UNITED STATES AIR FORCE • AUGUST 1972

Aerospace SAFETY

PRIDE IN THE PAST

25th ANNIVERSARY

UNITED STATES AIR FORCE

UNITED STATES AIR FORCE **AUGUST 1972**

Aerospace SAFETY

FOR AIRCREWS, MAINTENANCE & SUPPORT TECHNICIANS

SPECIAL FEATURES

REGULAR FEATURES

DEPARTMENT OF THE AIR FORCE • THE INSPECTOR GENERAL, USAF

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AUGUST 1972 AFRP 127-2 VOLUME 28 NUMBER 8

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USAF AT 25

Twenty-five years isn't very long in the annals of time, but in that span the Air Force has made some remarkable progress. What immediately comes to mind are the radically different aircraft of today, as compared to those extant in 1947 when the Air Force was born.

There were no swept-wing, Mach 2 fighters, no supersonic bombers, no jet transports that today shrink the Pacific crossing to less than half a day. There were some early jets and World War II aircraft such as the Mustang and Jug, the T-6, B-17, B-29 and the "Gooney Bird." The "Goon" is still with us and who wants to bet a few of them won't still be around when the Air Force reaches 50?

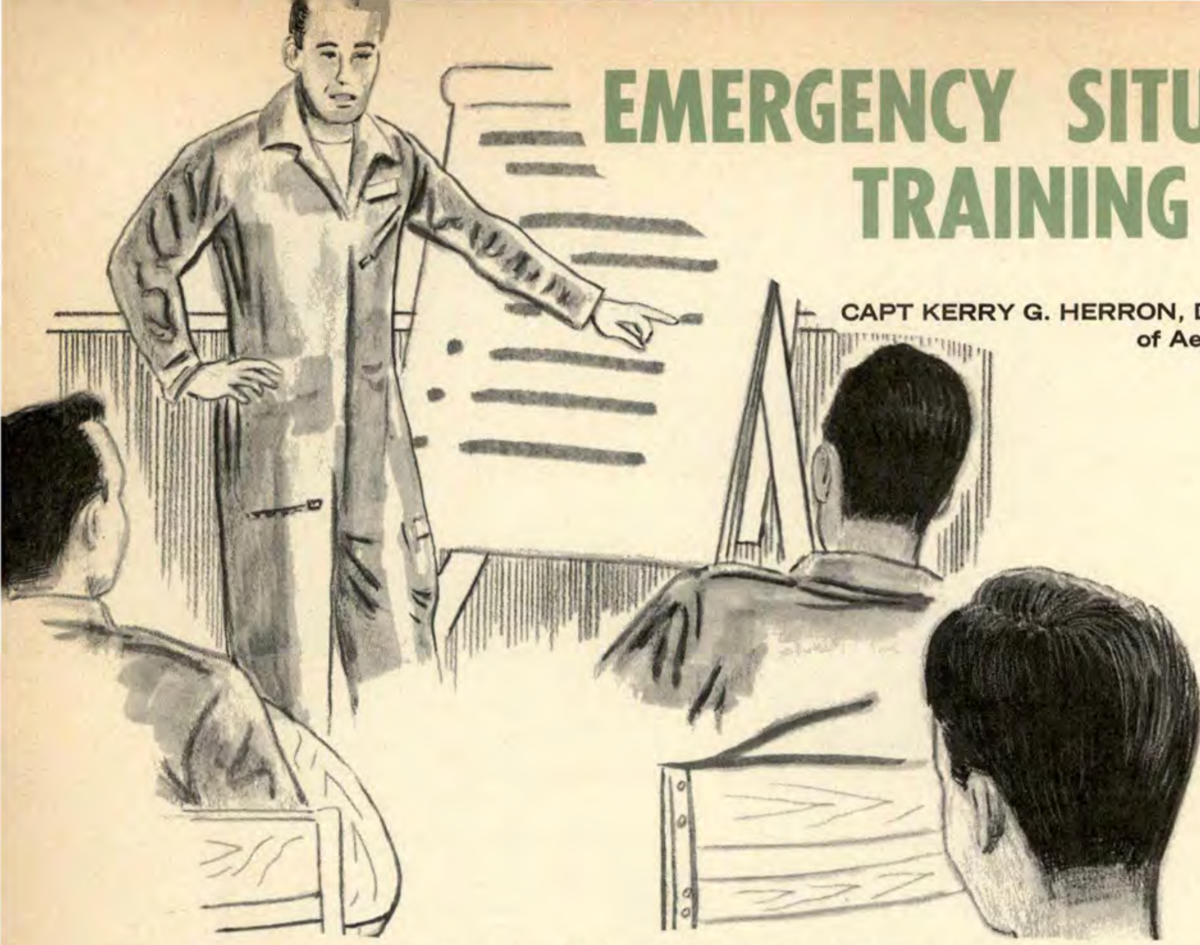
There was a flying safety magazine in 1947 and there surely must have been a wealth of material to fill its pages, considering that there were 1,555 major accidents that year for a rate of 44.0 per 100,000 flying hours. For the next several years the accidents increased but we were flying more, so the rate declined. The safety program really began paying off in 1957 and from that point the number of accidents has continued to decline. Contrast the major accident rate of 2.5 in 1971 to the 44.0 in 1947.

Records, however, are significant only in what they stand for. Our successes in accident prevention stand for lives saved and aircraft available to perform the Air Force mission. In 25 years we have lost a lot of fine men and aircraft in needless accidents. But we have continued to do better; we have learned and have applied the lessons of the past to the problems of the future.

We are now living in the future that we only contemplated in 1947 and we can feel a great satisfaction in our accomplishments. But satisfaction, unfortunately, often leads to complacency. We cannot afford to be complacent while we still have 150-200 major accidents per year. We must continue to use every asset we have to continue reducing the number of accidents. To this end improved design concepts and manufacturing methods are now a requirement. With more safety built into the product, we, as operators, must enhance that built-in safety with continuing improvements in training, workable operational concepts and knowledgeable management.

We have proved we can do these things and we look forward to another 25 years of even greater success.

EMERGENCY SITUATION TRAINING



CAPT KERRY G. HERRON, Directorate of Aerospace Safety

Aircrew practice and testing of immediate action emergency procedures is a well established part of every unit's training program. This type of rote memory training and response is important and necessary, and should continue to receive heavy emphasis, but not to the exclusion of general emergency procedure training involving situation analysis. Too often aircrews practice the bold face items thoroughly, but then do little thinking, reading, talking, or practice of emergencies not requiring immediate action.

No checklist is thorough enough to provide for every contingency or situation, and neither is any other guide yet devised. Aircrew judgment, supplemented by supervisory guidance when available, must provide the course of action in situations not specifically covered by published emergency procedures.

Judgment development is a lengthy process, dependent to a great degree on flying experience. Few training devices are available that concentrate primarily on judgment development, but there is one that offers real applicability, has been used successfully in several units, and is the subject of this article.

Theoretical, yet practical, emergency situations can be formulated, and when presented for analysis and discussion, can provide exercises in judgment development. These exercises can be based on occurrences described in Air Force or major command safety publications, personal experience or that of acquaintances, or may be entirely hypothetical. The exercise must include all the information necessary to mentally place the pilot in the situation, such as weather, mission, cockpit indications, and any other factors necessary to allow the participants to thoroughly analyze their predicament and choose what they consider to be the appropriate actions.

If carefully constructed, situation exercises can promote an exchange of ideas and experiences between old heads and new troops.

The situation, emergency and analysis should be presented on viewgraphs or slides, and projected on a screen for aircrew study. The answers and key factors for discussion should be presented on a separate card for use of the discussion leader, who should have either prepared the exercise or reviewed both the situation and the suggested answers. These discussions often last long after the meeting, and can even send an old head or two scurrying for his Dash-one. The exercise has been tested, is *known* to be effective, and can be used for all types of aircraft and missions. A few suggestions and examples follow:

• Select a project officer from among the safety or training officers who *wants* to try the exercise. Have one or more supervisors review his proposed situations to insure accuracy and complete contingency considerations. Don't force someone to run the exercise who doesn't have a real interest and who won't devote the time necessary to develop well thought out situations.

• After the project officer has established how best to implement the exercise locally, and has exposed the unit to several examples, others may want to contribute their experience or devise their own situations and present them for discussion.

• Don't convert this training tool into a testing device. Voluntary participation, contributions, and interest are essential to the exchange of ideas and the effectiveness of the training.

• Use the exercise at large aircrew meetings such as safety meetings, mission briefings for exercises, pilot's meetings, etc., but don't attempt to use it for every crew briefing or small group briefing on a daily basis. It seems to promote the best participation when used weekly or monthly, and when the practice situations are thoroughly researched. Daily use would not allow adequate preparation.

• Don't read aloud a detailed situation involving multiple variables and expect the participants to remember and analyze without an accompanying slide, viewgraph, or handout. The discussion leader should be prepared to discuss contingencies, to lead the discussion with everyone who wants to contribute, and to prevent monopoly by any one person.

• Formulate some situations where there is no specific, correct answer, in order that various aircrew opinions can be aired and discussed, often helping young pilots to reach the correct decisions on their own. (See Example 2, F-101 B/F.)

• Commander interest and participation will set an example and enhance acceptance of the exercise, and will often promote a higher degree of participation.

• The value of the exercise is in the analysis of the situation, the selection of applicable procedures, and the discussion and exchange of information and rationale between aircrew members. The end result is the direction of thought toward emergency contingencies which have no rote response requirement, before the actual emergencies occur. In short, an exercise in judgment development in an area terribly expensive to acquire by experience.

The following examples are presented to illustrate how to set up the situation.

AIRCRAFT T-33A

SITUATION: You are flying a T-33 target at FL 350 in a NORAD exercise, and your route has taken you over the Atlantic Ocean 200 NM from land. You are above an undercast; the weather between you and your recovery base is 800 ft overcast, visibility three miles. The tops are FL 310. The time is 0200 local.

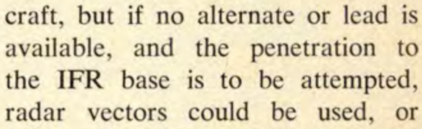
EMERGENCY: The gyro instrument warning light illuminates; immediately you notice the OFF flag visible on the attitude indicator, and your heading indicator appears to be frozen.

ANALYSIS:

1. What has probably occurred?
2. What action(s) should you take?
3. With standby inverter operating, what instruments and/or navigation aids are inoperative?
4. If the standby inverter then fails, would you attempt to complete a penetration and approach under the existing weather conditions, and if you did, what flight instruments and navigation aids would be available?

ANSWERS: (Provided on a separate card for the discussion leader only.)

1. Main inverter failure.
2. Select standby inverter.
3. TACAN and IFF/SIF.
4. OPEN FOR DISCUSSION: The decision of whether or not to attempt the penetration should be a personal one, based on individual pilot experience, ability, and system knowledge. The best choices would be a VFR alternate, or a lead aircraft, but if no alternate or lead is available, and the penetration to the IFR base is to be attempted, radar vectors could be used, or VOR using ID-249 only, with the terminal approach being a no gyro GCA or a localizer only ILS. Flight instruments available would be magnetic compass, turn and slip indicator, vertical velocity indicator, airspeed indicator, and altimeter.



AIRCRAFT F-101B/F

SITUATION: You have begun the takeoff roll on a one hop flight from Duluth, Minnesota, to Tyndall AFB, Florida. The aircraft has no armament, and is double tanked with a full fuel load. The Duluth weather is 400 ft overcast, visibility two miles. The time is 0800L.

EMERGENCY: The takeoff progresses normally until afterburner termination, when a larger than normal reduction in power is felt. An immediate check confirms that both throttles are still full forward. A glance at the engine instruments shows right engine RPM, EGT, and fuel flow falling. Your airspeed is 240K and bleeding off, and you have just entered the weather.

ANALYSIS:

1. What has happened?

2. Give the appropriate immediate action procedures.

3. Discuss aircraft attitude considerations.

4. If airstart attempts were unsuccessful, and the nearest suitable recovery base with weather better than Duluth AFB was Grand Forks AFB, with 2000 ft broken and seven miles visibility, would you proceed via single engine to Grand Forks, or would you attempt to land at Duluth?

5. If no further complications developed, and the weather remained the same, at what fuel state would you land?

ANSWERS: (Provided on a separate card for the discussion leader only.)

1. Right engine flameout.

2. THROTTLE—MAXIMUM (OPERATING ENGINE)
EXTERNAL LOAD-JETTISON

3. Level off to maintain a controllable airspeed. With the aircraft under control, and airspeed permitting a slight climb, attempt airstart.

4. OPEN FOR DISCUSSION.

5. OPEN FOR DISCUSSION.

AIRCRAFT F-4C/D/E

SITUATION: You are number three in a flight of four for an early morning range mission. Your aircraft has one SUU 23, one SUU 20, and two external tanks. During the takeoff roll, shortly after rotation, the fuel low level and master caution warning lights illuminate momentarily (5 seconds), then go out. The takeoff is continued, and during climbout all fuel quantity indications are found to be normal. The mission progresses normally, with the brief use of afterburners required several times. After the external tanks and internal wing tanks have fed, simulated pop-up rocket deliveries are being practiced.
EMERGENCY: During afterburner pull-up for roll-in altitude, the fuel low level and master caution lights illuminate. You terminate afterburners and check the fuel at 5500/5500 (tape over counter), but the feed tank indicates 700 lbs and slowly increasing, and boost pump pressure is zero for both engines.

ANALYSIS:

1. Are you in danger of flameout?

2. What has probably caused the low feed tank situation?

3. If hydraulic and electrical systems indications are normal, why are all the pumps inoperative?

4. What type of recovery should be made?

5. Of what significance was the fuel low level warning light during the takeoff roll?

6. Should you have aborted the mission when the warning lights momentarily illuminated during takeoff roll?

ANSWERS: (Provided on a separate card for the discussion leader only.)

1. Only if afterburners or sustained negative Gs are used.

2. Hydraulic transfer pumps and electric boost pumps are not operating.

3. The hydraulic fuel transfer check switch has failed. If this switch is stuck in the test position, it will prevent operation of the electric fuel boost pumps and will prevent hydraulic fuel transfer pumps from operating when gear squat switch is open (weight off the gear).

4. Recommend straight in approach because all fuel transfer will be by gravity.

5. It was an early indication that fuel was transferring only by gravity until the weight was off the gear, allowing the external tanks to pressurize.

6. OPEN FOR DISCUSSION.

AIRCRAFT B-52D

SITUATION: You are the aircraft commander on a typical eight or nine hour training sortie that includes refueling, low-level navigation and bombing, and a celestial navigation leg. Aircraft gross weight is approximately 395,000 pounds which includes a 210 fuel load. The takeoff weather is reported to be 700 feet overcast with tops at 8000 feet, visibility five miles, wind variable at 10 knots. Your initial climb clearance is to 12,000 feet with a climb to FL 310 when 35 NW of the departure fix. The time is 1400L.

EMERGENCY: During flap retraction, the gunner reports visible fire from Nr 7 engine. You look at the instrument panel and Nr 7 engine shows high EGT and the fire warning light is illuminated. The copilot also confirms fire from the Nr 4 pod.

ANALYSIS:

1. What has happened?

2. Give the appropriate "critical actions" for this situation.

3. If the steps in paragraph 2 above do not extinguish the fire, what would be your next course of action?

4. If the procedures in step 3 put out the fire, what would be your evaluation of the situation and what factors should be considered before landing?

ANSWERS: (To be provided on a separate card for the discussion leader only.)

1. Engine fire on Nr 7.
2. THROTTLE—CLOSED.
   FIRE SHUTOFF SWITCH—PULL.

3. Shut down Nr 8 engine using Emergency Engine Shutdown Checklist.

4. OPEN FOR DISCUSSION. The following are but a partial list of those factors that should be considered, and are provided to stimulate the discussion.

a. Lateral control.

b. Fuel management.

c. Gross weight vs six-engine go-around.

d. Stall speeds and approach speeds.

e. Inoperative aircraft systems.

AIRCRAFT C-5A

SITUATION: You are the aircraft commander of a C-5A Pacific Cargo mission at FL 350. You departed Travis AFB at 0700 with a full fuel load. Takeoff gross weight was 712,500 lbs. Your destination is Wake Island, with an ETE of 10+30 hours, and a forecast of 500 feet overcast and one mile visibility. Your alternate, Andersen AFB, Guam, is three hours from Wake, and is clear.

EMERGENCY: Just after passing ETP, you experience extreme vibration of the Nr 1 engine which continues and intensifies, and the Nr 1 hydraulic system quantity gage indicates zero. One hour prior to landing, the Nr 2 engine oil pressure begins to fluctuate, and the engine oil pressure light illuminates. The corresponding oil pressure gage indicates 10 psi and is slowly decreasing.

ANALYSIS:

1. What steps would you accomplish in response to the Nr 1 engine vibration problem?

2. What systems will be affected by the loss of the Nr 1 hydraulic system?

3. What actions would you take in response to the Nr 2 engine oil pressure problem?

4. If two engines were shut down, and destination weather forecast was stable, what considerations would you give to reducing gross weight?

5. Discuss in detail your approach and landing roll procedures including configurations and systems availability.

6. If normal braking was lost, what braking system(s) would be available?

ANSWERS: (To be provided on a separate card for the discussion leader only.)

1. EMERGENCY ENGINE SHUTDOWN
   FIRE HANDLE—PULL (P)
   AGENT—DISCHARGED (P) if fire is indicated.

2. a. Flaps and slats will be available, but slower than normal to operate.

b. Nose and aft main gear must be lowered by alternate gear lowering procedure.

c. Crosswind gear capability not available.

d. Normal nose wheel steering inoperative.

e. Upper rudder powered by only one hydraulic system.

3. Discussion as to if, when, and how the precautionary engine shutdown should be performed.

4. Discuss cargo and/or fuel jettison procedures. If fuel is to be jettisoned, discuss how much, and destination weather versus alternate requirements.

5. Discussion Items:

a. Three engine configuration and ILS approach procedures.

b. Two engine configuration and ILS approach procedures.

c. Go-around capabilities.

d. Crosswind landing techniques without crosswind gear available.

e. Nose wheel steering availability.

6. Emergency brakes (alternate braking system not available after Nr 1 hydraulic system failure). ★

DEADLY

This article is addressed to everybody whose job requires him to fly, work on or supervise maintenance on Air Force aircraft. We hope you read it and heed its message, because this subject is too important to ignore.

We call it FOD—but color it *deadly,* because that's what it is. Deadly to engines, aircraft and—to aircrews. The death of an aircrew because a tool was left in the controls is an unforgivable tragedy. Yet every year this FOD costs the Air Force several lives and millions of dollars.

Generally we think of FOD in connection with aircraft engines. Most often objects are left in intakes and sucked into the engine with drastic results. A frequent contributor is the ground crew carelessly handling safety pins which find their way into the intake. An engine change is the next step.

If all the tools chewed up by aircraft engines were assembled undamaged they would no doubt equip a squadron, with plenty of spares.

Whenever tools are left where they cause damage, there are two culprits. One is the man who left it there and the other is the supervisor or inspector who failed to find it.

A recent case in point: Prior to a maintenance engine run a foreign object inspection was accomplished. During the run a problem developed and an adjustment was required. Again it was inspected. Later in the day an engine screen was installed and the aircraft towed to another location for trouble-shooting. When the engine was started sparks flew from the exhaust. Pieces of a flashlight were found in the compressor section. Cost for overhaul exceeded $30,000.

In this case, someone was guilty of leaving the flashlight in the intake. Engine damage was guaranteed when the engine screen was not removed and the area inspected, although local procedures called for such an inspection prior to every engine run.

Lest we point the finger too sharply at the maintenance people, let us realize that FOD is sometimes caused by aircrews. Pilots leave checklists, gloves and other items in intakes with resultant engine damage. Seems the engine intake is an ideal place to put things during the walk-around.

FOD extends well beyond the engine and we must attack the problem on a broad front. Possibly the most dangerous place for a foreign object is in the flight controls. Since 1965 there have been at least 85 reported mishaps resulting from flight control FOD. This has cost four lives, several aircraft and many, many dollars, not to mention aircraft downtime. In 1971 there were eight incidents in the F-4 alone where foreign objects were found throughout the aircraft, from the cockpit to the bellows and venturi assembly of the artificial feel system. A pair of pliers in the control linkage cost us an airplane and a crew.

Reports of cases that have been investigated indicate that where debris is found depends on aircraft configuration. But, in general, statistics indicate items are found in the wings 37 percent of the time, in the cockpit 25 percent of the time, tail 21 percent and fuselage 17 percent.

What kind of stuff are we talking about? The following will give some idea, although the list is by no means complete.

- 9-inch steel punch
- Open-end wrench
- Nut plates
- 90° offset screwdriver
- ⅜" universal socket
- Wire bundle tie
- Spool of wire
- Flashlight

FOD

17-inch sheet metal stiffener
Cloth
Nuts
Bolts
Clipboard
5½-inch chisel

Cockpit FOD, while not as prevalent as in the wings, frequently results in extremely serious consequences. Safety pins, filmpacks, flashlights, clipboards and the like have jammed controls, caused unintentional ejections—or prevented ejection—and caused throttles to bind. These have generally been crew-induced, which indicates a need for better foreign object discipline on the part of crewmembers. And it's their lives at stake.

The biggest problem, however, is with the maintenance people, primarily because that is where the opportunity is greatest. Unfortunately, there seems to be an upward trend in FOD. In fact, one command reported a 58 percent increase in 1971 over 1970.

So what to do?

First, an organized, documented FOD prevention program is necessary. Now this is like saying we need a modern highway system to move traffic and prevent accidents. We have programs already—from Air Force level on down to local units. But plans and paperwork, in and of themselves, do not prevent accidents. People prevent accidents by using their brains and by application of self-discipline.

For example, non-destructive inspection has proven to be an important tool in FOD prevention. The vari-ramp area of the F-4 is prone to collect foreign items during maintenance. Radiographic inspection (X-ray) has been invaluable in determining whether there is debris in that area. (See article page 24.)

Tool control is a most fruitful area for improvement. Self-discipline is an important factor here. The man working on the aircraft is *responsible* for the tools he uses. He is responsible to himself, the aircrew and his country to prevent the careless handling of tools from causing an accident. One problem is the inexperienced maintenance man who may not realize the seriousness of misplacing a tool.

We recently asked a major airline for information on their FOD problems and prevention. They replied that FOD due to misplaced tools is a minor problem. They attribute this to the experience level of their mechanics, the consequences to an individual who is identified as the one who left a tool that causes an accident, and the fact that the mechanic is responsible for his tools.

For many reasons, the Air Force situation is different. Nevertheless, the airline's success shows that a well-supervised program to prevent FOD due to tool misplacement can succeed.

Another area that requires attention is the ramp-taxiway-runway complex. While we do not see this as the major problem in FOD to the engine, airframe and controls, dirty surfaces are hard on tires, flaps and other areas—particularly the lower surfaces of the aircraft. We recall a unit that was having severe tire troubles. The problem was finally resolved by better cleaning of the hard surfaces. In another case, old concrete spalled and cracked and pieces were thrown by taxiing aircraft and ingested into engines.

Not mentioned so far is micro-FOD, those tiny particles that can play hob with delicate hydraulic and electrical systems. Work on these components requires absolute cleanliness—hence, clean rooms. Yet inspectors frequently find contaminated components, dust caps not installed and dirty floors and work benches. As aircraft systems become more dependent on these components and tolerances become smaller, micro-FOD looms as one of the most vexing problems with which we will have to contend. People working on these systems and QC inspectors would do well to redouble their efforts to establish and maintain the cleanliness necessary to the integrity of this equipment.

In the final analysis, FOD prevention begins at the top and permeates the entire organization. The commander and his supervisors are responsible for establishing viable FOD prevention programs. But a commander cannot prevent a 3-level airman from leaving a wrench in the flight controls. However, he can see to it that the young man has been trained in the use and care of tools and the serious consequences of a misplaced object in and around the aircraft. Supervisors must exercise their authority and responsibility in carrying out the intent of the program.

Finally, however, the immediate responsibility lies with us who have the last opportunity to remove an object that may cause an accident. We are the maintainers and the aircrews—the guys with that tool, or a checklist, or whatever, that turns a work of art into a smoking pile of wreckage. Think it over. ★

THE IFC APPROACH

By the USAF INSTRUMENT FLIGHT CENTER
Randolph AFB, Texas, 78148

TAS COMPUTATION

Here is a technique for estimating TAS that will be helpful to pilots flying aircraft without a machmeter. Flight Lieutenant Millar, Royal Air Force exchange officer, offers this technique to his T-38 Pilot Instructor Training students:

JOT DOWN THIS CHART:

ALTITUDE x 1000	PERCENT INCREASE ADDED TO IAS		
5	3^2	+ =	9%
10	4^2	=	16%
15	5^2	=	25%
20	6^2	=	36%
25	7^2	=	49%
30	8^2	=	64%
35	9^2	=	81%
40	10^2	=	100%

Determine an estimated TAS by adding the applicable percentage to IAS. For example, the IAS at FL 250 is 180 KTS. Add 49%, or 88 KTS, to 180 KTS to obtain 268 KTAS. At 15,000 feet and 200 KIAS, the approximate KTAS is 250 (25% of 200=50). Try the technique; you may find it suitable for your needs.

TEARDROP ENTRY

Q If I elect to fly a teardrop procedure turn maneuver, must I fly a heading 30° from the reciprocal of the inbound course?

A Not necessarily. A "course" should be thought of as a ground track and the aircraft's "heading" as a means of remaining on that track. It may be necessary then to adjust heading as required to maintain or intercept the teardrop course. AFM 51-37 states that a teardrop course will be 30° or less from the inbound course and on the depicted side. This will position the aircraft so that the inbound turn will place the aircraft on or near the inbound course. Where positive course guidance is available, attempt to intercept and fly the teardrop course using any navigational aid available in the cockpit. Without positive course guidance, i.e., TACAN fix or marker beacon, etc., the heading used to fly a teardrop course must be estimated by the pilot.

* * * * *

POINTS TO PONDER

Have you noticed that ILS back course approaches are now published in the Low Altitude Instrument Approach Procedure books? The FAA has begun installation of back course glide slope transmitters at some major civilian aerodromes to provide an increased operational capability (see ILS BC RWY 11R, Minneapolis-St Paul Intl). These are precision approaches; however, due to the increased localizer sensitivity when approaching the end of the runway where the localizer transmitter is located, the BC ILS minimums are higher than front course precision approaches. Civilian localizer transmitters are tailored so that the front and back courses are the same width, between 3° and 6°.

Consider the situation where a runway has published front and back course approaches. At DH on the front course, the aircraft is approximately 14,000 feet from the localizer transmitter and the localizer width is approximately 1200 feet. The back course approach (same localizer transmitter), if flown to the same DH, would place the aircraft less than one-half mile from the localizer transmitter, and the width would be approximately 260 feet. Therefore, it is obvious that the localizer would be far too sensitive to provide adequate course guidance if flown close enough to the runway for normal ILS minimums. Perhaps more important to the military pilot is the fact that this is a *back course* approach and should be flown with the published front course set in the course selector window to obtain a directional CDI in relation to the aircraft symbol/heading pointer. ★

THE CAPABILITY-JUDGMENT GAP

LT COL VICTOR J. FERRARI, JR., USAF, MC

The article reprinted here is one of the most popular published in *Aerospace Safety* in recent years, if one can judge by the number of requests for reprints and extra copies of the magazine in which it originally appeared. It is presented here exactly as it first appeared in the November 1968 issue.

Those pursuits which require the development of manual skills generally indicate a need for the development of good judgment—or else great skill without good judgment might result in trouble for the individual. This is particularly true in flying and is a factor that must be taken into account in any training program for the development of piloting skill.

What we have just said, and what is about to be presented, is not new. In fact, we assume that nearly all pilots who read this recognize the concept as something learned in a practical way in youth and documented in some textbook at a later day. What *is* new is the chart upon which we have plotted curves representing certain factors indigenous to the kind of training program described. The chart presents graphically an abstraction that, while known, is not always recognized nor acted upon—a desert-like area of the chart we call the *capability-judgment gap*.

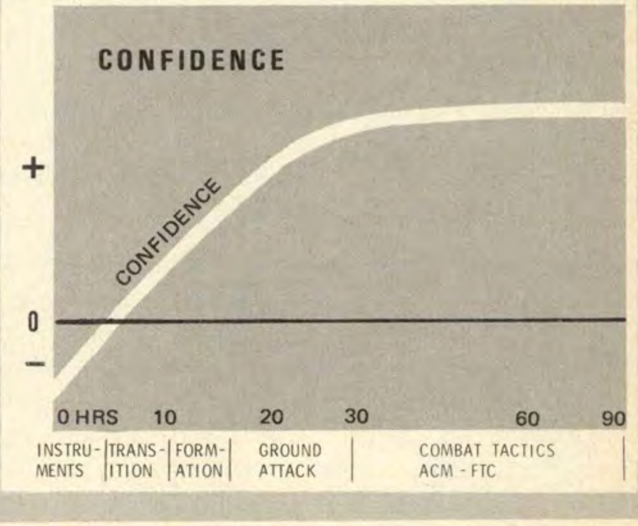
The chart came about as the result of a study of an F-105 Replacement Training Unit. The aim of the study was to identify all factors which have accident potential.

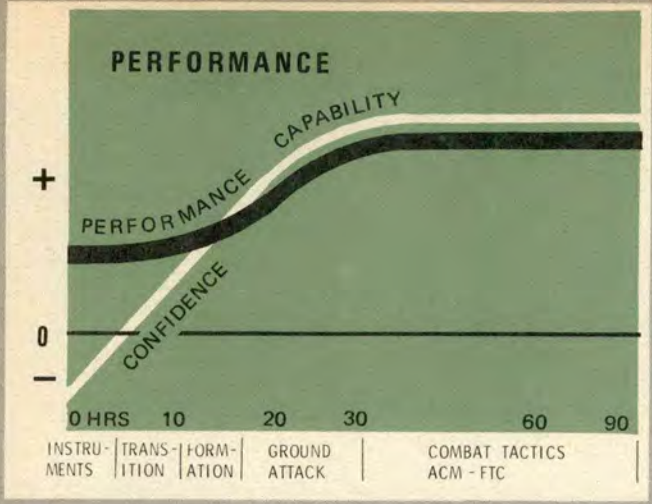
The method used was an analysis of the psychological and physiological stresses of the training program and student capability and limitations. Techniques included interviews with students who had recently graduated from undergraduate pilot training (UPT), squadron commanders, and IPs, medical evaluation of the training program (inflight and ground) and a review of accident experience. We should point out certain factors:

• The majority of students involved in accidents was evaluated as above average in the course.

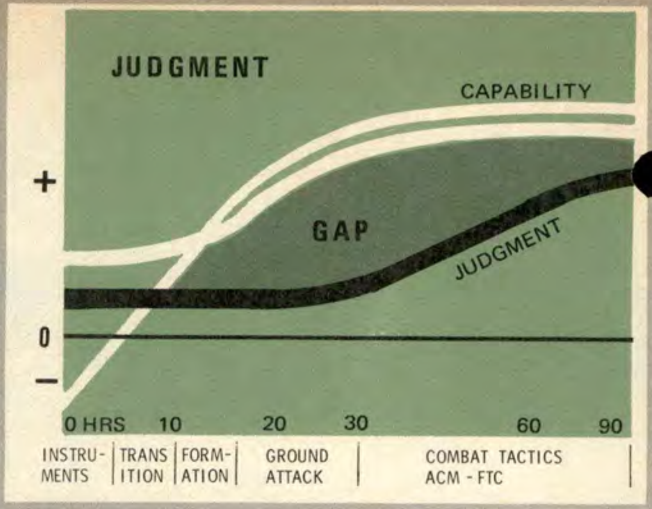
• Some students were direct from undergraduate pilot training, while others were experienced pilots but

The graph at right depicts the buildup of student confidence throughout the training program. Student interviews indicate that they enter the F-105 program with a "healthy" apprehension as depicted by the portion of the curve below the base line. Confidence builds rapidly, with most students stating they "get ahead of the aircraft" by the second or third transition ride. Confidence continues to rise to the high confidence level of the typical fighter pilot. IP interviews verify this rise in confidence.





The black line depicts student stick and rudder performance. The student enters the program with moderate capability in this skill. Instructor pilots testify that this ability rapidly rises and closely parallels the confidence level. This is to be expected because confidence and performance reinforce each other. For the purpose of this discussion, we equate confidence and performance to capability.



This curve represents the development of judgment, or is comparable to the student's capability to correctly estimate the effect of all human and environmental factors on his "real life" capability. This starts to rise toward the middle of the ground attack phase, after he has had enough experience to convince himself he can and will make mistakes. As mentioned previously, this capability-judgment gap is validated by automobile and general aviation accident experience. This curve flattens out below the "capability" curve and may never merge with it.

new to tactical fighters (only one had any significant tactical fighter experience).

- The accident experience covered in this study was too limited to be applied with statistical significance to the concepts discussed here.

- The Capability-Judgment gap is validated by correlation of accident rates and age groups, in general aviation and automobile accident experience.

- The curves on the charts represent judgment factors and are not intended to imply mathematical values or relationships. Their shapes are based on student and IP interviews, review of training folders, and general aviation and automobile accident experience. The curves should be expected to vary in shape and magnitude with specific training programs and personnel. However, the concepts are valid for any flight training program.

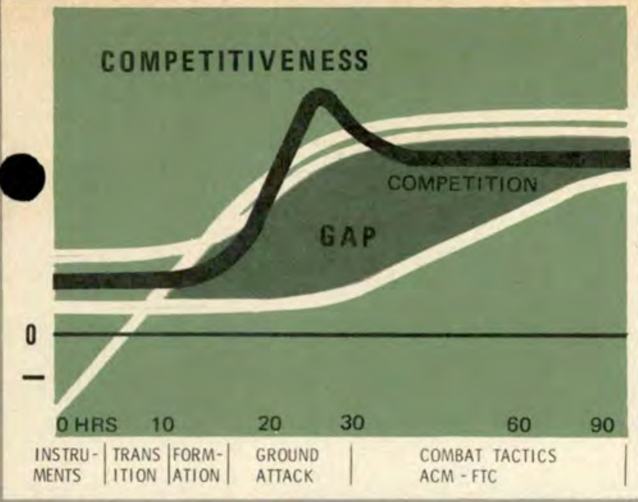
As the charts show, there exists a gap between a student's capability and his judgment development. This gap occurs early in a training program and would be predictably greater in the more aggressive student.

One thing we were especially interested in was the role competition plays in this type of training program. The UPT students who are assigned to F-105s are selected for their competitive background, and well so, for the tactical fighter mission demands an aggressive, competitive personality. Student and IP interviews, both formal and informal, reveal that this competition is not very apparent during the orientation/transition phase of the program. However, as soon as the students "get their feet on the ground" it rises rapidly. Formation and ground attack naturally stimulate the competitive spirit of the students with a positive correlation with the students' aggressiveness.

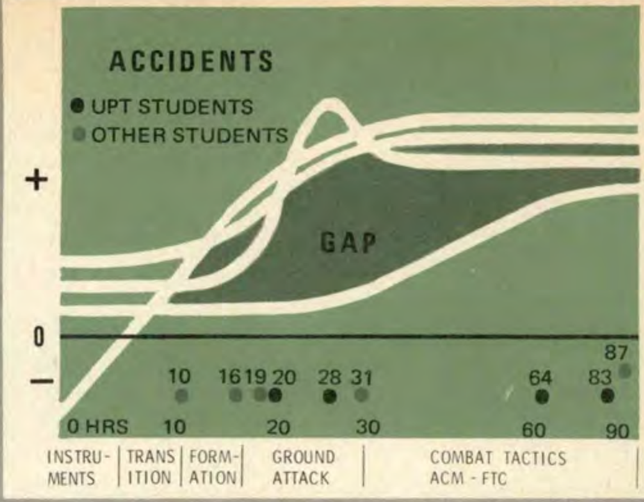
Rarely does this competitive spirit result in an accident. More often it results in a "near miss," which only the student knows about and never talks about. This experience has great learning value because it produces "judgment." Note the time correlation of the two curves, with the judgment curve starting to rise just after this peak.

Even if an accident rarely results, the accident potential during this phase is great. It must be recognized and controlled in order to optimize the learning process without compromising safety!

So where does all this lead? It leads to the conclusion that the instructor pilot must fill the capability-judgment gap. This means that instructors must exercise mature judgment in their supervision of students. Inexperienced or immature instructors may misinterpret the observable self-confidence and performance of students as an indication of good judgment and, consequently, set up a potential accident. Therefore, instructor pilot upgrade programs must emphasize a sound student-IP relationship with special attention to the capability-judgment gap. Finally, supervisors must closely monitor inexperienced IPs in order to develop



The element of competition is shown here. The graph depicts the competition curve rising rapidly while the judgment curve is still flat. The peak of the curve suggests that this factor may exceed the "capability" curve. This becomes more likely when a very capable and aggressive student is matched with an inexperienced IP. Actually competition may exceed capability at several points in the program, for example the air combat maneuvering phase.



On this chart are plotted nine accidents involving pilot factor. As previously mentioned, these accidents are too few to have statistical significance. Black dots represent students fresh from UPT; gray dots are experienced pilot students. The most significant thing about this chart is that two of the accidents involving recent UPT graduates and four of those involving experienced student pilots occurred between the 10th and 31st course hour—in the wide portion of the capability-judgment gap.

in them an awareness of the need for a close student-IP relationship and the vital role the IP plays in the development of student pilots.

While this article was based on a study of a pilot training situation, the principles discussed apply to many training situations. For example, supervisors of automotive and special vehicle driver training would do well to ponder the charts presented here, and then look at their instructor force to determine how well they are filling their students' capability-judgment gap. ★

HORSE PLAY

LT COL SIDNEY T. LEWIS, USAF, MC, Directorate of Aerospace Safety

It has been traditional that a student pilot be dunked in water after his first solo ride. A large tub was provided for such an event. In Southeast Asia, this practice was carried even further. Crewmembers who completed their end-of-tour mission were greeted with water from various sources, most of it under high pressure. In two cases, the crewmembers, both pilots, were struck in the eyes by the high-pressure water. The ultimate injuries received resulted in their referral to the USAF School of Aerospace Medicine. Following ophthalmological evaluation, one pilot was permanently grounded and the other pilot was returned to flying status. These young pilots will require careful follow-up as the years go by since people with injury to the eyeball itself have a greater incidence of future eye problems such as glaucoma or detachment of the retina. It is truly ironic that these young men safely completed their combat tour only to have their fellow pilots unintentionally cause serious injury upon return from their last mission.

In a third case, the pilot upon return from his last mission was greeted by a gush of water from a fire truck hose. No one had thought about the fact that the water in the hose had been lying in the hot Southeast Asia sun for a prolonged period. He received painful burns from the hot water and was hospitalized.

No one intentionally causes these injuries and most people are sorry or ashamed when such things occur. A little common sense and thought could have prevented these injuries.

To paraphrase an old saying: "When we become adults, we must put away childish things." If ceremonies are required to celebrate an event, make sure they are safe! ★

ED. NOTE: We can vividly remember a cadet graduation party years ago when everyone was celebrating new silver wings. One 2d lieutenant didn't get a chance to use his. He hit his head on the edge of the pool when a friend's hand slipped during a heave-ho. He has never fully recovered.

LT COL D. D. JOHNSON, JR.
Directorate of Aerospace Safety

T-39 Engine Restrictions

Operations Supplement 1T-39A-1S-9 is self-explanatory as far as the procedures are concerned. However, for the T-39 driver, the Supplement does not tell us why the restrictions were imposed. This article will review past engine problems, proposals under consideration to correct known deficiencies and the effect of the present restrictions on operational flights.

From 1960 through mid-1970 there were 51 failures of the 9th stage blades in the J60-P3/3A engine. All of these failures involved steel blades. In July 1970, an ECP (2J-J60-546) was approved for a 9th stage titanium blade retrofit. The purpose of this retrofit was to eliminate blade failure caused by stresses which can occur at high rotor speeds. The engine manufacturer expected that the stress levels would be considerably reduced due to a change in vibration frequency of the new blade. This ECP was designed to alleviate blade failure since disk failures had not yet been experienced. As a precautionary flight procedure, the five minute restriction on MRT below FL 200 was also imposed on unmodified engines.

The first 9th stage disk failure occurred during a ground maintenance run in October 1971. Major airframe damage was caused by this failure. The second disk failure occurred in flight in February 1972. Pieces of the disk and blades tore a hole in the diffuser case; however, serious damage to the fuselage did not occur. Of these two disk failures, the first involved steel blades, while the second involved titanium blades.

Based on those disk failures, the manufacturer made nine recommendations. Seven of these concerned procedures for inspection, repair, assembly and test of compressors/engines and have already been implemented at the overhaul facility. The five minute time restriction on MRT for takeoff was the eighth recommendation. The ninth recommendation involved an engineeing change which would provide improved air flow characteristics to the 9th stage blade area. Testing is currently in progress to evaluate this proposal.

How do these new restrictions affect the operation of the aircraft and what flight safety implications are involved?

• MRT is limited to five minutes for takeoff only. As far as takeoff performance is concerned, this restriction should present no problems. The previous five-minute limitation for operation below FL 200 has been deleted and MRT is for takeoff only. Figure 1 of Ops Sup 1S-9 provides the thrust settings for takeoff. Note that at temperatures below +12°F (−11°C) the thrust lines are flattened out. Therefore, to compute takeoff thrust at and below these temperatures, you must use the new charts. The J201 computer, if used in the *normal* manner will give a Pt 5 setting that will over boost the engine. However, the J201 computer can be used if a *constant* temperature of +12°F is used even though the takeoff temperature is colder than this.

• MRT is available at all altitudes for *emergency* use only and

ED. NOTE: The information presented in Operations Supplement 1T-39A-15-9, on the use of the J-201 computer, was written by Lt Col Johnson after the above article went to press.

Figure 2 of Ops Sup 1S-9 gives the thrust values. Note that at temperatures between −10°C and −20°C, depending on indicated mach number, the lines are flattened out. The net result is reduced Pt 5 settings. Again, the new chart must be used to obtain the proper thrust settings, as the J201 computer could provide higher settings than desired.

• Figure 3 of Ops Sup 1S-9 gives the NRT settings. Note here that the indicated mach number lines are flattened out below −30°C depending on mach. This chart should be used for computation on Pt 5 settings. However, the J201 computer can be used for all flight conditions when the free air temperature is *not* below −30°C. Below this temperature, the chart values should be used since the J201 may give higher settings than desired.

The above restrictions may be summarized as follows:

Do not use the J201 computer for takeoff MRT when the temperature is colder than +12°F.

Do not use the J201 computer for emergency inflight MRT settings when the temperature is colder than −10°C.

Do not use the J201 computer for inflight NRT settings when the temperature is colder than −30°C.

The San Antonio Air Materiel Area (SAAMA) has given this engine problem top priority and is working closely with the engine manufacturer. Both are well aware of the problem and the associated reduction in operational capability that the present restriction imposes. However, until additional testing and analysis are completed, we will have to plan our flights within the parameters given. Remember, the thunderstorm season is now in full bloom and these engine restrictions should influence our planning and inflight deviations. As additional information is gained, or changes are implemented to the present restrictions, you will be advised through normal channels. ★

HEY, JOE, WHICH WAY?

This story, if it were not true, would be amusing. However, it is being printed to salute everyone who has ever cussed, strained and moaned when time came to open a balky hangar door.

Early one evening a helicopter was parked in the hangar with the horizontal stabilizer protruding outside. One side of the hangar door was open and the other side partially open.

The night crew was directed to move the aircraft from the hangar to the flight line. To do so, the partially open door had to be opened all the way so the rotor blades would clear.

A crew was formed to move the helicopter. One of the wingwalkers later stated that he accidentally hit the door CLOSE switch. The result was as you suspect. The door struck the leading edge of the horizontal stabilizer. *But wait? There's more.*

When activating either of the control boxes, in OPEN or CLOSE mode, it was anyone's guess as to which door would move—due to a short in both boxes. If that wasn't confusing enough (would you believe) the instructions printed on the control boxes were vague. The 3-position switch was mounted in the box below the instructions: OPEN on the left and CLOSE on the right. In neutral, the arm of the switch was at the 9-o'clock/3-o'clock position. To open the door, would you rotate the arm clockwise to OPEN or counterclockwise toward CLOSE? The way it was rigged, the correct way to open the door was to move the switch counterclockwise away from OPEN toward CLOSE.

If you're confused trying to follow the narrative, imagine the maintenance troops!

Since the incident report did not address the problem, it is not known how long this screwball lashup had existed. You can bet there was a heap of scurrying around to correct the defects. ★

(US Navy APPROACH)

OXYGEN QUICK-CHECK

LT COL THOMAS J. McNEY
Chief, Physiological Training, George AFB, California

For those who fly, the words P. D. McCripe and PRICE are familiar sounds. Over the years they have served to remind aircrew members of a step-by-step procedure for checking aircraft oxygen equipment.

P. D. McCripe became popular in the 1950s and stands for Pressure, Diaphragm, Mask, Connection at mask, Connection at regulator, Regulator, Indicator, Portable oxygen equipment and Emergency oxygen equipment. It is an equipment check still used on multi-place aircraft where portable oxygen equipment is employed.

The PRICE check became popular in the 1960s and stands for Pressure, Regulator, Indicator, Connections and Emergency oxygen equipment. It is essentially a check on the aircraft oxygen system; it assumes that the mask and helmet have already been checked. PRICE is currently used for aircraft not equipped with portable oxygen equipment.

In the 1970s, with the development of quick checks for other aircraft systems, a similar quick check for oxygen equipment has become practical and popular. It is a quick check for proper functioning of the principal oxygen system that the crewmember relies on: the mask, the automatic regulator, integrity of connections and the aircraft oxygen system itself. The check is simple, logical and requires no "artificial" method of remembering what to do. It's a very thorough check, yet it takes only a few seconds to perform. No matter how pressed for time one might be, there should always be enough for a quick oxygen check.

Here's how to do it:

- Make sure your regulator is turned on, attach your mask and adjust it for a firm face seal, turn the regulator to 100 percent oxygen and the pressure setting to Emergency. Check the quantity and pressure indicators.
- Take a few breaths. Observe the proper function of the oxygen flow indicator. Be alert for the foul odor characteristic of a contaminated oxygen system (an extremely rare occurrence).
- Take a breath and hold it, observing the flow indicator. This simple act is a leak test of the entire system. If you're not breathing, there should be no flow and the indicator should stay black.

The quick check will instantly disclose much of what can go wrong with an oxygen system. For example, it can reveal an automatic oxygen regulator inadvertently turned off. When the regulator is set for 100 percent and pressure breathing, one cannot inhale if the regulator is turned off. The danger with a regulator turned off lies in the fact that the user can breathe normally, as if he were getting oxygen, to cabin altitudes above 20,000 feet. If he doesn't notice the position of the switch or the absence of the "blinker," the first warning he gets may well be his symptoms of hypoxia. Of the cases of inflight hypoxia reported in recent years, a significant number were caused by the regulator being inadvertently turned off.

The quick check can also reveal an improper mask fit. It can find an unseated microphone, an improperly installed inhalation/exhalation valve, or a hole in the mask, the mask hose or the CRU-60/P connector. It can disclose an improper connection at the quick disconnect to the regulator hose or a missing white rubber gasket on the CRU-60/P connector. It can detect a hole in a regulator hose, a loose hose connection at the regulator, or a bad regulator diaphragm or airscreen.

All the malfunctions mentioned have figured prominently in documented hypoxia incidents. All of them could have been prevented by applying the quick check procedure.

The quick check is quite adaptable. It can be used with the tester in P.E. and save an abort because of bad personal equipment; it can also be used as an inflight check when the mask is re-donned after momentary removal—although it is important to remember to return the automix lever and pressure settings to normal afterwards, to avoid unnecessary depletion of oxygen supplies.

One held breath—a few seconds of your time—and you protect yourself against almost everything that can go wrong with an oxygen system. A quick check is essential to oxygen discipline; and oxygen discipline is essential if bad equipment or bad connections are to be discovered in time.

If you aren't now using some simple quick check of your oxygen system, try this one. It's a good investment! ★

REX RILEY'S CROSS COUNTRY NOTES

876-2633 AUTOVON

Direct Contact. One of our transient pilots made the point that he did not feel that it was possible for him to realistically evaluate the transient facility. Generally speaking, you complete the questionnaire (if there is one) before you return the bird. Then if something goes haywire, it's just too much trouble to unstrap and head back across the ramp to Ops to file the complaint. I agree with him and this is why we have encouraged transients to call Rex direct on autovon. At the top of this column is the phone number that will put you in contact with us. When you call, we'll take your complaint and put it into the file. Don't hesitate when you have a suggestion you feel will help make our traveling easier.

Not the Regular Crew Chief. A Code 7 friend of mine called the other day with a gripe about service he had received while on cross-country with a fighter. Seems that there was a maintenance problem with his bird and rather than continue on that afternoon he decided to RON and get it fixed. He told the duty NCO about the malfunction and proceeded to his quarters. The next morning he filed and proceeded to his airplane only to find that the discrepancy had not been cleared. Marching into transient alert, he asked why the repairs had not been made. The answer was that, "We changed shifts last night about the time you left and I guess that it didn't get passed on." Come on, guys. You've got to have some system to insure that this doesn't happen. You have a system, don't you?

Why Bother??? Since it's impossible for me to personally visit every base in the Air Force, we asked and received some help from the Unit Effectiveness Inspection teams. They supply me with an informal report on some of the activities that they can find time to look at. The evaluations are not used in any way in the formal report; it's just to help me to get a handle on some of the problem areas. The comment that interested me was that "Base Ops doesn't take timely action on complaints about air traffic control problems." To me this is the heart of the whole system. Why bother to ask for comments from transients if you're not going to take action or even read them? Does your Base Ops have a system to insure that all the valid complaints are resolved? Also, when a transient says he got super treatment, are you in a position to pat somebody on the back? If not, you're missing a good management tool.

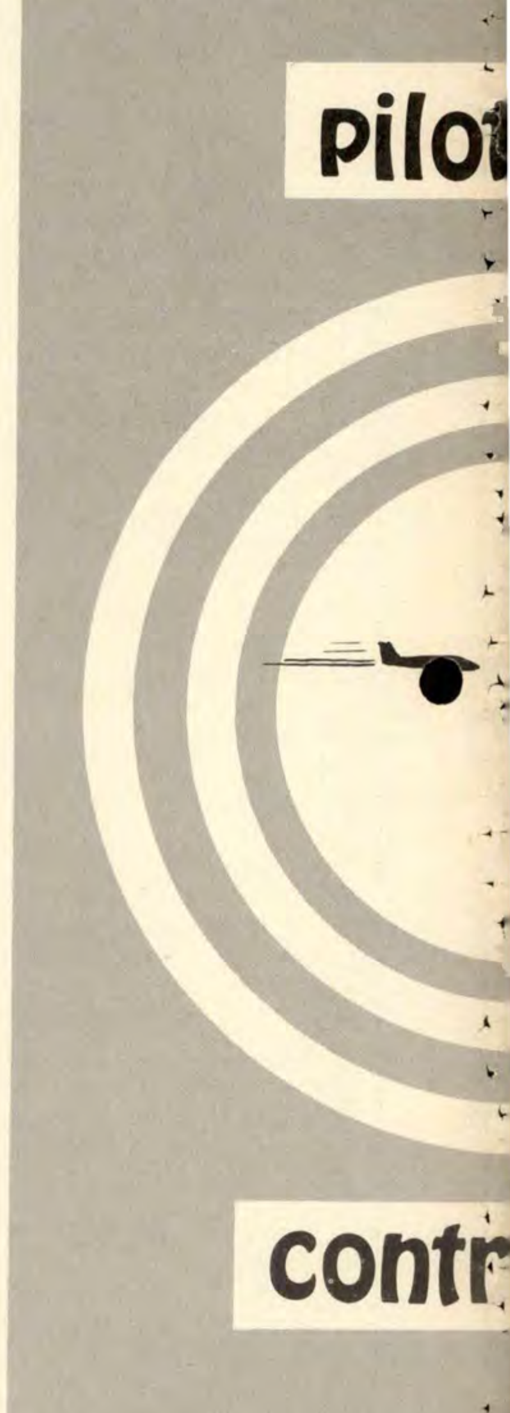
A Little Extra! When the forecaster at Richards-Gebaur handed me back my completed weather briefing, I noticed that in the comments section were some station identifiers with UHF frequencies. Seems that this weather squadron section takes time to evaluate your route and gives you a ready reference for pilot to forecaster service. A nice touch. It shows that they are interested in your welfare. Nice work, R-G. ★

THE

REX RILEY
Transient Services Awar

LORING AFB	Limestone, Me.
McCLELLAN AFB	Sacramento, Calif.
MAXWELL AFB	Montgomery, Ala.
HAMILTON AFB	Ignacio, Calif.
SCOTT AFB	Belleville, Ill.
RAMEY AFB	Puerto Rico
McCHORD AFB	Tacoma, Wash.
MYRTLE BEACH AFB	Myrtle Beach, S.C.
EGLIN AFB	Valparaiso, Fla.
FORBES AFB	Topeka, Kans.
MATHER AFB	Sacramento, Calif.
LAJES FIELD	Azores
SHEPPARD AFB	Wichita Falls, Tex.
MARCH AFB	Riverside, Calif.
GRISSOM AFB	Peru, Ind.
CANNON AFB	Clovis, N.M.
LUKE AFB	Phoenix, Ariz.
RANDOLPH AFB	San Antonio, Tex.
ROBINS AFB	Warner Robins, Ga.
TINKER AFB	Oklahoma City, Okla
HILL AFB	Ogden, Utah
YOKOTA AB	Japan
SEYMOUR JOHNSON AFB	Goldsboro, N.C.
ENGLAND AFB	Alexandria, La.
KADENA AB	Okinawa
ELMENDORF AFB	Alaska
PETERSON FIELD	Colorado Springs, C
RAMSTEIN AB	Germany
SHAW AFB	Sumter, S.C.
LITTLE ROCK AFB	Jacksonville, Ark.
TORREJON AB	Spain
TYNDALL AFB	Panama City, Fla.
OFFUTT AFB	Omaha, Nebr.
McCONNELL AFB	Wichita, Kans.
NORTON AFB	San Bernardino, Ca
BARKSDALE AFB	Shreveport, La.
KIRTLAND AFB	Albuquerque, N.M.
BUCKLEY ANG BASE	Aurora, Colo.
RICHARDS-GEBAUR AFB	Grandview, Mo.
RAF MILDENHALL	U.K.

RESPONSIBILITY . . .



Most of us go about our daily routine with a great deal of complacency and seldom give a conscious thought to safety. We are so sure we are safe that we are not self-critical of our own actions. Suddenly, when we least expect it, we have a near disaster. Then we stop and ask ourselves, why? In most instances we find that the cause is either a misunderstanding or lack of knowledge of a procedure we have been using as a matter of routine. We know that we are not going to deliberately commit an unsafe act; that we are going to carry out our responsibilities; and we trust that the other guy will also. That is the key to this article. What are the other guy's responsibilities? Do you really know where his responsibility ends?

In most cases, I think an honest answer would have to be "I'm not sure." How about traffic advisories; both to VFR and IFR aircraft? Are you aware of both the controller's responsibility and your responsibility as a pilot? I hope so, but let's review a specific case which occurred while my crew was on duty in a Radar Approach Control facility.

A MAC C-141 was handed off from the center to Approach Control at 8000 feet enroute to the fix serving the airport where he intended to land. Radar contact was established, weather, traffic, and airport information was given to the pilot on initial contact. The weather was perfect: one of those beautiful starry nights with endless visibility and not a wisp of a cloud in the sky. The pilot requested clearance to descend in the holding pattern to the initial approach altitude and execute an ILS approach. His request was approved by the controller, who had only one other aircraft under his control at the time. A civil DC-4 flying VFR through the area had requested VFR traffic advisory service. The DC-4 was radar identified and since his route of flight would take him to the vicinity of the holding fix, traffic information was passed to both aircraft. Both pilots were advised of the position, distance, altitude and intentions of the other aircraft. Both pilots acknowledged the information and reported having their traffic in sight. The civil aircraft continued on the same heading and the C-141 continued to descend. Neither pilot took evasive action and a near miss resulted. The C-141 pilot filed an OHR against the controller for failure to provide him with separation from a VFR aircraft.

In the investigation that followed the C-141 pilot stated that he was not aware of his obligation to operate on the "see and avoid" concept as required by paragraph 67A of FAR 91. He stated that he was governed by AFM 60-16 and not Federal Air Regulations. He further stated that he thought the controller had to separate him from all traffic both IFR and VFR.

I was very fortunate in that I had an ex-C-130 pilot who was cross-training into Air Traffic Control on my crew for his checkout in the facility. He stated that he felt sure that most pilots shared this same belief. As a result, the two of us stopped by Base Operations and MAC ACP and asked about a dozen pilots who came in to file Flight Plans if they were aware of their

SMSGT GEORGE V. STRICKLAND, 1962 Comm Gp, APO San Francisco 96239

obligation under FAR 91.67A. (Ed. Note: We probably would have answered the question in the same way as those pilots questioned. Since Air Force regs are almost always more stringent, we seldom if ever refer to the FARs.)

The standard answer was "No." Of the pilots we questioned, only one answered in the affirmative.

This points out one thing. The Air Force instrument training program and flight supervisory personnel need to place additional emphasis on FARs and the responsibility of Air Force pilots to comply with them. (Ed. Note: We have constantly stressed the importance of "See and Be Seen." Hopefully, all our pilots know that when you can see out of the windscreen it's time to "look out." The only time you can afford to keep your eyes in the cockpit is when you're in weather and can't see out.)

The Air Force made what I feel is a very good effort to combine the most commonly used FARs into AFM 60-16. However, AFM 60-16 is not a duplicate of every paragraph of the FARs, and each pilot should expend the time and effort to become thoroughly familiar with FARs, paying particular attention to such areas as Right of Way and Lost Communications procedures. To help clarify any misunderstanding of an Air Force pilot's responsibility to comply with FARs, paragraph 1-1c of AFM 60-16 clearly states that Air Force aircraft are governed primarily by FARs and nothing stated or implied in AFM 60-16 relieves the pilot of his responsibility under FARs.

The controller is required to provide traffic advisories to IFR aircraft, and traffic advisory service may be provided for VFR aircraft on a workload permitting basis. However, advisories provided by a controller are only *advisories*. They are for your information and to assist you in locating other aircraft whose path of flight may conflict with yours. It does not mean that the controller is going to provide separation between your aircraft and the other observed target. Separation is provided only between known IFR traffic. The controller can vector an IFR aircraft clear of other observed targets but only if the pilot requests this service and the aircraft to be vectored is in the controller's area of responsibility.

Too many pilots assume that when a controller states "Radar Contact" they are home safely. They seem to feel like they have a shield of protection around them and the controller is going to keep everybody else out of their little world. Nothing I can think of is a more grave misconception. I have heard crewmembers say that when the controller states "Radar Contact" there is an audible sigh of relief in the cockpit. As an Instrument Rated Flight Instructor I know how sweet the words "Radar Contact" sound, but don't let those two little words ever lull you into a false sense of security. The controllers will assist you in any way they can to help make your flight a safe one; but when you are flying in VFR weather conditions, the responsibility for separation from other aircraft rests with you, the pilot—without regard to the type of flight plan you are on. The controller will provide you separation from known IFR traffic only. ★

MULTIPLE MALFUNCTIONS

Every pilot and maintenance man who has even a few months' experience has had the admonition "Use TO procedures" beaten into his head until one would expect callouses on his brain where such things register. The point of this article is to emphasize the critical need to use systems knowledge to recognize and handle problems when step-by-step flight operating procedures or maintenance troubleshooting procedures fail to achieve expected results. Multiple malfunctions are infamous for lousing up standardized troubleshooting procedures.

To illustrate the point, we are going to discuss a very troublesome maintenance problem that occurred at an ATC base as reported in an Unsatisfactory Material Report. The discussion is admittedly "Monday morning quarterbacking" in the classic sense; reference to the specific case is only to illustrate how troublesome multiple malfunctions can be when detailed systems knowledge is absolutely essential in solving a problem. The people actually involved with the problem handled it and probably used the techniques under discussion.

The first indication of the problem occurred in flight when the gear handle was lowered for the third landing pattern. The gear did not come down; the red light in the handle came on and the warning horn sounded. The pilot attempted to recycle the gear handle but it was "stuck" in the down position. Mobile Control observed the gear up and the gear doors open. It is assumed hydraulic pressure remained normal.

We now have strong, but not quite conclusive, evidence of multiple malfunctions. Considering the systems involved, it looks like this:

1. Gear doors opened normally, warning light circuit normal; but the gear handle is stuck. What's the problem?

2. Normal procedure would be to recycle the gear control lever, but it is stuck. The most likely thing to stick the gear lever in the down position is the solenoid lock and its associated circuit that helps prevent gear retraction with weight on the wheels. If a check of the override button shows it frees the control lever but the gear still does not go down, we definitely have multiple malfunctions. We know the landing gear lever solenoid circuit is malfunctioning, but that wouldn't keep the gear up. What next?

3. All three gears are up. It can't reasonably be a mechanical problem in the gear actuating mechanism as each gear has its own independent mechanical system. Electrically, it could be a simple open circuit, a fault in the landing gear door open indicating switches (either switch function or rigging), a malfunctioning set of contacts in the gear control handle or a problem in the gear actuating hydraulic valve solenoid. Hydraulically, possibilities are pretty well limited to the gear actuating hydraulic valve. In any case, the alternate release system is the thing to try.

4. Now, gear handle down—check. Pull the alternate release—The gear goes down—three green lights. Remember, no nosewheel steering is available after lowering the gear with the alternate release unless the system is reset. It doesn't matter; the problem belongs to maintenance now.

Now the maintenance men recognize the presence of more than one malfunction and take action. A broken wire is found and repaired on the left main gear strut switch. That will keep the gear lever from "sticking" in the down position with no weight on the main gear. The right main landing gear inboard door sequence switch is adjusted to solve the problem of the gear failing to come down normally, and the system checks out okay. Later events indicate that either the door sequence switch adjustment was one of the three simultaneous malfunctions or it was not a factor in the inflight situation. Of course, even if it was not a factor, it may have been in need of adjustment.

Two weeks after the first incident, a pilot wrote up the aircraft for inoperative nosewheel steering. A ground taxi test and operational check failed to show a defect. After two more days, another case of inoperative nosewheel steering was reported. At this point, in good Monday morning quarterbacking technique, it can be pointed out that the history of the aircraft in having the gear fail to come down plus two cases of nosewheel steering failure could have led to the conclusion that the gear actuating hydraulic valve might be malfunctioning. This is because the hydraulic pressure for lowering the gear and for nosewheel steering come through that valve. However, troubleshooting procedures in TO 1T-38A-2-8 for nosewheel steering failure do not include checkout of the gear actuating hydraulic valve, so the steering actuator was changed. Incidentally, the removed actuator was subsequently bench checked and found okay.

Another day—another steering failure. Finally an intermittent open circuit was found in the gear down solenoid of the landing gear actuating hydraulic valve. Replacement of the valve apparently cured the last of a series of two or three simultaneous malfunctions. A recommendation for inclusion of the landing gear actuating hydraulic valve in the checkout procedure for steering failure was submitted.

* * *

In summary, use your TO procedures. In addition, while you are using them, relate the procedures to your knowledge of the aircraft systems and how the systems work. Whenever the procedure doesn't seem to give satisfactory results, a little more system analysis may put you on the right track. It is the multiple malfunction that can't be fully anticipated in writing TO procedures that can give you serious problems, either in flight or on the ground. ★

(Northrop *Talon Service News*)

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EPILOGUE of a FLIGHT SAFETY OFFICER

MAJ RALPH T. LASHBROOK
67th Tactical Reconnaissance Wing, Bergstrom AFB, Texas

In a few days I'll hang up my flying gear for the last time. But before I do I want to get in one last plug for my company product—Flight Safety.

During my military flying career I have been catapulted off aircraft carriers in the back seat of SB2C "Helldivers;" photographed atomic bombs at Bikini through the waist gun ports of PBM "Mariners;" slid off the runway in a T-6 "Texan;" saw three classmates collide as their four-ship T-33 flight turned onto initial at Willy Air Patch; flamed out during landing roll in an F-86E at Nellis because of poor fuel management; made a gear up landing in an F-89 at Scott because of materiel failure; missed a head-on collision by less than 100 feet when the other jock forgot to check a runway change; almost lost an RB-66 south of Cuba in a violent tropical thunderstorm; and snagged the midfield barrier at Udorn after a utility failure. Do I know about flight safety? You bet your bippy I do.

I have seen the flying game move from relatively simple machines to highly complex integrated weapons systems and aircrews progress from devil-may-care flying fools in 50 mission crush caps and long white scarfs to highly skilled airmen in pressure suits and fish-bowl helmets. Hold on, before you old timers get up in arms about being called 'flying fools', there were professionals in WW II (the big one) just as there were in the Spads and the Nieuports and there are in the Thuds and the Phantoms.

In my association with military aviation from 1944 to 1972 I have had many satisfying experiences. If asked to select one above all the others, I would have to say my assignment as Flying Safety Officer was the most gratifying experience in my aviation career. Flying will always hold a special place in my memories but that was primarily due to the efforts of myself and my crew. A good flying safety record is possible only through the combined efforts of everyone associated with flying operations: the approach controller, the crew chief, the dispatcher, the flight engineer, the flight surgeon, the navigator, the operations officer, the pilot, the systems specialist, the tower operator, the weather forecaster, the commanders, and many many others.

As I put my hard hat on the shelf for the last time, I would like to thank each and every one of you who, as true professionals, have made my assignment as Flight Safety Officer a very pleasant high point of my military career. May all your days be CAVU, your nights starlit, and your sunsets golden.

FLY SAFE ★

Ops topics

INLET GUIDE VANE ICING

An air carrier flight experienced an unusual circumstance in which approximately half an inch of ice accumulated on the inlet guide vanes during ground idle. The weather was clear and the temperature 25°F. The taxiways, however, had been chemically treated to melt a covering of ice and snow. This created a very thin layer (not more than one foot) of fog, not considered as visible moisture in the usual sense. During extended idle, enough of the moist air was drawn into the engine intakes to cause the ice buildup. Fortunately the flight returned to the ramp where this condition was discovered.

(Flight Safety Foundation Bulletin)

REUNION

The annual reunion of the 36th, 49th and 50th Tactical Fighter Wings will be held at the Union Plaza Hotel in Las Vegas, Nevada, 6-9 October (3-day holiday weekend). Request all present and former members send current addresses to P.O. Box 9766, Nellis AFB, Nevada, 89110; or telephone Project Officer, Col "Dag" Damewood.

OV-10A FACs

1st Bronco Reunion, Hurlburt Field, Fla.

6-7 October 1972

For info write: Bronco Reunion, Box 517,

Mary Ester, Fla. 32569

LOW SLUNG

The F-4 pilot was returning to his home base after an extended TDY on the other side of the country. The aircraft had been loaded by the home troops and was configured with two external drop tanks plus a TER on each inboard pylon with a BLU-1 baggage pod mounted on the bottom station of each TER.

On takeoff, as the bird passed over the approach end BAK-12, the aircraft swerved to the right. The pilot got the bird back under control and continued the takeoff. Shortly thereafter, tower passed the word through departure control that the F-4 had left numerous objects on the runway.

Suspecting a ruptured or open baggage pod, the pilot dumped fuel and lowered the landing gear—and immediately experienced utility hydraulic failure and an unsafe nose gear indication. An inflight check confirmed that the nose gear was trailing at 45 degrees, the right baggage pod was ruptured and the right main tire was shredded, possibly blown.

The pilot actuated the emergency landing gear system, the nose gear indicated down and locked and the utility hydraulic pressure came back. The bird was recovered with a routine approach-end bar-

WAKE TURBULENCE

Recently a twin engine lightweight utility aircraft, belonging to a sister service, was conducting a precision approach to an Air Force base. The final controller issued a landing clearance and advised him he was number two behind a C-130. The aircraft was observed going below the glide path, and at one and one-quarter miles from touchdown was told he was too low for a safe approach and was issued go-around instructions. The pilot replied, "Okay, Roger; we're trying to stay under the C-130's wake turbulence."

The aircraft then entered a violent, ninety degree, nose down bank at about 150 feet above the ground. Power was applied and luckily the aircraft responded. After landing, wheat stalks were removed from a wing of the aircraft.

Apparently, this pilot was not aware of the approved procedures for avoiding wake turbulence. Remember, don't fly behind and *below* a large aircraft on final approach. An *above* and behind position should help avoid this hazard!

Hq AFCS
Richards-Gebaur AFB, Missouri

PHANTOM

rier engagement. The shredded tire didn't blow.

Examination of the runway, the aircraft and the barrier disclosed that the barrier cable had snagged the right baggage pod on takeoff roll and ruptured it. Two hundred feet past the cable, one of the gear down locks fell from the ruptured pod and was run over by the right main wheel, cutting the tire tread. A little later, probably during gear retraction the tread separated from the tire and a piece of rubber impacted and severed the landing gear down hydraulic line. When the gear was lowered and the line was pressurized, the severed line resulted in utility system failure. Actuating the emergency system isolated the severed line and there was sufficient fluid remaining to let the system build back up to normal pressure.

Primary cause of the flub-up was laid at the feet of the people who loaded the bird. Seems that the bottom TER station is not authorized for the BLU-1, since it results in only five and one-fourth inches of ground clearance—certainly not enough to clear a barrier cable rebounding from the nosewheel.

But we have to wonder about the aircrew not noticing a little thing like that.

ONE MORE TIME

Shortly after starting the takeoff roll, the Nr 1 fuel flow on the T-39 fluctuated and dropped 500 pounds. The pilot aborted early—about 50 knots.

He made a run-up on the taxiway after the abort and everything checked normal, so he taxied back for another try at it. Everything was go on the second try until about 70 knots, when the symptoms recurred, and the pilot aborted again. Time between the aborts was about 13 minutes.

Finally getting the message, he was taxiing back to the ramp when the right main tire blew out. The aircraft was shut down and the fire department called.

The fuel flow problem was due to failure of the fuel flow transmitter. The tire failure occurred when excessive heat built up and ruptured the sidewall. Both wheels were checked out during teardown and no discrepancies were found.

We marvel at some people's persistence. Darned few parts of an airplane are self-healing, and when a malfunction serious enough to call for an abort crops up, that same prudence which dictates the abort *should* dictate taking the bird back to maintenance.

FLIP CHANGES

High Performance Aircraft in Terminal Areas—"Keep-'em-High": The FAA has initiated a program known as, "KEEP-'EM HIGH." Arriving IFR high performance aircraft will be kept at the highest possible altitude as long as possible. Departing high performance aircraft will be climbed to the highest possible altitude filed by the pilot as soon as possible. The program is intended to reduce the mixture of aircraft in the vicinity of the airport. This program is also intended to provide noise relief to the community surrounding the airport. Details on "KEEP-'EM-HIGH" have been published in FLIP Planning Section II North/South America Special Notices section.

THE LEMMING EFFECT

After takeoff, the pilot made several attempts to raise the gear, but the handle wouldn't move out of the "down" position.

Did the pilot call immediately for a closed pattern, maintain airspeed below gear-down speed, return and land so that maintenance could clear the malfunction?

Sorry, no. The pilot, like a lemming rushing to the sea, was locked onto a course of action and wouldn't break lock. ("By God, after takeoff the gear's supposed to come UP!")

He turned out of traffic and gave it another try. This time the handle came up and the gear started to retract. Before the retraction was complete, however, the gear handle fell back to the down position. The gear went back down—almost. Two green and a nosewheel barber pole. Another aircraft confirmed the nosewheel partially extended.

Now nothing worked. The gear handle was frozen. Emergency gear extension had no effect. Putting G on the bird, yawing violently, repeated touch-and-goes,—nothing helped.

Having tried everything, there wasn't much left to do but bring it in. The pilot bored holes for a little while, burning off fuel while the runway was being foamed, then made a nice landing on the mains and, after he'd slowed down, on the extended speed brake.

We were fortunate in that aircraft design prevented an incident from being a major accident. But no thanks to the operator.

It would have been a lot more professional to accept the fact that the cockpit is a lousy place from which to perform maintenance. The proper environment for gear retraction tests is the hangar.

PREVENTION IN ACTION

The C-130 was on a low-level drop mission, and had just completed a troop drop. The loadmaster was retrieving the static lines, when the retriever cable attached to the winch snapped, sending approximately ten feet of cable and the retriever spool whipping back toward the loadmaster.

The loadmaster wasn't injured. But the helmet and face shield he was wearing took a beating!

Why was he wearing a helmet and face shield? Because several months ago another loadmaster was fatally injured during a similar airdrop accident. He wasn't wearing any protection. The investigation concluded with the recommendation that a helmet and shield be required, the command acted on the recommendation, and the protection was subsequently available when it was needed.

Thoughtful recommendations from the accident investigators; quick implementation by command; and ready acceptance by the user saved at least one man—and probably more—from serious injury.

We wonder how many people were aware of the potential for an accident before the *first* one happened . . . and took no steps to prevent its occurrence. Now that we know, there is no excuse for not using the protection. It can save lives!

TRAINING PAYS OFF

Every once in awhile, something comes across the desk which makes all the preaching seem worth while. The following is printed verbatim from a report on a fighter aircraft which lost power and crashed short of the runway.

"The ballistic timer of the automatic parachute deployment system did not fire due to a bend in the arming cable pin. This failure negated the entire automatic deployment sequence. The action of the pilot of manually pulling his 'D' ring deployed the parachute. The effective life support training given to the pilot prepared him to successfully accomplish the low altitude extraction in spite of system malfunction.

"The Instructor Pilot's timely decision to abandon the disabled aircraft was the primary factor in the totally successful recovery of both aircrew members."

OFF-COURSE GUIDANCE

If the airplane you fly has 50KHz separation on the VOR receiver—if it's possible to dial in, say, 117.65 when what you want is 117.6—look out! If you make a mistake and tune your receiver 50 KHz off the intended frequency, the possibility of an erroneous course indication exists.

The indication produced can appear to be usable. Station identification may be heard, the off-flag may be absent, a course indication may be displayed. But the course indication will probably be near the 180 degree radial (from), or its reciprocal 360 degrees (to), and will not vary as the aircraft moves past the VOR ground station.

With 50 KHz separation, the old "tune and identify" rule isn't enough. Always perform a visual check of the frequency selector to make sure the correct frequency is dialed in, and be alert for the symptoms of 50 KHz detuning described above. ★

Toots

is interested in your problems. She spends her time researching questions about Tech Orders and directives. Write her c/o Editor, Aerospace Safety Magazine, AFISC, Norton AFB, CA. 92409.

Dear TOOTS

I am concerned about the intent of paragraphs 3-19 through 3-21 of TO 00-25-234. I believe these paragraphs were intended to address the problems of transporting and storing equipment, and do not apply to electronic gear which is kept in one place and is available for use on a daily basis. For example, if I follow the letter of the paragraphs, I should seal off and pack (in a suitable container) the oscilloscope in our electronics shop whenever it is not in use.

Please don't read me wrong. I believe in protecting valuable equipment. But I don't want to have to cover the 115 VAC wall outlets with a plastic cap just because someone missed the intent of the TO.

CMSgt Sherrell L. Smith
18th Avionics Maint Sq
APO San Francisco 96239

Dear Chief

I talked with the people at AFLC who wrote the book. They agree with you that paragraphs 3-19 through 3-21 pertain to equipment (black boxes) awaiting service, repair, inspection or storage. They do not apply to in-shop test or mockup equipment that is used daily in the performance of the job.

I might add that such test or mockup equipment should *be secured, covered and protected in accordance with the appropriate handbook for that equipment.*

Toots

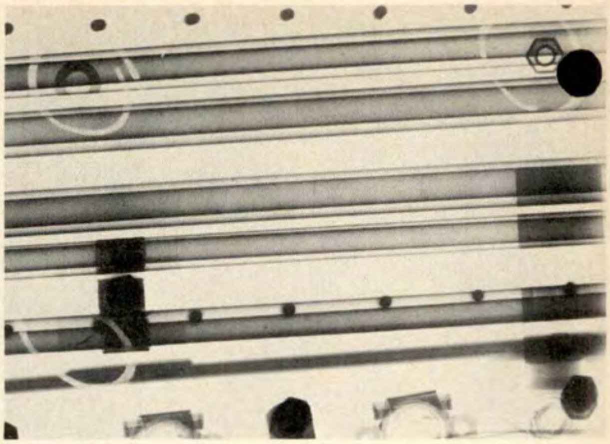
Dear Troops

Although the staff of *Aerospace Safety* spends lots of their time reading about, talking about, and writing about maintenance malpractices and deviations from tech data which adversely affect the aircraft accident rate, we continue to be impressed with the really high quality of maintenance work being accomplished. Month after month we place the spot light on bad maintenance, misuse of tech data, carelessness, goofs—but these things are the exceptions. The idea is that everyone learns from mistakes, his own or someone else's, so we publicize more of the bad than the good.

We trust our readers realize that the bad is not representative of the entire maintenance complex.

Toots

1



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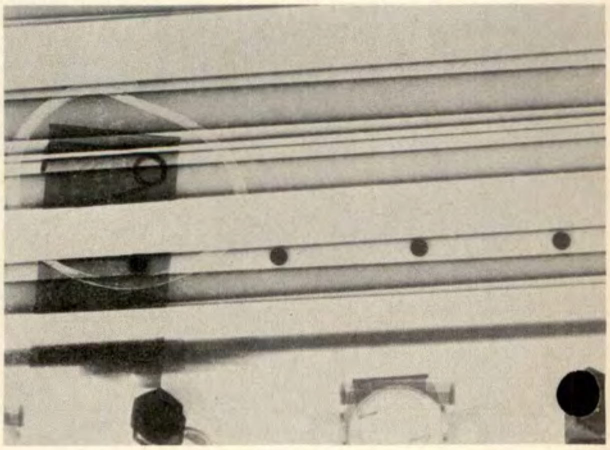


1b

LT COL ARTHUR W. DAY
4th Tactical Fighter Wing
Seymour Johnson AFB, N.C.

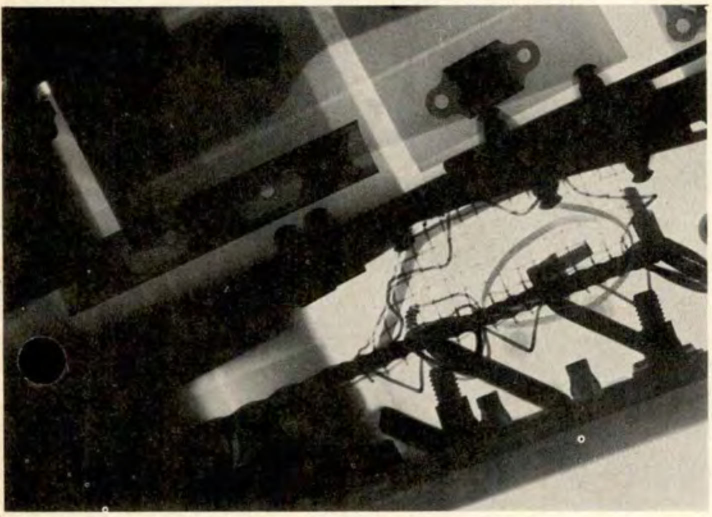
NDI-FOD

WEAPON IN FOREIGN OBJECT CONTROL

The 4TFW recently experienced an unusual number of engine FOD incidents, which led to an intensive search into all aspects of FOD causes and prevention. Several findings turned up that should be of interest to all F/RF-4 units.

Through the use of NDI X-ray procedures (radiographic inspection), this wing discovered numerous small objects located under the protective shield that covers hydraulic lines in the bottom of each engine

2



2a

3

3a

bay. Photo #1 shows SSgt Richard Smith aligning X-ray tube head for shooting bottom of engine bay. X-rays from different aircraft revealed a washer, nut and heavy safety wire under hydraulic lines (Photo 1a) and a hidden brake pin and heavy safety wire (Photo 1b). Photo #2 shows SSgt Ernest R. Brothers placing the X-ray film and TSgt James K. McDonald aligning the tube head prior to exposure. The exposure, Photo 2a, revealed a loose Jo bolt. By making exposures at different angles, once a foreign object is discovered its location is pinpointed using polaroid film. Photo #3 shows polaroid film placed in air intake and X-ray tube shooting up. Resulting exposure, Photo 3a, pinpointed the Jo bolt between the intake inner and outer skin.

By visual inspection, foreign objects (washers, clips, cotter pins, safety wire) have been discovered in the crevices below the centerline split panel cannon plug seal assembly where the centerline tank electrical lead goes through the left engine bay. Most of our FOD has occurred in the left engine and the majority of foreign objects discovered during X-ray has been in the left engine bay area.

Analysis has shown that most FOD is a result of:

• Remnants left from the recent 2147 Program. The majority of this work occurred in the left engine bay and variable ramp area.

• Carelessness of personnel performing maintenance or training which required removal of the centerline split panel cannon plug seal assembly.

• Loose screws being placed in the exterior boarding step wells.

• Foreign objects which cannot be removed without removing a protective shield assembly above and aft of doors 74L & R.

In response to these findings, the 4TFW has taken the following actions:

• Established a requirement that all aircraft variable ramps and protective shield areas be X-rayed and any foreign objects removed prior to the next flight.

• Established a requirement that the protective shield discussed in Paragraph 2 be removed and the area below inspected and vacuumed at engine removal (AFTO Form 22 has been submitted to include this requirement in TO Work Cards 1F-4C-6WC-4).

• Emphasized importance of performing thorough and accurate engine variable bypass bellmouth inspections anytime an engine is removed.

• Visually inspected all aircraft for proper installation of centerline split panel cannon plug seal assembly; examined the crevice area below it and all boarding step wells.

• Formed an FOD Investigation Team (similar to the Flight Control Team) for continuity of FOD investigations.

• Formed a special intake inspection team to inspect aircraft prior to each flight subsequent to aircrew's arrival for preflight.

• Include boarding step foot wells on crew chief's preflight inspection (AFTO Form 22 has been submitted to include these boarding step areas).

• Placed additional emphasis on insuring that all personnel who work on or around the F-4 are properly educated and trained in detection and prevention of FOD. Sample X-rays have been included in this education process.

Inspection of 28 aircraft revealed that 12 of them contained potential FOD. Ten of the 12 discoveries were in the left side of the aircraft.

Collection and analysis of data will be continued in order to surface additional trends which may identify origins of FOD contamination. ★

THE "IF-YOU-DON'T-KNOW-HOW-IT-WORKS-LEAVE-IT-ALONE" DEPARTMENT

MAJ EDWARD G. FRANCIS, CF, Directorate of Aerospace Safety

Although this story involved a T-bird, the lessons to be learned apply to all of us. It is another incident that shouldn't have happened. Our thanks to the drafter of the incident report, from which much of the narrative was lifted.

The aircraft landed away from home base with a fuel venting problem which was traced to a leak near the right tip tank disconnect area. Two technicians began to investigate the problem. One removed the tip tank jettison access panel and decided he needed a torque wrench and adapter to check the torque on a nut. The other found he needed a speed screw driver to facilitate removing the tip tank fairings. Both technicians left the aircraft to get the tools.

Meanwhile, the pilots returned to the aircraft to see how the repair was going. The AC jumped up on the wing, walked to the end and proceeded to explain to the other pilot how the jettison system worked, although as he admitted later, he did not understand it. He picked up the tip tank pin which was lying on top of the wing, inserted it into the arm of the tip tank hook release lever, and then removed it. He then grasped the arm and moved it sideways, causing the tank to jettison (as advertised). Unbelievable? But true!

Most of us are drawn to open panels on airplanes to see what makes things go; there is nothing wrong with a healthy curiosity. We must, however, remember to "look, but don't touch." Obviously, in this case, the pilot had no business tampering with a system which he did not understand; therefore, pilot factor was the primary cause of this incident.

Although they could not have forseen what would happen, the technicians should not have left the aircraft unattended with the tank jettison mechanism uncovered and the safety pin removed. They were right not to have attempted to insert the pin with the access panel off because of the chance of jettisoning the tip tank, but one of them should have stayed to guard the area. That might have prevented the incident. ★

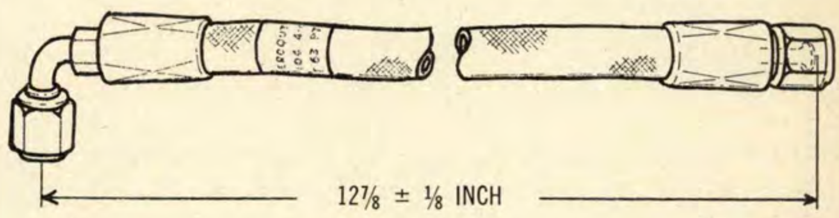
Tech topics

briefs for maintenance techs

T-37 NOSE GEAR HOSE

NOTE
MEASURE HOSE LENGTH FROM CENTER LINE OF 90° ELBOW TO END OF FLARE INSIDE OF NUT.

CAUTION
The method of measuring and the length of the new hose assembly is very critical; insure close quality control.



In spite of specific instructions and the caution note in TO 1T-37-B-2-3, maintenance personnel continue to deviate from the tech order when installing this critical item of the landing gear system.

In this incident the gear handle would not lower to the full down position. The student pilot went around with the gear handle stuck in the intermediate position, but after the handle was worked a few times, it went to the down position. But only the nose gear extended. Hydraulic pressure was observed at 300 psi. The emergency extension system was activated and the mains went down and locked.

A $13\frac{1}{4}$ inch up pressure hose was found installed instead of the $12\frac{7}{8}$ inch required by the tech order. The "B" nut connecting the hose to the restrictor had loosened allowing the hose to turn and hang. This restricted movement of the gear selection linkage. The continued movement of the handle by the pilot finally freed the linkage allowing the gear to go to the down position. However, hydraulic fluid had been depleted by this time, which necessitated use of the emergency extension system.

Strict compliance with specific instruction in the TO would eliminate this type problem.

FIRE IN COCKPIT

Two T-38s recently had electrical fires in the cockpit because maintenance men installed the ignition control circuit breaker panels (front cockpit) backwards. One of these incidents occurred in flight, the other during engine run-up for takeoff.

It's been a known fact by most T-38 maintenance types for many years that this panel will fit backwards, but if installed backwards the wire bundle will chafe the left throttle cable which could cause an electrical fire.

I know of one outfit that installed a simple little "UP" decal on their panels to help prevent improper installation. Seems like a real good idea.

TIGHTEN NUTS CORRECTLY

During the high speed portion of an A-37 functional check flight, as airspeed passed approximately 350 knots, both indicators fluctuated momentarily and decreased to 30-40 knots. Pitot heat was selected but failed to correct the problem. The pilot declared an emergency and an escort aircraft joined up to assist in a safe landing.

A drain "T" fitting "B" nut had not been properly tightened during prior maintenance. The "B" nut backed off in flight causing system failure.

TECH TOPICS

MAINTENANCE STANDS

Air Force Manual 127-101, paragraph 8-2H(2), requires that all maintenance stands be secured while parked on the flightline, to prevent damage to aircraft or equipment should the stand be subjected to exhaust blast.

One outfit did not comply with this requirement and a B-4 stand was blown into a parked KC-135 during launch of another aircraft. Eighteen manhours were required to repair the aircraft damage.

This same paragraph also requires that the responsible supervisor inspect the various stands daily for condition of the brakes, jacks, securing cables and anchor connections. Are you performing the daily inspections as required by AFM 127-101?

The pilot also has a responsibility for making sure the exhaust area is clear. It doesn't take much wind blast to move one of these stands even when it's properly secured.

REALLY INSPECT

As the C-131 turned final, it was noted that the Nr 2 engine was stabilized at zero thrust, 2000 rpm, and would not react to throttle movement. The approach was continued, an emergency declared and an uneventful landing accomplished.

The flight mechanic, assisted by transient alert, found the throttle linkage disconnected at the carburetor. The nut and cotter key that secure the connection could not be located. Apparently the cotter key had not been installed during previous maintenance, allowing the nut to vibrate off in flight.

Work accomplishment inspections which consist of signing the aircraft form do not prevent accidents (or incidents, in this case). The only thing they do is get the supervisor off the hook (sometimes). They do not fulfill the requirement for an aggressive, searching inspection.

The next time you clear a Red X, get up on the maintenance stand or crawl in that hell hole and take a good look. After you are sure everything is just right, then sign the forms.

QUOTE . . .
WITHOUT COMMENT

"While completing a simulated single engine approach, it was noted that the EPR gages in the front seat were connected to the wrong engine."

* * * *

"Evaluation of the UMR indicates that materiel failure of the restrictor valve was not the cause of the reported problem. Difficulty was attributed to the foreign object (thumb tack) in the valve."

* * * *

"EUMR #______ is downgraded to routine due to the existence of adequate maintenance control."

* * * *

". . . the standby inverter had never been installed and was found sitting on the battery in the nose compartment."

* * * *

". . . disassembly revealed an intermittent breakdown in the primary winding of the rotor and pivot assembly. There were no signs of defects in workmanship. When possible, material defects will be corrected prior to failure. This is closing action . . ."

* * * *

"Unfortunately, the exhibit was inadvertently turned in for overhaul . . ."

OPENER/DISPENSER

Have you taken a good look at that oil opener (spout) lately? It would be a good idea to make sure that the opener is securely mounted to the spout. The openers on some of these spouts are secured with a common 10/24 screw and plain nut.

In one case the nut came off while an aircraft was being serviced with engine oil and the nut almost went into the oil tank. This unit has removed all common nuts and replaced them with self-locking nuts to prevent this hazard. Seems like an outstanding idea.

WRONG HANDLE

When you reach in the cockpit of any aircraft and start throwing switches and pulling handles, know what you are doing.

One transient maintenance troop apparently was not paying attention. He was installing the drag chute on an F-4 and went to the cockpit, reached in and pulled the canopy jettison handle. One thing that contributed to this incident is that the canopy jettison handle on the F-4 is located in the general area of the drag chute handle on other aircraft.

NOT A TOOL RACK

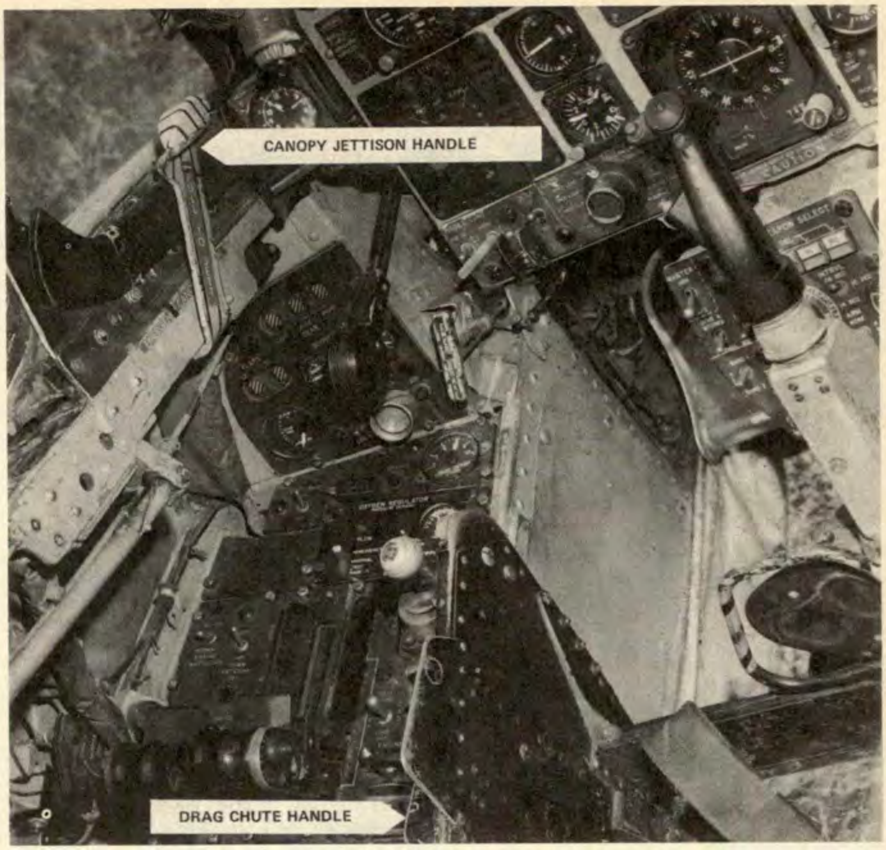
As the KC-135 started descent, Nr 2 throttle stuck at 88 degrees (cruise power); however, later in the descent the throttle came free and worked normally until landing.

A small metal loop—the kind found on a mechanic's flashlight —was found on the throttle cable in the nose compartment. The loop was marred and scratched where it had interfered with cable movement.

Apparently an unknown individual had found the throttle cable an ideal place to hang his flashlight and he failed to retrieve the metal loop when the job was completed. The control cables in an aircraft are for a specific purpose, and are not designed as a tool rack.

$13,450 STOMACHACHE

Following a completed mission, the F-105 pilot taxied into the chocks and advanced the engine to 75 percent prior to shutdown.



At this time the crew chief removed the tank pins from the pin bag and while holding the pin by its streamer end, tossed the pin toward the assistant standing by the right main gear. Yep, the engine ate the pin and got a $13,450 stomachache.

FAULTY GAUGE

During preflight of an F-111 the crew chief noticed that main strut extension appeared to be excessive. Proceeding to check the pressure, he discovered the gage was faulty. The crew chief attempted to locate another gage but was unsuccessful so he continued the preflight, completed the forms and launched the aircraft on schedule.

All was normal on taxi and takeoff roll, but after liftoff the speed brakes failed to retract. (The main forward gear doors also serve as speed brakes on the F-111.) The gear was recycled, but the speed brakes remained extended. The mission was aborted and the aircraft returned to base.

The main struts were found over-serviced which allowed the gear to retract but the linkage to the speed brake control valve would not position to permit the speed brakes to close.

Concerning this incident, a few questions remain unanswered:

• Why was a faulty gage readily available to the crew chief?

• How long had this gage been available for use in this condition?

• Was there actually only one gage available? (The faulty one?)

• Was the supervisor aware of the faulty gage? (He should have been.)

• Why hadn't steps been taken to insure that all required equipment, correctly calibrated, was available to flightline personnel?

TECH TOPICS

THE WRONG WAY

Airman Doe was assigned to inflate the right main tire on a T-38. He took the two-wheeled nitrogen cart (ATC common) and proceeded to the aircraft where he attached the hose to the valve stem, turned the regulator valve full clockwise, and opened the nitrogen bottle.

The wheel assembly immediately split at the attachment bolts. Part of the wheel was blown through the gear door and into the side of the next aircraft, penetrating the skin and cracking the canopy. Some bolts were found 80 yards from the mishap.

The airman had turned the regulator valve to full pressure (estimated 1800 psi) instead of counter-clockwise as required by tech data. Fortunately, this young airman was not injured by the exploding wheel and tire assembly. This incident should remind all maintenance personnel that aircraft tires are deadly weapons when proper safety steps are not followed per the aircraft tech order and AFM 127-101.

CHECK THE BATTERY?

Would you use an open flame to view the fluid level in a battery? Recently a man in another service tried to do just that with catastrophic results. He was detailed to check four 12-volt batteries which were in a poorly lit area under a work bench. The batteries were on a continuous trickle charge because they were used as a source of emergency power. Since he had not brought a flashlight with him, he used his cigarette lighter and, as he bent toward the battery, the resulting explosion blew acid into his face and eyes. The man's injuries may lead to permanent disability.

(CF Directorate of Flight Safety)

FLIGHT CONTROL FOD

During basic flight maneuvers the control stick in both cockpits of the F-4 could not be moved more than one to two inches aft of neutral. The stab aug system was engaged and disengaged with no result. After a controllability check, the aircraft was landed from a long straight-in approach at 220 knots.

Maintenance found part of a 10/32 inch bolt broken off in the rig pin hole in the stabilator bell crank assembly in the left forward missile cavity. The bolt had apparently been used as a rig pin during maintenance and was not removed after being broken. The broken piece of bolt had worked out enough to bind the controls.

Tech Order 1F-4C-2-4, paragraph 2-69 tells how and what precautions to take when using bolts as rig pins.

RIGHT TOOL FOR THE JOB

A CF-101 pilot had to shut down an engine and carry out a single engine approach and landing because of a low oil pressure indication. Investigation revealed that the oil pressure gage was sticking because the instrument casing had been badly dented—apparently through the use of water pump pliers or other similar tool.

It is imperative that maintenance personnel treat aircraft instruments as extremely delicate objects (which they are). In particular, all maintainers must be cognizant of the need to use only the approved tools, in accordance with the applicable tech data, when installing or repairing aircraft instruments.

(Canadian Forces Safety Bulletin)

QC AND THE DASH 6 REQUIREMENTS

Quality Control: Are all Dash 6 requirements being complied with at your base on all aircraft?

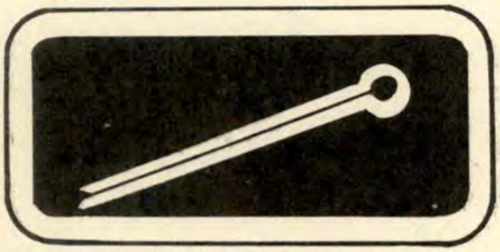
Read on: The F-4 was turning out of traffic when the crew heard a loud "bang;" the left generator light came on, RPM went to 55 percent, and oil pressure to 10 psi.

The cause: The throttle control box was found dry of lubricant. This caused the IGV feedback cable to wear and slip, causing compressor stall.

Lubrication of this control box is a 36-month Dash 6 requirement. According to the month and year etched on the box, this one had not been lubricated for **six years.**

Once more: Quality Control, are all Dash 6 requirements being complied with at your base?

NUCLEAR SAFETY AID STATION



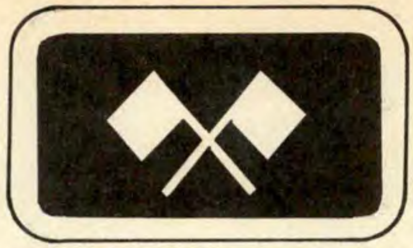
IMPROBABLE CAUSE

After a bomb-laden MHU-20C clip-in was loaded in a B-52, two of the bomb racks appeared to be unlocked. The locking cable was stretched over a cotter pin, increasing tension in the cable and partially extracting the rack locks. This resulted in the unlocked condition.

The Dull Sword report gave transport motion during convoy as the probable cause for the cable being in this abnormal position, so one could imagine the effect aircraft motion would have on the system. This was an alarming thought, from a nuclear safety viewpoint! The Dull Sword report was a preliminary/final type, so the information should have been complete and accurate. However, additional investigation revealed that the clip-in had been recertified two weeks before the deficiency was noted, the lock systems operated properly after the cable was released from the cotter pin, and the deficiency was caused by inadvertent placement of the cable by a "person unknown."

In general, almost everyone is doing a good job of submitting mandatory nuclear safety deficiency reports. Nevertheless, before you submit your reports, check them for completeness and accuracy. If you don't have all the necessary information, submit a preliminary report and follow up with supplements.

TRANSIENT SIGNAL?



NOT ALWAYS!

Intermittent faults in the Minuteman system often result in Dull Swords and the cause is usually diagnosed as a transient signal. Thorough investigation of a recent transient condition proved otherwise. The Execute Launch Command light was caused by a washer embedded between the male connector shell and pin 13 of cable W712. Equipment vibration finally caused the washer to make contact after many months of being undetected. There could be similar cases awaiting detection, so continue to report similar faults. In this case, the crew properly inhibited, as required by AFR 122-30, "Safety Rules for the WS-133A-M and WS-133B (Minuteman II) Weapons Systems."

KUDOS, BUT . . .

Kudos to the alert B-52 flight crew which noticed and reported a nuclear safety deficiency during their aircraft power-off preflight. The release circuits disconnect (RCD) was properly safety wired and sealed, *but the RCD was connected.*

An experienced and fully qualified load crew had just completed an AGM-28B "Hound Dog" Postload Check for Alert, supposedly in accordance with Section VIII of TO 1B-52B-16CL-1. At step 29, they were required to unseal and connect the RCD for several electrical continuity checks. Step 51 calls for RCD disconnect and resealing. The Two-Man Concept applies to this operation and there was a quality control inspector on duty.

It appears that the job had become routine—familiarity breeding complacency. This incident happened on a Friday, probably late in the day. Were they rushing to make a party? Were their thoughts of fun and leisure?

Regardless of the circumstances, we must always be alert in any job involving aircraft or ordnance, particularly nuclear weapons. To paraphrase a familiar saying: ENGAGE BRAIN BEFORE OPENING TECHNICAL ORDER. ★

"PILOTS QUIZ"

With reference to the "Pilot's Quiz" (June, page 8), question #9 appears to have no correct answer.

Your situation is as follows: "You are being radar vectored to an ILS approach and the controller tells you 'Cleared ILS approach'." According to your answer, the pilot is then cleared to descend to the intercept altitude.

Not so! What AFM 51-37 really says is that the pilot is cleared to fly the approach *as depicted*. If there is an altitude restriction (based on either DME or on an intersecting radial, for example), the pilot is well advised to adhere to that restriction.

Lt Col Emmett L. Herron
Chief, Flight Stan Div
USAF IFC, Randolph AFB, Texas

You are absolutely correct. Thank you for bringing the error to our attention.—Ed.

"IRAN VERSUS IRAP"

The June issue of Aerospace Safety featured an article "IRAN Versus IRAP." Interestingly a Joint AFSC/AFLC/AMC/NMC Panel on Maintenance Man-Hours Per Flying Hour studied the concept of IRAN (AF) IROAN (Army) and PAR (Navy). The conclusions of the panel were consistent with the article. One of the results of this panel, which bears approval of all the Services, is to consistently redesignate the various acronyms to the Servicewide use of PDM (Programmed Depot Maintenance).

The Army was the first Service to issue their directive as TB55-1500-313-25. The Air Force version will appear in an imminent revision of TO 00-25-4. The Navy is revising OPNAVINST 4790.2.

Robert Chernoff
DCS/Logistics, AFSC
Andrews AFB, Wash DC

"SIX FLAME OUTS LATER"

Your article "Six Flameouts Later" closes with, "You can shorten those odds on your bird by doing the job right the first time." But this excellent article points out not only the importance of doing the job right, but also of doing the right job. Though a crew chief may follow tech data perfectly, if he's not careful he can still be in error, like a surgeon who amputates the wrong foot.

Capt Ralph W. Harker
433 Tac Ftr Sq
APO San Francisco 96304

Your analogy is a little macabre, but your point is well taken.—Ed.

"KEEPING UP WITH THE TIMES"

Many thanks to Mr Taylor for his article, "Keeping Up With the Times," *Aerospace Safety*, May 72. His brief synopsis of the more significant changes to our "Bible," AFM 127-100, is most welcome and informative; however, . . . the third item of the synopsis of Chapter 9 is in error (probably typographical). It states, "(except for HC Smoke, which needs the symbol "B" plus a single diagonal)." The "B" marking is used solely for identification of locations containing Biological Defense Research Agents. . . .

In January, I compiled an alphabetical index to the new manual for use by the additional duty explosives safety personnel assigned to the subordinate units of this Wing. As an afterthought, I submitted it to higher headquarters for evaluation as an item suitable for wider dissemination. AFISC/SEOE has indicated that it will be published as part of Change 1 to the basic. I'm enclosing a copy of that locally produced index. . . . Again, many thanks for a concise, well-written article; one for which I'm sure most of my fellow weapons safety officers are equally grateful. It fills a definite need for a quick reference to the major changes in the manual.

Capt Andrew M. Popovics
Sembach AB, Germany

You're quite right—the sentence should have read "(except for HC smoke, which needs the symbol "D" *plus a single diagonal)." We caught the error, but not until it was frozen in print.*

Thank you for the compliments. We'll throw one back at you by saying that your index is very well done, very complete, and should be an extremely valuable addition to AFM 127-100. You should be commended for your willingness to contribute to the field of Explosives Safety.—Ed.

☆ U. S. GOVERNMENT PRINTING OFFICE 1972 789-131/12

UNITED STATES AIR FORCE WELL DONE AWARD

Presented for outstanding airmanship and professional performance during a hazardous situation and for a significant contribution to the United States Air Force Accident Prevention Program.

Captain EDWARD L. CHASE
Major WILLIAM C. BURNS JR.

474th Tactical Fighter Wing, Nellis AFB, Nevada

On 21 January 1972, Captain Chase and Major Burns departed Nellis AFB in an F-111 on a tactical evaluation flight check. The mission was uneventful until, rolling out on downwind, after their last low level bomb delivery, the aircraft suddenly rolled hard to the left. Captain Chase was able to right the aircraft and maintain wings level only by using full right roll control. Numerous warning lights confirmed failure of pitch, roll, and yaw damper systems; CADC, fuel quantity and distribution systems; primary and auxiliary attitude and heading systems; automatic cowl and spike control systems; and pitot and angle of attack heating systems. In addition, most engine instruments and the flight control position indicators were inoperative. His only available instruments were the engine RPM gages, standby airspeed indicator and the altimeter. Captain Chase attempted to reset the damper systems, which caused another violent and uncontrollable left roll. He then turned the dampers off and placed the flight control disconnect switch in OVERRIDE.

An emergency was declared and the flight headed south for recovery at Nellis, with Major Burns helping Captain Chase hold the very heavy right stick pressure required to keep the wings level. A visual check from the chase aircraft did not reveal any external indications of the problems. The aircrew went through all checklist procedures for flight control malfunctions, but none of these procedures relieved the problem. Wing sweep was moved to the forward position. The indicator had failed; however, the wingman confirmed the wings had moved forward. The crew climbed to a safe altitude and accomplished a controllability check. With full flaps, they could not maintain wings level, but Captain Chase determined that he had sufficient control to land the aircraft with 15 percent flaps at 220 KIAS.

Shortly thereafter strong electrical fumes were detected in the cockpit. Major Burns turned off all electrical equipment except the UHF radio, eliminating the fumes. Captain Chase requested a straight-in approach to the inactive runway to avoid flying over a highly populated area. Major Burns insured all landing checklist items were accomplished and pneumatically positioned the cowls and spikes to the proper configuration for landing. A straight-in final was flown at 220 KIAS using full right stick and right rudder, and a smooth touchdown was accomplished in the first 1000 feet of runway. Although nosewheel steering was not available, Captain Chase kept the aircraft in the center of the runway, extended the arresting hook and successfully engaged the arresting barrier at the far end.

Investigation revealed a failure of a hot air duct to the rain removal system. The failure had occurred in the forward equipment bay, and the resulting heat popped 75 circuit breakers, rendering the flight control system completely out of trim and most instruments and aircraft systems inoperable.

The outstanding airmanship of Captain Chase and Major Burns clearly saved one of the most valuable aircraft in the Air Force inventory. WELL DONE! ★

FAITH IN THE FUTURE