"Just fine, sir. She often speaks of you, father."

"That's good. Dismissed!"

The train had been delayed and by the time Mrs. Chumley had returned with the brood, CZ had awakened, turned off the test pattern, bolted some "Crumchies," and had made it to base headquarters on time. The base seemed fresh and clean. A new start, thought CZ. A new start on a new base—just 47.9 miles from the nearest village. Oh well, at least no one here knew of him—he hoped. The nice looking secretary showed the way to the CO's office. Although startled by some strange familiarity in the presence of the Colonel, Chaunce came to attention and reported in. The CO looked up at the irregular shape standing in front of his desk, settled back into his chair and spoke.

"Well Chumley, I suppose you're all settled by now—housing, schools, base sticker and all—and are ready to hit the old ball? I think you'll like this part of the Air Force. What do you think of this missile business?"

The friendliness of the voice threw the World's Greatest Aeronaut. "I'll do better, sir," CZ blurted from force of habit, then catching himself, continued, "I mean I know I'll like the work and that it won't be any time at all until I'll have that launch success

Archie D. Caldwell, Asst. For Records & Statistics, DIG Safety

rate up to 99 and 44/100%, then that ol' missile badge will be mine and . . . "

"Well Captain, I think we must walk before we run, but I'm sure you'll work in just fine. You will report to Major Hartung for specific duty assignment. That will be all."

The following days and weeks quickly melted into months, and with each month, more knowledge and know-how about missile operation were picked up by CZ. Unsure at first, Chumley became self-assured almost to the point of overconfidence. He knew almost all of the new words: hypergolic, ATRAN, IRFNA and such; he knew that roll and pitch programming were not baseball terms; in short, he had the course hacked. But with his self-assurance came many of the old Chumley ways, such as the incident of the home-built rocket explosion that demolished the garage and the better portion of the patio—little things like that.

The clear December dawn gave a strange background to the Christmas tree lights that had not been turned off the night before, but it was a clear day, the first one in weeks. CZ was happy for the operational crew assigned to him would have their semiannual training launch and would be home for the holidays. The slightly scorched Jag (it had been in the garage) laid tracks for the base. Inside the launch control room CZ took his place as the "head man," as he referred to it. Everything was going smoothly and the crew hadn't forgotten a thing. They knew their business, all right, he thought.

"T minus 15 minutes and counting," a metallic voice from the speaker said.

Chaunce looked at the clock. "Couldn't be going better if I had Von Braun here in my lap," he thought.

"T minus 6 minutes," the voice called.

The Range Safety Officer called for additional checks. Radar was being received by the missile beacon. Gyros were "at speed." CZ could visualize his missile badge.

"T minus 30 seconds . . . 10 . . . 9 . . . 8 . . . " Suddenly, "Holding . . . we are Holding."

Chaunce grabbed every phone in sight. Minutes went by. What was the delay? Something that *looked like* a plane. . . .

"No sweat, lads. Pick up the count on my signal," CZ called hurriedly. "Minus 10 seconds . . . 9 . . . 8 . . . 7 . . . "

Crewmen raced for positions, and phones rang.

"Three . . . two . . . one . . . fire . . . and counting . . . "

Chumley was elated. He had made his own very first launch, somewhat unassisted.

"Whattaya' doing?" . . . "Radar didn't acquire" . . . "We've lost the beacon . . . " "No, we've got it." "No, it's lost." "What happened?" "*Who* picked up the count like that?"

The voices ran together in CZ's ears. Outside, the missile rose from the launcher, climbed a hundred feet or so, dipped down, rolled twice, tried an outside loop and a Randolph Field B pattern.

The RSO reached for the button.

"NO—NO, John, not destruct, maybe we can salvage it, maybe we can."

"Too late, Chaunce old man. The button has done been pushed. Let's go outside and pick up the pieces."

As the pudgy figure and the RSO went through the door, some remarks as to CZ's contributions to the launch and the need for testimony over the holidays were made. However, they couldn't be heard over the sobbing of the pair.

The Colonel spoke of what may become known throughout the Air Force as a "cryogenic appreciation" of the busted bird and the findings of the accident board.

"Chumley, as you know, AF Reg 58-10 is explicit. The investigating board looked into every detail of the launch and your actions. Your eagerness was inexcusable. Those people who were here from the field had been impressed by experts. Your failure to follow established procedures in picking up the count, arguing with the Range Safety Officer on destruct, attempting to be president of the accident board . . . "

The Colonel continued. "You know that the launch of any Air Force missile, whether it be an ICBM, or a hypersonic test vehicle for ramjet engines a fraction of the size you lost, is the end result of an extremely well coordinated effort by a team—and note my use of the word *team*. No *one man* runs the whole show when it comes to these birds. The days of the individual fighter jock just don't fit when it comes to a TM-76, SM-65, IM-99 or any of the other missiles we have for our nation's protection. When you deprive the Air Force of the use of just one of these birds, you are cutting into our deterrent to prevent another "big one." It takes the best efforts of the best men we can find to get our missiles on the target. The best efforts of many more men than you ever see during the actual countdown. All of the people from the truck drivers, air installations, Air Police, MAB, fuel storage—all of them are a part of one big team. You have to become a part too, Chumley, or you just won't fit . . . "

"But everything had been going so nicely up to the time that . . . "

The CO cut CZ off. "I mean after all, doing the wrong things when the going got a little sticky looks bad to the front office. We could have lost a lot of people and equipment." The Colonel looked at the missile models on the wall. "I have no other choice. You are restricted from all actual duties connected with live launches until you've proved yourself capable of handling any and all situations and functions of the launch. *Then* you will have earned the missile badge. Until that time you may put it in your hope chest."

CZ reeled under the blow, started to make another excuse, then thought better of it.

"And I think I have just the man for staff duty officer over the Christmas weekend. Anything to say, Chumley?"

"No sir, nothing at all."

CZ saluted and started for the door.

"Just a minute, lad." CZ froze. What else could fall upon him?

"By the way, Chumley . . . "

"Yes sir?"

"Merry Christmas. Dismissed!" ★

THE NEW

On an early spring morning this year, in the Antelope Valley of Southern California, three F-104Fs made a scorching pass over the Lockheed ramp at Air Force Plant 42. Then they pulled up into a tight circle and made their landings. To the casual observer this activity was in no way any different from that which takes place every day at this busy jet center. The markings on the planes, however, were quite startling—Black Maltese Crosses on the wingtips and fuselages and the German tricolor flag on the high sweeping tails. If an observer could have been among the group of men on the Lockheed ramp he would have been immediately aware that this was a moment of great significance. For these men on the ramp—mechanics, inspectors, supervisors and pilots—this flight was the culmination of the most intense flying training activity in which they had ever participated.

For the precision-smooth pilots who had just displayed their skill, and for their nation, this moment marked the graduation of the first qualified instructor pilots in the newest weapon system they had acquired. As the leader of the formation taxied his '104 in and parked, a wide grin told of his satisfaction. And satisfied he should be! More than two years before this moment he had been instrumental in starting this chain of events by his participation in the German Air Force evaluation of supersonic manned weapons systems of the entire free world. Lt. Colonel Gunther Rall of the German Air Ministry was now following up on the next step of the introduction to the German Air Force of this potent weapon. To the West German Government, and to him, the graduation flight marked the beginning of the New German Luftwaffe and a vast training program that would eventually encompass combat trained pilots for approximately 650 all-weather fighter-bomber and fighter-interceptor F-104Gs.

Since the initial steps are so critical in an under-

Lockheed had a hot potato designing a training program to qualify the first of Germany's F-104 instructor pilots. Naturally, safety was a major requirement. This article tells you how a new program and safety can be interwoven right from the start.

Below, at Lockheed's Palmdale facility, Germany's first 104's get the same painstaking detail to maintenance as its flying training program.

LUFTWAFFE

Glenn Reaves, Asst. Chief Pilot
Fighter Flying
Lockheed Aircraft Corp., Palmdale, Cal.

taking of this scope, a very careful study had been made as to the method of obtaining the first cadre of instructor pilots. To the German Air Force, the most important requirement was not only laying the groundwork for operational instructors but also getting the best flight safety instruction available. Like the USAF, they are keenly aware of the necessity of preserving their weapon systems for the real conflict and of the need of fighting the danger of becoming ineffective from their own accident losses in peacetime training.

When the Germans decided definitely to come to Palmdale for their training, the Military Contracts Department notified Tony LeVier, Director of Flying Operations. He buoyantly tossed the hot Idaho to the Fighter Flying Department with the succinct command "Go to it!"

In the past this department had given ground school instruction to innumerable Air Force pilots and limited flying instruction to a few. Never before had we been offered the opportunity to conduct our concept of a thorough IP school for our "easy to fly, but unforgiving bird." Fortunately, the department enjoys the services of Mr. Gus Guisler, Production Liaison Coordinator and Supervisor in charge of ground school instruction on F-104s. And since Mr. Guisler had been conducting ground school instruction from the time the first '104 had rolled off the production line, ground school was in very capable hands. But the ground school was not the ogre on our backs that was growing uglier by the day. The sobering realization was that—despite our self-proclaimed eagerness to train the pilots of foreign governments—we actually did not have even a program outlined.

Perusal of the transition programs and flight cards of the Air Defense and Tactical Air Commands disclosed a fact that, while they were excellent for their purposes, they proved that nothing fits better than a

The flying classroom: two-place German F-104F.

Right, immediately after flight, author "Snake" Reaves, hammers home the good and bad points of the ride to Captain Flade.

The New Luftwaffe (Cont.)

tailor-made suit. The situation definitely dictated the need for a tailor-made IP Program.

First of all, then, we listed those facilities at our disposal for flight training and received great encouragement. Air Force Plant 42 at Palmdale has two 12,000-foot runways with jet barriers. Within a 100-nm radius of Palmdale there are 13 dry lakes with at least 10,000 feet of usable runway surface. And, of course, there is Edwards Dry Lake with 35,000 feet of smooth surface. Also, there are 10 military airfields within this radius that have 8000 or more feet of runway and comparable facilities.

Obviously, we did not overlook our greatest asset: the ready information from all the design engineers on the F-104 would be available for the answers to any and all questions that can come up on our little bird. This is really getting the *correct* information straight from the source!

We were determined to give the German pilots a course so thorough they couldn't help but know our aircraft from stem to stern. Into this program we poured the cumulated experience of over 900 F-104 test hours, and thousands of jet fighter hours with both WW II and Korean combat experience thrown in. And good flying safety sense was imbedded in every flight profile. The theme of the training could be summarized in this manner:

- At least one demonstration (and in many cases more than one) had to be given by the IP *before* the student was required, *or even allowed,* to attempt scheduled maneuvers.
- After close supervision on dual rides, students would be dispatched on solo flights which would keep them so busy, there would be only enough time to accomplish their flight profile.

Above, instructor conducts ground school on all systems and intense study of flight characteristics and performance. Below, before heading back to Germany instructors and students pose for one last picture.

- Immediately after dual and solo demonstrations of proficiency attained, the student would be launched upon the next phase of instruction.

The specifics of the outlined flights called for impressive totals. Within 34 flying hours, each student had to accomplish: 7:10 hooded instrument or weather time; 3:50 night time; 6:10 supersonic and subsonic formation time; 9 VOR penetrations; 8 GCAs; 8 SFOs; 40 landings.

On the morning that the DC-3 brought the students to Palmdale, we anxiously awaited our first look at the pilots we would be instructing. As they came out of the airplane one of our instructors stepped forward and made a welcoming speech (in German) that he had laboriously practiced. When he finished, one of the German pilots, who unknown to us had taken cadet training in the United States, replied in flawless dialect, "Speak English, Daddio, and tell me, where's my '104?" Thus disappeared our language concern.

Over a cup of "joe," in Flight Operations, we began to delve into the background of our students. And, man, what a cross-section they comprised! All the way from Lt. Colonel Rall, mentioned previously, with all his years of WW II combat and unique test experience, to Lt. Wolfgang von Stuermer, boy pilot and Alpine Yodeler, who boasted the grand total of 500 flying hours. Between these extremes were:

Captain Hans-Ulrich Flade, WW II veteran and handpicked squadron commander of the first '104 outfit.

Lt. Edmund Schultz, aeronautical engineer and fighter pilot, future instructor on flight characteristics and performance of the F-104.

Lt. Bernd Kuebart, flying safety expert and "glass-smooth" instrument pilot.

Lt. Berthold Klemm, continental bachelor and aircraft systems instructor.

Mr. James Jester, ex-USAF fighter pilot and now Messerschmitt's Chief Pilot.

Ground school progressed smoothly. Our respect for the German pilots increased daily at the quick, intelligent questions they asked. We would soon discover what returns our aggressive flight program, which took nothing for granted, would yield.

Actually, having these fine gentlemen to fly with, everything turned out to be a real ball. As all fighter jocks before them, they took to the '104 like ducks to water, and in the end were begging to fly some more. Our scheduling and flying went so smoothly that it amazed us even after watching topnotch USAF squadrons fly the wings off the beastie. In 19 days of flying with three F-104F aircraft, our program was completed with:

- No flying time lost due to maintenance.
- An average of three flights per day per aircraft.
- Only two aborts during the entire program.

And as we watched our proteges turn into flying experts in their new buggies, we fully realized the success of the program. At the joyful bash celebrating the completion and success of this new concept of factory training for instructor pilots we fondly bade our newly developed tigers "Auf Wiedersehen" and confidently settled back to await the Canadians, Dutch, Belgians, Japanese and, who knows? ★

DON'T TALK UNLESS...

The most serious air traffic control problem that existed in northern California, until October 1959, involved UHF frequency interference. In fact, six Air Force bases, all within a radius of 60 miles, were operating on USAF common UHF frequencies. Even under moderate traffic conditions, pilots and controllers had to contend with every form of interference problem, such as continuous requests to "say again," transmissions "blocked out," and instructions either not received at all or misunderstood. The most hazardous factor, of course, was interference on those frequencies being used to control IFR traffic. There were many instances wherein missed approaches, diversions and minimum fuel conditions resulted from UHF frequency interference and congestion.

In September 1959, Hqs Western Airways and Air Communications Service Region (WAACSR) at Hamilton AFB, presented a plan to USAF and FAA organizations in the area that would eliminate interference on UHF frequencies used for the control of instrument traffic. Basically, the plan called for realignment of USAF common frequencies with additional UHF discrete frequencies, to be allocated by major air commands and apportioned to ATC facilities at each base. The plan was implemented and published on 15 October 1959. With the aid of wide publicity plus the wholehearted cooperation of everyone concerned with the problem, remarkable success was achieved within 90 days.

The encouraging results of the WAACSR in northern California brought a request from USAF and the FAA equally concerned with similar problems in southern California for assistance in developing a plan for that area. Complying with this request, this headquarters developed a similar UHF discrete frequency plan for southern California.

In order to make sure that both IFR and VFR frequency interference would be eliminated in this area, a plan was designed to include discrete channelization on all terminal air traffic control frequencies. The southern California discrete frequency plan was implemented 1 July 1960, and now the consolidated discrete frequencies are published in the USAF/USN En Route Supplement for the entire state of California.

Although interference has ceased on IFR traffic control frequencies, it has persisted on those frequencies used for the control of VFR traffic. Control towers in close proximity have continued to report interference on USAF commons Channel 1 and 3 (local control and ground control). Although each Air Force base is authorized to channelize on a discrete Channel 2 for local control purposes, few have made use of it. Base aircraft might or might not be channelized on their discrete local control frequency. Additionally, misuse of the ground control frequency 275.8 mcs is a common occurrence.

In order to eliminate UHF frequency interference on VFR traffic frequencies, the following letter from Col. T. J. Ice, Commander, Western AACS Region quoted here has been sent to all USAF base commanders in the eight Western States, encouraging them to take vigorous action to insure the proper utilization of control tower frequencies. We believe that such action will provide greatly improved services and eliminate those major problems and hazards associated with any type of frequency interference.

"Severe interference is being encountered on Channel 1 (236.6 mc) Control Tower, common whenever two or more bases are located in the same general vicinity. As a result of Air Traffic Analysis performed by a team from this headquarters, it has been revealed that this interference is caused by the improper use of control tower frequencies. A majority of pilots, regardless of their assigned base or major command, are using the USAF Common Channel 1 while operating at their home base. Figure 24-28, Pages 24-44, AFM 100-24, 15 Nov 59, clearly outlines the proper use of Channel 1 and other frequencies normally assigned to Control Towers. The proper use of primary control tower frequencies are outlined below for your reference.

- Channel 1, 236.6 mc Terminal Control. This frequency should be used only by transient aircraft when contact is made with Control Towers other than their home base. This frequency should be used by home based aircraft only as a secondary frequency when contact cannot be established on the locally assigned tower frequency.
- Channel 2, Terminal Control. Each Air Command would assign a local discrete frequency to Channel 2. This should be used by all locally assigned aircraft for all terminal control functions except for ground control. In the case of locally assigned aircraft belonging to a tenant unit, they too should be channelized for the locally assigned frequency.
- Channel 3, 275.8 mc Ground Control. This frequency should be used for ground control functions only, except it may be used for transient aircraft terminal control functions when contact cannot be accomplished on the primary, Channel 1. Many bases are using this frequency for airborne formations, i.e., Special VFR control, and so on. When this is done the frequency is made practically worthless to neighboring bases.

As result of our combined efforts, we have made much progress in reducing frequency interference on approach control frequencies by development and execution of discrete frequency plans. This more than ever highlights the problems now encountered on Control Tower Frequencies. It is our firm belief that if all bases were to enforce the proper use of the control tower frequencies, most of the interference would be cleared up without further action.

I ask that you review your control tower frequency utilization. If it is not in accordance with AFM 100-24, every effort should be made to brief all locally assigned pilots and enter into a joint effort with the local AACS unit in the enforcement of proper control tower frequency use. The sooner you do this, the sooner AACS will be able to provide improved ATC service." ★

Hq Western AACS Region, Hamilton AFB, Calif.

Flamed out? Engine surging? Fuel Pressure and EGT falling? Wouldn't it be wonderful to punch one switch and get a . . .

...TRUE AUTOMATIC START

Capt. Norris J. Hanks, Project Officer, Flight Test Center, Edwards AFB, Calif.

A test program on the T-33 aircraft was recently completed at the Air Force Flight Test Center which included 298 airstart attempts and provided a wealth of new data on flameout and airstart characteristics. As a result of these tests the T-33 Dash One has been changed to reflect some of the lessons learned. Those of you who really study the "bible" will quickly spot the origin of the new procedures as you read the story. Without doubt, other changes will be forthcoming from the AFFTC's tests. We'll pass them on as soon as we know for sure when the revisions are going to be published. In the meantime we have some fine type data and experience that you should know now so that our nice little maidenly T-33s may be spared the indignity of the salvage yard. Production is ended, and extinction is in sight if we continue to have losses that could be avoided.

Three different T-33 aircraft were used for the test but most of the quantitative data was obtained from one with a photo panel installed and all of the current modifications completed. These modifications included a nickel-cadmium battery, combined battery/generator switch, main and standby inverters, secondary electrical bus, removal of the Cook pressure switch, and (for the last 96 airstarts) a gangbar airstart modification.

Although the various areas of test are interrelated and data was often obtained in several areas during one flameout, a combined discussion of the test results would get lost in details. So, the details will be presented first and then combined in a big commercial at the end.

FLAMEOUT AND GLIDE CHARACTERISTICS:

A standard type flameout is characterized by a rapidly developing silence as the engine whine unwinds, most of the gages go counter clockwise, the canopy seal blubbers and pressurization is lost, the generator cuts out at about 24%, and various warning lights come on. The aircraft attitude and response to control do not change but there is a definite loss of push. The hydraulic pressure stays up and, if at altitude with no other problems, no immediate action is required. The RPM drops rapidly to around 30% and then decreases more slowly to windmill RPM. The earliest and most positive indication of a complete flameout is a fuel pressure below 20 psi and falling.

The glide performance is like the book says but is relatively insensitive to airspeed near recommended values. Gliding at 180 knots instead of 150 plus fuel reduces distance from 40,000 feet by only 2.5 miles yet gets you on the ground in 23.5 minutes instead of 29.5 minutes. Remember the sure battery life of 20 minutes and the 2.5 miles becomes easy to sacrifice. Other reasons for gliding at 180 knots will be added as we go along.

A considerable amount of SFO data was obtained from chase aircraft during the program. The realism further benefited from six unscheduled (though planned for) flamed-out landings. The rates of descent and glide angles at low altitudes were much greater than those set up with the former SFO power setting. The steeper glide angles (and other factors that are crowding a pilot's mind on final approach) tend to induce an oscillatory flare and a period of feeling for the runway. When combined with no thrust, and a correspondingly more rapid than usual loss of speed, an extra cushion of speed at the flare is advisable. With up to full internal fuel, a final approach speed of 140 knots is recommended. To set up a better SFO procedure, the recommended power settings and speeds (speed brake down) are 60 per cent and 180 knots to 10,000 feet. Below 10,000 feet use 45 per cent and not less than 140 knots to flare, idle after the flare.

FUEL STARVATION FLAMEOUTS:

For a total of 14 times, the engine was allowed to die from fuselage fuel tank starvation. A throttle setting for 80% (at 20,000 feet) was set and left to allow surging without temperature problems. For these conditions, it takes almost a full minute for complete flameout to occur. Lower altitudes and higher RPM would give faster results.

Events commence when the fuselage fuel tank indicates 3-5 gallons remaining. The first symptom is a rough engine. The fuel pressure oscillates slightly and a distinct engine vibration is felt for about 15 seconds. From there the fuel pressure oscillations increase in magnitude and RPM and EGT begin to fluctuate. The engine surges gradually get bigger until they become a series of apparent flameouts and relights. The relight EGT's get higher as the average RPM gets lower (the throttle still at the original 80% position) but on only one run was it necessary to stop-cock to prevent overtemp. Finally, when the fuel pressure stays below 20 psi for some time, the engine dies.

With the rough engine initial symptom, the tendency might be to stop-cock; however, a quick look at the handbook reveals that someone has been this route before. The first step in the emergency procedure for engine vibration or surging is to gangload fuel switches. Gangloading fuel at any time up to the last surge saves the day. The times from fuel on to pressure available are: for leading edge, 13 seconds; for wing, 10 seconds; for gangload, 5 seconds.

AIRSTARTS:

The J-33-35 will start every time you give it a fair shake. The handbook says establish a glide of 180 and 6% RPM below 25,000 feet. If you remember, the recommended glide speed *used to be* between 175 to 200 knots with 10% RPM, implying that the per cent comes through wind mill with the speed. We found it didn't. 10% windmill RPM at 5000 feet requires 270 knots, which is just a little too fast for a flameout pattern. Further, it was found that 10% is not required for a successful airstart. In 83 low RPM windmill start attempts at various altitudes from 26,000 feet down to 5,000 feet and with indicated airspeeds from 253 knots to 155 knots there were no failures. All of these were at 9 per cent RPM or less; 18 were at 6 per cent RPM or less. These results back a recommendation to glide at 180 knots and (with 6 per cent RPM or more) make repeated start attempts without using the starter down to 10,000 feet. Below 10,000 feet, use 160 knots and the starter while setting up the flameout pattern.

The difference between the automatic and manual starts is minor. The manual start is faster (19 as compared to 31 seconds on an average) and works at a little higher altitude but it requires much more pilot attention up to turning off the manual start switch (in the air, the throttle does not have to be reduced below idle). With the Cook pressure switch removed and the automatic start made on an emergency system, there is no reason to abandon the automatic start as a first try at altitude. (Ed. Note: To clarify this last statement, the author is talking about an automatic start of a T-33 that has Engine Fuel System No. 1 (take off and land position deleted). If your T-33 has Engine Fuel System No. 2 the Dash One recommends your first airstart at altitude (10,000 feet or higher) should be a manual start. For further explanation of Engine Fuel Systems No. 1 and No. 2, see pages 7-4 through 7-6 of the Dash One.)

As a result of these tests, it is believed that many successful airstarts have been shutdown by panicked pilots who did not realize the time required for an Auto start and did not recognize the mild symptoms and small and slow gage indication changes in the cockpit. If you have 40 psi fuel pressure and 300 degrees or so EGT and the RPM is increasing at all, a start is in progress. *Don't shut if off.*

The results of the tests of the low altitude method were truly amazing. Every successful attempt was cool and smooth; no failures influenced subsequent attempts with other methods; the tailpipe was never drained at any time during the program; the envelopes of successful starts and time available to make them after flameout, are a revelation. The real limitation on low altitude starts turned out to be fuel pressure available with throttle alone and only one fuel system pump. The same conclusion was reached for all three starting methods: If 160 knots, 6%, and 40 psi fuel pressure can be obtained, a light will follow. The 40 psi need only show momentarily. On an automatic start the regulator gives a shot at 40 psi and then reduces pressure; on a manual start the manual starting fuel switch and full open throttle combination give it (and more if left on and open); on successful low altitude starts, the throttle and one fuel pump give it (at idle throttle if the RPM is high enough at the time). As was gradually proved during the tests, the fuel pressure is the key indicator for flameouts and airstarts. After the pressure is once seen, idle throttle can be left for both the low altitude and manual methods. Once the light-off occurs, any of the starts can be hastened with more throttle and higher EGTs.

GANGLOAD SYSTEM:

The various switches required for airstart and other emergency procedures are scattered around the cockpit in the various block numbers and modifications of the aircraft. The most critical switches are buried under the canopy rail, behind the throttle, flaps switch and guard, and among similar switches. At the same time, singly or combined, the steps of the three possible airstarts add up to the most complicated airstart procedure of all Air Force aircraft. A gangload system, devised by Captain L. Setter, the engineer on this test

program, turns it into one of the most simple. This system initiates an automatic start if the throttle is open. If the fire is still going it initiates the procedures for rough or surging engine, partial power loss, and fuel system icing.

The standard fuel switch gangbar is actuated by the emergency gangbar or can be operated separately. The parallel battery switch, emergency fuel system switch, and AUTO starting fuel sequence switch, are turned on (AUTO is cut out for low altitude starts and other throttled operations by the throttle being open). The holding relays on the de-ice (30 seconds) and airstart ignition (standard 40 seconds) switches are energized while momentarily mashing the gangbar. A failed low altitude procedure start can be abandoned and an AUTO start initiated merely by stop-cocking the throttle. All switches also can be operated one at a time as before but in better locations.

The manual position of the starting fuel sequence switch is protected by a lift-to-release guard like that on the present take-off-and-land switch.

With this modification a low altitude procedure start becomes:

- Throttle idle.
- Gangbar.
- Watch for 40 psi fuel pressure.
- Full throttle to get 40 psi and then idle (throttle not necessary if within limits).
- Accelerate engine as desired by holding higher EGTs with throttle (not necessary unless immediate thrust is required.

Emergency start (515 complied with) becomes:

- Stock-cock.
- Gangbar.
- Idle when RPM stabilizes (or earlier if necessary).

A manual start becomes:

- Stop-cock.
- Gangbar.
- Auto to manual.
- Throttle open to 40 psi.
- Throttle idle.
- MANUAL OFF at EGT rise or rumble.
- Accelerate engine as desired by holding higher EGTs with throttle (not necessary unless immediate thrust is required).

This system was installed in a T-33 and air tested around the boundaries of the enlarged airstart envelope. Seven demonstration pilots made 42 of the 69 gangbar starts and all enthusiastically endorse it. Also, many gangbar actuations were made at the 80% throttle setting during and after fuel starvation at 20,000 feet and in simulations of rough engine to 40,000 feet. It truly reduces immediate engine emergency procedures on takeoff and at altitude to:

- Reduce throttle.
- Gangbar.

A simple kit is required for the modification.

CONCLUSIONS AND RECOMMENDATIONS:

Within the present handbook framework the following recommendations can be made:

- Don't hesitate to use the low altitude airstart method. It works over a wide envelope of speeds, altitudes and RPM, is a cool start, and leads directly into a second try with either of the other systems if it fails (auto only if the Cook pressure switch has been removed, T. O. 515). Go from idle to momentary full throttle to get 40 psi if there is no immediate fuel pressure rise.
- Gangload fuel and then don't hesitate to use deicing fluid and/or switch to emergency fuel system (at 80% or so) when the engine gets rough.
- Use fuel pressure as the prime indicator for flameouts and airstarts.
- Save the battery for low altitude start attempts and for actuation of equipment during the flameout pattern by making start attempts below 25,000 feet with 180 knots glide speed and at least 6 per cent RPM. These conditions plus a momentary fuel pressure of 40 psi will give a start with any of the methods.
- Use all three methods several times below 25,000 feet before giving up. Don't forget to push and hold momentarily the airstart ignition every 40 seconds or so. Use de-icing when fuel is flowing (it leaves a blue trail not to be confused with smoke). Make the last try a manual/emerg start with starter and momentary full throttle.
- To continue start attempts in the flameout pattern use at least 160 knots and the starter.
- All starts, but the AUTO start particularly, take a long time to develop. Check fuel pressure, EGT, and RPM trend closely before abandoning each attempt. It is amazing how easily the engine starts when all of the switches have been turned on.

(Ed. Note: The T-33 test program at Edwards has, without doubt, produced some of the finest results seen in a long time. The subjects discussed above were just a part of the program; other tests were made on the MA-2 Nickel Cadmium battery, ground manual starts, flap retractions, fuel de-icing, emergency/normal fuel system transfer and practice flameouts. These will be discussed in another article early in 1961. Now, about the gangload bar—it looks as if this is the greatest invention since sex and you may wonder when it will start showing up on your T-33's. As the author described, the gangload bar requires relocating certain switches. A preliminary study at the prime depot (SMAMA) indicates that the mechanical gangbar presents some problems due to the different aircraft configurations and the necessity for trimming the switches to insure that all 9 switches are gangloaded. When these problems came up, SMAMA developed an electrical (relay) concept utilizing a simple switch to do the same thing as the gangload bar. A T-33 was prototyped using AF stock items. Further flight tests at Edwards AFB proved that the "single switch" system was reliable and that it provided the necessary "gangstart" capability. Cost of the material is estimated to be less than $100 and less than 20 manhours per aircraft is required for installation.

As of this writing, it looks as if the using commands prefer the "single switch" to the "gangbar." Our people in Flight Safety Research also prefer it. Just how soon we'll get it is not predicted. It looks encouraging though, since all of the major air commands using the T-33 aircraft are solidly behind the modifications and have so certified it as an immediate operational requirement. We'll stay on top of the situation and let you know as soon as we can just when we will have the True Automatic Airstart.) ★

FALLOUT

LETTERS TO THE EDITOR

OHReporting Made Easy

I stopped by the Editor's Desk recently and was pleased to see that the FSO at Hill AFB and his Assistants are continuing to operate right on the ball. The OHR Board, size 24 x 36, which is used to invite reports, is made of lacquered pine, and across the top the large bright letters indicate its purpose. In the middle portion is space for two 8 x 10½ posters showing hazards of some type. A recent diversion is the use of pinups—always an eyecatcher, you know. Below the posters are two special areas. To the left, under The Form, you'll find a small wooden pocket for the AF Form 457 (OHR to you). For your convenience and to make reporting even easier, there are envelopes already addressed to the FSO at Ogden Air Materiel Area. To the right of this pocket is the instruction sheet, under the words "How & Why." Isn't this easy to read? On the reverse side is a more complete breakdown of the same information for those troops who brave the section in fine print.

The FSO places these boards in strategic locations around the base, like flight operations and maintenance areas. Cartoons and pinups are rotated periodically to make sure that fresh material is provided as often as possible. These OHR boards have proved their worth and they do make reporting easy. My requests for such reports have appeared rather often in past issues of the magazine. Suggest you take your cue from Hill AFB and if you have any OHRs, let's have 'em.

Lt. Col. Rex Riley, USAF
Flying Safety Officer

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Bombay Controller

I am an air traffic control officer of ten years' standing, presently stationed at the Bombay (Santa Cruz) International Airport. Since the last two years or so I have been engaged in the study of air safety problems and found it not only absorbing but also most satisfying. As a matter of fact I may modestly state that I am writing a series of articles on Air Safety, some of which have been included in the Information Circulars published by the Civil Aviation Training Centre (India).

A study of air safety and its problems, you'll no doubt agree, requires wide reading and good reference books and other allied material. As one with very limited means I find it extremely difficult to do, so I wonder if you would care to publish my letter in your journal in the hope that your wide circle of readers may know of my needs. I would very much appreciate any material they may be able to send me dealing with any aspect of air safety, e.g., old copies of journals containing air safety problems, reports and inquiries on accidents, etc. Of course, I would very much welcome any pamphlets, booklets, and books dealing with the subject. I shall be most grateful to your readers for any assistance they may care to render to me in my endeavour to be of service to my fellowmen.

H.I.S. Kanwar, A.M.I.S.E.
No. B-6/1, Aerodrome New Qrs
Vile Parle East, Bombay 57, India

You are welcome to this space and I hope that much helpful information will find its way to your organization.

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More Clicks

Have just read your August issue; it's very interesting and informative. Congratulations! Regarding your article by Major Glenn Crum, entitled "Three Clicks Through Twenty," I was rather surprised to see that this situation has not arisen before. The value of the "clicks" from a "Speechless" pilot was recognized over here many years ago, and a standardized procedure formulated and promulgated.

Briefly, a pilot—realizing he can receive but not transmit speech and is flying above the overcast—sends a four-click transmission out, i.e., H in Morse Code. This appears on the Cathode Ray DF as four strobes and indicates to the operator that the aircraft is lost and requires a homing and letdown. The agreed code is then one click for "yes" and two for "no," and three for "say again." If all this is being carried out on Guard Channel (which of course it should be), the Centre Controller has an immediate fix on the aircraft, and by elimination finds out whether jet or conventional, fuel remaining, altitude, etc., steers him to the nearest appropriate airfield, hands the aircraft over to the GCA who continue the procedure so that from start to finish the pilot doesn't say a word.

It has proved to be quite successful and in fact some seven years ago I had occasion to handle a jet aircraft in this way and a successful landing was accomplished.

In another article "Pan Pan For DF Fix," how right you are in saying "unfortunately too many pilots feel it would be a reflection on their ability to use the call PAN" etc. The same problem occurs over here, but as the land area is so small (comparatively), and the distress system is so well organized and constantly exercised, it is now becoming rare for a pilot to come up with a MAYDAY with less than 10 minutes fuel left because he is reluctant to admit being lost. Long before their fuel is low they now come up with "Practice PAN uncertain of position," get a fix from the Centre, and everyone is happy. We old timers used to get quite a laugh out of this, knowing full well that in many cases the pilot was hopelessly lost, but so long as the youngsters knew the system and got down safely, that was the main thing.

Hope you'll be interested in the foregoing.

Jas. G. Dobbs, Sqdn Ldr, RAF (Ret.)
1970 AACS, APO 147, New York

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More About Guard

I've read your September issue and find in it many pearls of wisdom and only one small mistake. It occurs in the last line, second paragraph of "Rex Says" which relates the sad tale of an active Air Force type airplane driver.

Now it may be true in the Midwest and maybe even in the Far West that 243.0 sounds like Navy Common. But here on the Atlantic Seaboard we Navy type throttle jockeys have been impressed with the clarity of USAF voices so strongly received on our "common" frequency. For a few thousand more words on this subject, I suggest you contact NFSLO, Cdr. J. F. Stone, who can be found right around the corner from you.

All kidding aside, I only wish that our joint efforts to reduce unnecessary traffic on the Guard frequency soon will have effect.

Cdr J. P. Hobson, USN
Analysis & Research Dept. NASC
Norfolk, Virginia

PS: Everyone knows that 243.0 is USAF ground control.

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From NAS Pensacola

In the September issue, the "Rex Says" column, first article, second paragraph probably should read "USAF Tactical, 243.0 vice Navy Common, etc."

Lt. W. D. Inman, USN
Service Information Officer
Hq NABTC, USNAS Pensacola, Fla.

It's nice to see you Navy Troops stirred up and know that you're reading our magazine. Now if we can get more of our Air Force jocks stirred up maybe we'll all stay off Guard Channel until there is an emergency.

In the April 1960 issue we ran an article called "Late Late Lunch" showing a typical day in the life of an Airdrome Officer. This past summer and fall, Rex found through his travels that all AOs aren't as typical as depicted. They ranged from outstanding to "do-nothings." Some of the scenes depicted here are so close to the truth they are embarrassing. Recognize anybody you know?

Some major commands had higher quality AOs than others, but the standards varied even within the commands. One conclusion reached was this: the more interest the Commander showed in base ops, the better the performance of the AO. The biggest disappointment is the AO's attitude that this is a one-day tour so why should he knock himself out. The best Airdrome Officer systems were at those bases that had permanent AOs or a prolonged tour (a month at a time). These two systems won't be popular with the flying troops, but they do plug a gap that needs plugging.