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Aerospace SAFETY

THE MAGAZINE DEVOTED TO YOUR INTERESTS IN FLIGHT

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SPECIAL FEATURES

REGULAR FEATURES

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Fallout

LETTERS TO THE EDITOR

FRIEND OR FOE

On page 20 of the July issue is an article "Friend or Foe" by A1C Howard T. Wainwright, 3501 Student Sqdn, Reese AFB, Texas. We would like permission to republish this article for distribution to all our employees as a part of our Safety Education program which includes Health, Safety, and Fire Prevention.

The article will be reprinted as a single sheet, both sides, for general distribution, and will be used as a topic for a safety meeting in October during Fire Prevention Week.

Percy Wyly 2nd
Safety Education Div 3212
Sandia Corporation
Sandia Base, Albuquerque, N.M.

Please be our guest.

WELL DONE: Pro and Con

I suggest you pull out a copy of the August issue and read the article "Delayed Ejection Decisions" by General Putnam (page 1). Note particularly paragraph five and then turn to your "Well Done" feature on page 29 and read it.

Although recognition of excellence in doing one's job is fine, the "saved the plane hero" image is a significant factor a pilot runs through his mind in determining his actions in a crippled aricraft. True, it will be more significant to some than others, but nevertheless it contributes to confusion and in a way makes General Putnam's suggested decisions a bit harder to arrive at.

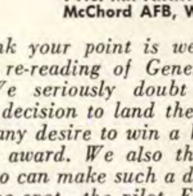
It appears to an interested reader—one who generally admires your publication—that you're preaching one doctrine and subtly encouraging another. What do you think?

Capt Donald R. Crouch, AFRES
941st Mil Airlift Gp
McChord AFB, Wash 98438

We think your point is well taken but suggest a re-reading of General Putnam's article. We seriously doubt that Major Yandow's decision to land the aircraft was based on any desire to win a Well Done or any other award. We also think the only person who can make such a decision is the man on the spot—the pilot. For as long as we can remember, Aerospace Safety has stood for this idea.

The Well Dones are not *selected by the*

continued on page twenty-eight



FRONT COVER

Fisheye-lens view of Captain Gary Boyer as he scans the jungle for Viet Cong activity. On his door window are coordinates he receives from ground forces, other FACs, etc. Photo by Mr. Kenneth Hackman AAVS.

PUT THE ORDNANCE ON THE TARGET

Maj Nelson Allen
Directorate of Aerospace Safety

The name of the game is Put the Ordnance on the Target. Everyone knows that. All you have to do is be at the right place at the right time, at the right airspeed, at the right dive angle, at the right slant range, at the right G-loading, at the right wind corrected aiming point. And, oh yes, you must be in perfectly coordinated flight. That's all it takes and *anyone* can hit the target—every time.

Every fighter pilot in the business knows how much more difficult that is than it may sound. Everything stated is true, but some of those variables by themselves are tough to handle, and when they're grouped in series, chaos may result. Standard error analysis shows us what happens when the dive angle is just a *little* shallow, the airspeed a *little* low, etc. You miss the bloody target, that's what happens. And when *you* miss the target, then *you* or one of your pals have to go back and try again. Funny thing about that ground fire! It's almost never lighter on that second pass. Ground fire, flak, and missiles are bad for the safety business, so I'm going to chat about hitting the target on the first pass—better living through magic.

Why don't we use a system that computes the results of all these parameters for us and places the

Avionics systems of future will mean the difference between "just an airplane" and effective weapons system.

"pipper" on the computed impact point using real life quantities instead of assumed values? Let's not assume that the dive angle, slant range, airspeed, crosswind, headwind, target elevation, G-load and aircraft coordination are all constants that you have brilliantly planted in concrete in spite of wind, snow, sleet, hail, flak and MIGs. Instead, let's adapt the wizardry of the avionics industry to the flying machine. If we can take pictures of the back side of the moon, maybe we can put the smash on the Ho Chi Minh trail—or a gun position. All it takes is slide rules, money, and brains. Here's how it works.

Design a super-sophisticated gun/bombsight that has a "pipper" that is really a *continuously computing impact point.* Design the system so that the pipper is positioned on the windscreen in accordance with your *actual* position and velocity, and the target's *actual* position and velocity. Have the computing gunsight assume nothing. Feed slant range data to the computer from a narrow beam radar that is measuring slant range from the aircraft to the point on the ground (or in the air) that is indicated by the pipper at that moment. This removes the problem of vague, unknown, or ill-defined target elevations as well as the slant range problem.

Feed the computer dive angle information from an inertial guidance platform. Feed actual airspeed to the system from a Central Air Data Computer (CADC). Feed aircraft G-loading from the CADC or a real life accelerometer. Determine target velocity from the narrow beam radar feature.

By the time you're through with all these inputs, your job is a great deal simpler than it has ever been before. Any time the pipper is on the target and you are anywhere within the broadest feasible envelope, if you push the button or pull the trigger, the selected ordnance will impact the oxcart.

Let's incorporate some icing on the cake. Let's assume that your dive angle is so flat, your slant range is so great, or your airspeed so slow that the pipper is depressed as far as it will go but the impact point is still somewhere under the nose of the aircraft. Then if you hit the button or trigger, nothing happens, but if you continue to hold it during the pullout the stuff leaves the airplane at the right moment during the pullout to do all the good work you set out to do. It doesn't really matter how smartly you pull back on the stick, by the way, because we're slipping the computer all that good G information all the time that we're changing direction. HOW ABOUT THAT!

What are the prospects for the working man to have this kind of hardware in his flying machine during this lifetime? They're pretty good. I have described in the broadest and most general terms one of the capabilities of the F-111 Mark II avionics package.

The pilot of an F-111 will get a lot of mileage out of the avionics package before he gets to the target. It incorporates a lot of features in addition to those described in the beginning of this article. In the broadest terms, a complete flight profile can be set into the system. The pilot can either follow the dictates of the computer or delegate this task to the autopilot. He can set the mission into the computer while airborne and he can update the program from visually acquired or radar acquired checkpoints. He can deviate from his program to avoid unforeseen hazards to flight and then return to the planned profile as he sees fit. He has a terrain avoidance radar system that seems to be much more effective than previous models. He can use the system to attack ground or air targets in the blind or visually.

PRE-PLANNED MISSIONS

The computer will accept a preplanned mission from a prerecorded tape system. Using this feature, all the precise and tedious details of a mission can be previously computed and placed on a tape through a "typewriter" system. This mission can be filed in the squadron library or fed into the aircraft computer when needed. It takes less than two minutes to transcribe the mission to the aircraft computer. Once the aircraft is airborne, this mission can be revised, amended, modified, expanded or canceled.

As the mission progresses, the crew can readily update by manually placing the target cursor over the "real" checkpoint. This "real" checkpoint can be located on the radar display in front of either pilot, or the pilot can locate it by looking out the window. There is a Heads Up Display (HUD) on the gunsight/combining glass in front of each pilot. To update the computer to a visual checkpoint, the aviator manually places the target cursor that appears on the HUD on the checkpoint or target, releases the manual button, and the system is back on course. The HUD provides flight director information such as attitude, airspeed, range and other symbology as well as the target cursor. The configuration on both HUDs (left and right window) is identical to that on the radar display in front of the aircraft commander. This facilitates rapid conversion changing reference from the instrument panel to the windscreen.

The IR override switch is a feature of this system that must have been conceived by a bona fide card-carrying fighter pilot. You can imagine the circus that might take place in the cockpit if you were IFR, on auto pilot, approaching target for an air-to-ground missile attack, when you suddenly broke out of the clouds, looked out the window, and saw a sky full of MIGs. Repositioning all those switches in a 6G turn by the light of the Roman candles could give a fighter pilot more problems than his job description calls for. Hence, the IR override switch. It is positioned on the instrument panel directly in front of the Aircraft Commander. A flip of the switch says "Magic box, forget everything after 'ATC Clears' and set me up for air-to-air missiles. Seems I have some work to do." At this point all appropriate switches step to the position necessary to shoot MIGs.

The reliability factor in this system demands our attention and comment. As we all know by now, a magic set that doesn't work is nothing more than a waste of money, weight and trouble. The more complex the equipment, of course, the greater the reliability problems. There are indications that the reliability factor should be within acceptable limits in this system. Here are some of the salient features that indicate an appreciation for this problem. Fastidious attention to quality control is assumed at this point. The following features indicate a healthy approach to coping with malfunctions.

The system has two high-speed computers. One is primarily a navigation computer and the other is primarily a weapon delivery computer. Each computer can accomplish the essential elements of the other computer's task. Although the two systems are not totally redundant, failure of one computer does not abort the mission. Incidentally, at this time 25 per cent of each computer is uncommitted. These circuits are reserved for future requirements that will develop from operational experience.

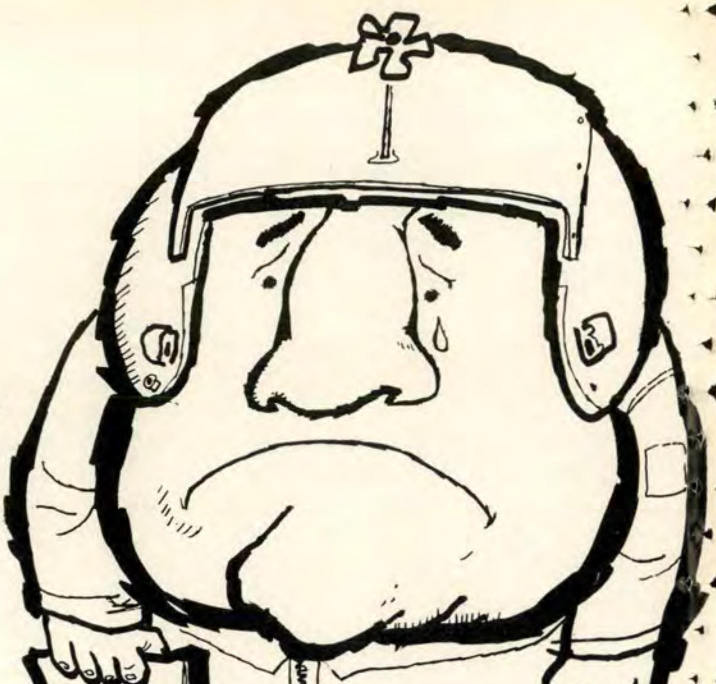
The system has a test circuit that constantly monitors the entire package and informs the pilot if such components as the Doppler radar inertial guidance, or terrain avoidance system are inoperative. The ground crew has a test circuit that further isolates the malfunctioning subsystem or circuit. A nice feature of the airborne test monitoring system is that its diagnosis is continuously recorded on tape. Therefore, when the ground type finds that the system "Ground checks OK" he plays back the tape and locates the gadget that had been malfunctioning even though it was normal in postflight.

The myriad magic boxes in this system are designed to test go-no-go and then be removed and replaced as necessary, with the minimum calibration and system realignment. Evidently, this system comes much closer to that concept than previous systems we have dealt with. Advances in the state of the art have reduced the interaction between the many black boxes to the point where we can anticipate a legitimate remove and replace maintenance capability for most parts of this system.

The avionics package described here is not a reality at this point. It will be installed in the F-111D and the FB-111. While it is certainly complex and unquestionably expensive, if it works as advertised it should be of great help to that working man whose mission it is to "put the ordnance on the target." ★

Banish the...

Maj Michael G. Filliman
Directorate of Aerospace Safety



There is good news ahead for all pilots, whether you fly fighters, bombers or transports. Can you imagine confidence in your knowledge of Bold Face Emergency Procedures to a degree where you'd take the Stan/Eval Test cold? Although we have many pilots who can do just this, too many cannot, especially the multi-currency types. Oh, sure we all know the procedures, but the sequence may be a little rusty or an item may be missed here and there, especially in a long procedure with eight or nine steps, so we bone up before the Stan/Eval.

To combat this problem, some organizations go so far as to require that a Bold Face Procedure be covered on every mission brief. Other good ideas are used, one for example, a quick question and response test of one Bold Face item by each flight member; even the flight lead gets his turn. All these ideas, however, do not help the many pilots, who by the nature of their flying, are not exposed to continued study.

Possibly the most sensible approach in this area is a proposal to standardize, where possible, the criteria, terminology, and procedures for *critical* emergency situations. The proposal resulted from a study conducted by the AFSC Stan/Eval Division at Eglin AFB, Fla, and adopted for USAF use in 1966. The Mil Spec on flight manuals (7700A) will eventually be revised to include this concept. However, the degree of use of this concept and procedures for emergencies peculiar to a particular type aircraft will still remain the prerogative of the using commands through Flight Manual reviews. It will be applicable to all types of aircraft, although the original study was for jet fighter/trainer aircraft only. The following excerpts from this study explain the thinking involved.

INTRODUCTION

Critical Procedures: It is necessary that the word *CRITICAL* be fully understood. Most of our flight manuals contain a definition of CRITICAL in the introduction to Section III, since the term carries a special connotation when used in connection with flight manuals and pilot's checklists. For this definition, we have gone directly to T.O. 1F-101A-1 (which is representative of definitions in the other flight manuals).

CRITICAL: Those steps which must be performed immediately without reference to written checklists. These critical steps should be committed to memory.

NON-CRITICAL: All other steps wherein there is time available to consult a checklist.

We therefore reason that a critical emergency requires an immediate, conditioned response on the part of the pilot.

We further reason that the BOLD FACE format, because of its importance and the consequences implied, should be exclusively reserved for the truly CRITICAL emergencies. They will normally be followed by non-critical steps in the same procedure,

...Bold Face Blues

designed as follow-up actions as time permits.

Four major factors prompted this study:

1. Misuse of the term CRITICAL in that many procedures presently treated as BOLD FACE do not meet the established criteria for CRITICAL. Examples of this will be shown.

2. Cross-training and multiple currency. Pilots transitioning into new aircraft or maintaining currency in two or more aircraft are constantly faced with an unlearning-relearning process. This is costly in terms of additional training time required. In addition, if the pilot should become confused because of dissimilarities between the procedures for the aircraft involved, flying safety is immediately compromised.

3. Difficulty imposed by the non-standard treatment of similar emergencies in different aircraft. A wide variation in treatment by the various flight manuals is readily apparent. In some aircraft, a given situation is covered by a BOLD FACE procedure; in others, the same situation may not even appear.

4. Many present BOLD FACE procedures are either misleading or actually incorrect. A CRITICAL procedure that is illogically arranged, requires interpretation on the part of the pilot, or is too long to memorize should be replaced by one that is clear, concise and sensible.

The following examples illustrate these points:

F-106 BELLY LANDING

If forced to make a gear-up landing, proceed as follows:

1. Tanks—Jettison (if required)
2. Normal Approach
3. Speed Brakes—Open
4. **GEAR HANDLE—DOWN**
5. Shoulder Harness—Locked
6. Immediately Before Touchdown:
   a. Throttle—OFF
   b. Fuel Switches—CLOSE
   c. Canopy—Retain
7. Touchdown Attitude—Normal
8. Drag Chute—Emergency Deploy
9. Master Electrical Power—OFF
10. Abandon Airplane

T.O. 1F-106A-1 carefully explains that this procedure should be used only if all efforts to lower the landing gear have failed and the pilot is forced to make a belly landing. However—the only BOLD FACE step in the procedure (Number 4) is GEAR HANDLE—DOWN.

This emergency situation does not meet the criteria for CRITICAL. In addition, it is difficult to explain the logic involved in preceding a CRITICAL step with one or more NON-CRITICAL steps when the definition of the term CRITICAL is applied. If BOLD FACE steps are required, they should be the first steps of the procedure without exception.

T-33 SMOKE OR FUMES IN COCKPIT

1. **OXYGEN REGULATOR DILUTER LEVER — 100% OXYGEN**
2. **CHECK FOR PRESENCE OF FIRE**
3. Battery and generator or battery/generator switches—Off

Steps #1 and #2 or this procedure are reasonable and logical. However, step #3 is a precautionary step in case the smoke is a result of an electrical fire.

It is entirely possible that this step could complicate the pilot's problems rather than alleviate them. For example, if it is determined that the aircraft itself is on fire, step #3 having been accomplished, the crew would have no radio or IFF to alert anyone prior to ejection. It is therefore felt that this step would be more appropriate AFTER it has been determined that the problem is electrical, rather than before. Considering the time interval involved in analyzing the situation, this step would then be presented in non-critical format.

TERMINOLOGY

The Air Force publishes a great number of flight manuals, checklists and associated material. This task is divided among the various Air Materiel Areas, with the major input to each publication being made by the primary using command. This, of course, involves many different individuals—each with his own ideas, personality, sense of values, etc. This accounts, in part, for many of the almost insignificant, but nevertheless, annoying differences which confront the pilot. Such things as speed brakes, speed boards, dive brakes, dive flaps and even AIR BRAKES are all used to describe basically the same item.

A throttle can become a thrust selector or a power lever. A throttle can be closed, shut down, stopcocked or moved to OFF. It can also be placed in military power, full open, full mil, or 100 per cent. If that is insufficient, it may be moved outboard, or to afterburner, or maximum, or full A/B, or MAX thrust.

These minor differences add a certain measure of confusion. More serious, however, are the larger differences that can be found throughout the BOLD FACE emergency procedures. By eliminating these differences (standardizing) where possible, most of this confusion will be removed. Hopefully, this could result in a reduction of the number one cause of aircraft accidents—pilot error.

PHASE OF FLIGHT SEQUENCE

One of the more recent changes to the flight manual specification requires the rearrangement of Chapter III of the flight manuals into what is called the "Sequence of Events Format." This has already been done in some manuals, such as the F-4C, F-101A, etc. The sequence of event format consists of four phases as follows:

Ground Operation Emergencies
Takeoff Emergencies
Inflight Emergencies
Landing Emergencies

This study followed this same format.

The following are good examples of the rationale used in the study:

DISCUSSION OF PROCEDURES

Phase I, Ground Operation Emergencies. It is recommended only one emergency be retained in CRITICAL format in this phase of operation. This

recommendation is based on AFR 60-9 which requires references to the checklist during the ground operation phase, very little would be gained by memorizing these procedures. In fact, at the present time very few manuals have more than one CRITICAL procedure in this phase of operation. The one emergency situation discussed is:

ENGINE FIRE DURING START

Present Titles:
Engine Fire During Start
Engine Fire/O'Heat During Start/Shutdown
Excessive EGT or Fire in Tailpipe During Ground Operations
Engine Fire—Start or Shutdown
Fire or Overheat (Start)
Excessive EGT During Start or Shutdown
Ground Starting Failure

Note all the present titles used by the various flight manuals for this same emergency situation. This is the first area of standardization—terminology. In this case it would be *Engine Fire During Start*. The following steps are used by one manual or another in various groupings to handle Engine Fire During Start. Present BOLD FACE Procedures:

1. **THROTTLE(S) — OFF**
2. **KEEP AIR FLOWING TO ENGINE**
3. **MAINTAIN ENGINE WINDMILLING**
4. **FUEL SHUTOFF SWITCHES — CLOSED**
5. **START & IGNITION STOP BUTTON — PRESS**
6. **ENGINE MASTER SWITCH — OFF**
7. **BATTERY SWITCH — OFF**
8. **STARTER SWITCH — STOP START**

This list does not show the procedure for any specific aircraft. In order that the exact BOLD FACE procedure for each aircraft can be studied, the following table must be used in connection with the preceding list of BOLD FACE steps.

T-33	T-38	F-4	F-5	F-100	F-101A	F-101B	F-102	F-104	F-105	F-106
1	1	1	1	1	None	None	1	1	1	1
8	2		3	5						4
	4		4	6						
				7						

It can be seen from this table that every aircraft concerned uses the same first step—THROTTLE(S)—

OFF, with the exception of the F-101 series which treats the entire procedure as non-critical.

In every case moving the throttle to OFF terminates fuel flow to the engine. Since the fuel is the source of the fire, this action should terminate the CRITICAL portion of the emergency. Further study will show that the remaining steps can all be done at a more leisurely pace, while referring directly to a checklist.

Once again—remember that the pilot, by regulation, is required to refer directly to the checklist anyway during this phase of operation.

Proposed CRITICAL Procedure for all Jet Fighter Aircraft:

ENGINE FIRE DURING START

1. THROTTLE(S) — OFF

NOTE: This would be modified as follows in the case of the T-33, where starting fuel is metered to the engine with the throttle already in the OFF position.

1. STARTING FUEL — OFF

Our intention is that this one step be the ONLY step permitted in CRITICAL format. Also, the wording be exactly as shown, i.e., not changed to THROTTLE-CLOSED or ENGINE-SHUTDOWN, etc.

All other steps in this procedure should be non-critical, and should be written as needed by the individual handbook managers.

It is also felt that this particular emergency procedure, ENGINE FIRE DURING START, would be more beneficial to the pilot if it were repeated in Section II of the checklist, immediately following the normal engine starting procedure.

Phase II. Takeoff Emergencies: This is perhaps the most critical phase of flight—where a rapidly deteriorating situation could well become catastrophic. The proposal calls for seven CRITICAL procedures during the takeoff phase, three of which apply only to certain aircraft; the other four to all aircraft. The procedures involved in dealing with Takeoff Emergencies must be divided into two major categories:

1. IF DECISION IS MADE TO STOP. (Based on available runway, arresting gear, barrier, overrun terrain, etc.)
2. IF TAKEOFF IS CONTINUED.

One of the most difficult choices of terminology faced in this study was this phrase "IF DECISION IS MADE TO STOP." The reason for this difficulty is the fact that almost every flight manual uses a different phrase or choice of terms—most of which are technically incorrect. For example, some of the terms currently in use are:

IF COMMITED TO TAKEOFF
GO-NO-GO
TAKEOFF NOT COMMITTED
DECISION SPEED
REFUSAL SPEED
IF AIRBORNE
AFTER LIFT-OFF
BEFORE AIRBORNE

All of the terms are used to describe the magic point at which you must abort or continue takeoff.

Under careful scrutiny, however, none of these terms actually mean what we intend to say—for various reasons.

For example, "refusal speed" is defined as "The maximum speed at which engine failure permits stopping at the end of the runway." It does not consider the fact that you probably have a barrier, arresting gear, some sort of overrun, etc., that is perfectly capable of stopping the aircraft safely. You could very well be far beyond refusal speed and still have the capability to abort. With a burning aircraft, this may be the best course of action.

It is impractical to deny the pilot the use of his educated judgment in an extremely critical situation such as this. Phrases such as After Airborne, After Refusal Speed, After Lift-Off, etc. leave no room for judgment, even though a successful airborne abort may be possible. The term "If Committed to Takeoff" is technically meaningless until we are supplied with performance data designed to compute this point, such as a chart for ABORT AFTER TAKEOFF. For these reasons, we have selected the phrases IF DECISION IS MADE TO STOP and IF TAKEOFF IS CONTINUED as being most realistic and descriptive of what we actually want to tell the pilot during this short but critical phase of flight.

If the decision IS made to stop, the pilot is then faced with the first CRITICAL takeoff emergency to be considered.

ABORT

Present Titles:	Abort
	Barrier Engagement
	Abort or Barrier Engagement
	Runway Overrun Barrier
	Aborted Takeoff
	Abort (Before Leaving Ground)
	Abort (After Leaving Ground)
	Abort/Barrier Engagement

Abort is a Takeoff Emergency and includes Barrier Engagement as an integral part of the procedure.

Barrier Engagement should be considered a Landing Emergency and may be repeated in the landing section of Chapter III under the title "Barrier Engagement." In all cases, however, the procedures for both will be identical.

ABORT

1. **THROTTLE—OFF**
2. **THROTTLE—IDLE**
3. **THROTTLES—IDLE** (For Fire—Affected Engine—**CLOSED**)
4. **THROTTLES—IDLE (OFF-FIRE)**
5. **THROTTLE—IDLE OR OFF**
6. **THROTTLES—IDLE**
7. **THROTTLE—IDLE (OFF FOR FIRE AND EMERGENCY BRAKE HANDLE —PULL FULL AFT)**
8. **EXTERNAL STORES—JETTISON** as Required
9. **STORES—JETTISON** (If Necessary)
10. **TANKS—JETTISON**
11. **CANOPY—JETTISON** (If Necessary)
12. **EXTERNAL LOAD—JETTISON** (If Necessary)
13. **CHUTE**—DEPLOY
14. **DRAG CHUTE—DEPLOY**
15. **DRAG CHUTE—EMERGENCY DEPLOY**
16. **SPEED BRAKES—IN**
17. **SPEED BRAKES—UP**
18. **SPEED BRAKES—OPEN**
19. **SPEED BRAKES—CLOSED**
20. **TAILHOOK—DOWN**
21. **HOOK—EXTEND**
22. **HOOK—DOWN**
23. **BRAKES—AS REQUIRED**
24. **WHEEL BRAKES—APPLY**
25. **BRAKING—STEER FOR CENTER, STOP BRAKING PRIOR TO ENGAGEMENT**
26. **BRAKING ACTION—AERODYNAMIC, NORMAL, EMERGENCY**
27. **ARRESTING HOOK—RELEASE**
28. **BARRIER—ENGAGE SQUARELY**
29. **CONTROL STICK—AFT TO RAISE NOSE.** (Avoid Nosewheel Liftoff)

T-33	T-38	F-4	F-5	F-100	F-101A	F-101B	F-102	F-104	F-105	F-106
1	6	6	6	2	3	4	5	5	7	2
17	19	13	14	16	18	18	14	9	8	15
28	25	24	24	14	14	14	27	14	14	20
	29	22	16	12	26	12	10	21	27	23
			8	27	12	20	23			
					20	11				

The 29 BOLD FACE steps shown here are again a combined list of all the various steps presently used by all flight manuals collectively for this particular emergency. Note the lack of standardization in terminology. Steps 16-19 (Speed Brakes), Steps 1-7 (Throttle), Steps 8, 9, 10 and 12 for External Load Jettison.

In this area we have selected the phrase "External Load-Jettison" as the best option for across-the-board application to all aircraft. The word LOAD is all encompassing, whereas "tanks" implies tanks only. "Stores" is usually construed to mean all items other than fuel tanks, such as bombs, special pods, etc.

Applying these steps to the individual aircraft points out several interesting facts:

a. All have throttle movement as Step #1.

b. Only 4 aircraft call for wheel brakes.

c. The F-101A and F-101B, which are often flown interchangeably by the same pilots, require different procedures for this emergency.

Recommended CRITICAL Procedure for all Jet Fighter Aircraft:

ABORT

1-. **THROTTLE(S)—IDLE (OFF FOR FIRE)**
2. **SPEED BRAKES—CLOSED** (For aircraft where extended brakes interfere with engagement)
3. **DRAG CHUTE—DEPLOY**
4. **EXTERNAL LOAD—JETTISON** (As Necessary)
5. **ARRESTING HOOK—EXTEND**

Only the steps which are applicable would appear in any particular flight manual. The F-100 is the only aircraft at the present time that would show all 5 steps. The T-33, in comparison, would have only 2 steps (numbers 1 and 2). However, the sequence will remain standard, as will the terminology used.

The abort procedure in itself is an integral part of several other takeoff emergency procedures. When we use the term ABORT as part of another procedure, we mean that the pilot will revert back to this procedure and execute the prescribed steps. This technique is already in use in most of the fighter manuals.

The same approach and reasoning was followed for Critical Procedures through all four phases of operation. The following are the standardized procedures proposed for all jet fighter/trainers:

GROUND OPERATION PHASE

ENGINE FIRE DURING START

1. **THROTTLE(S)—OFF**

TAKEOFF PHASE

ABORT

1. **THROTTLE(S)—IDLE (OFF FOR FIRE)**
2. **SPEED BRAKES—CLOSED** (For aircraft where extended brakes interfere with engagement)
3. **DRAG CHUTE—DEPLOY**
4. **EXTERNAL LOAD—JETTISON** (As Necessary)
5. **ARRESTING HOOK—EXTEND**

continued on page twenty-four

the I.P.I.S. approach

By the USAF Instrument Pilot Instructor School, (ATC)) Randolph AFB, Texas

OUTER AND MIDDLE MARKER ALTITUDES

The reason for outer and middle marker altitudes depicted on ILS approach charts is frequently misunderstood. The inclination of approach chart designers to depict these altitudes as minimum altitudes has added to the confusion. These altitudes are merely calculated values where the glide slope intersects the center of the marker beacon signal. The aircraft altimeter should approximate this value when the aircraft crosses the center of the marker beacon on the glide slope. There are no specific limits.

The primary purpose of outer and middle markers is to provide the pilot with specific range fixes along the final approach course. The glide slope provides adequate obstruction clearance over the outer or middle markers. A pilot flying an ILS should attempt to remain on the localizer and glide path from glide slope interception point to decision height. Intentional deviation from the glide slope, between glide slope interception point and the DH, is not required on any published ILS approach procedure.

In accordance with JAFM 55-9, a minimum altitude restriction (step down fix) is not authorized on a precision final approach, nor is more than one minimum altitude restriction authorized on a non-precision final approach. Altitude restrictions may be published at marker beacons, but should be identified as applicable to the non-precision portion of the approach.

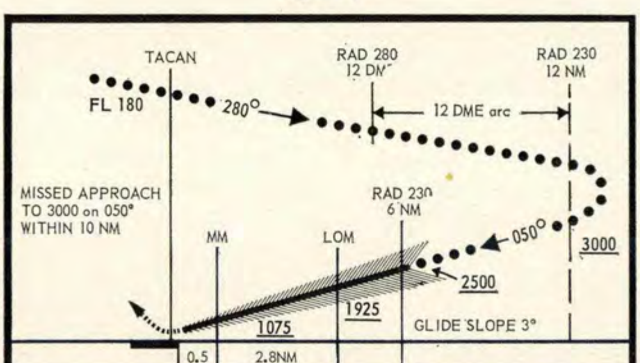
The present method of depicting altitude restrictions on combination ILS/non-precision approach charts is confusing. For example, consider this profile view (Figure 1) of a high altitude instrument approach. As previously explained, "minimum" altitudes depicted at the marker beacons are meaningless in regard to the ILS approach. The pilot should intercept the glide slope at 2500 feet and attempt to remain on the glide slope until reaching decision height at 1005 feet.

The pilot must comply with all "minimum" altitude restrictions depicted on the approach chart when he is flying a *localizer only* approach. In this case, the altitude published at the outer marker should not be depicted as a minimum alititude *unless* an obstruction prior to the outer marker prohibits descent below 1925 feet.

The altitude published at the middle marker is depicted as the minimum altitude authorized after passing the outer marker. However, the middle marker altitude of 1075 feet is 105 feet *below* the minimum descent altitude authorized for the approach. The altitude 1075 is a marker beacon altitude only, and should not be depicted as a minimum altitude. This type depiction is dangerous, and could easily influence the pilot to descend below the minimum descent altitude.

The IPIS has suggested a method whereby the altitude depicted at marker beacons may readily be identified as a marker beacon altitude, minimum altitude or glider slope interception altitude. Until such a program is adopted, pilots must continue to study the entire approach chart to avoid being trapped by such depictions. ★

Figure 1



CATEGORY	C	D	E
S-ILS-5	1005/24 200 (200 - ½)		
S-LOC-5	1180 356 (400 - 1)		
CIRCLING	1340 - 1½ 516 (600 - 1½)	1380 - 2 556 (600 - 2)	1600 - 2 766 (800 - 2)

Are you a . . .

PAPER

Maj Victor J. Ferrari, Jr., USAF, MC
Life Sciences Div, Directorate of Aerospace Safety

The Air Force is rightfully proud of its den of tigers—ready, willing and able to meet the challenge of preserving or restoring peace, as called upon. These tigers have everything a tiger is supposed to have—keen, clear minds, quick reflexes, cool courage, sharp teeth and claws.

They look the part, too. You never saw a healthier, sleeker looking pack of tigers. Solid, muscular, graceful. Certainly enough to deter any would-be opponent if seen close-up.

Could it be that we've got some paper tigers in the lot in spite of outward appearances? Paper, because they could be missing when needed most. Paper, because one unseen ingredient essential for the real tiger is lacking—a heart and vascular system that can assuredly endure.

We frankly don't know how many aircrews and airplanes we lose each year through inflight incapacitation brought on by coronary artery disease. Even when the pathologist can accomplish a satisfactory post-mortem examination, many remain in doubt. But we do know these facts:

- Coronary artery disease (narrowing of the vital arteries supplying the heart muscle) is not uncommon among young otherwise healthy American males, and is a leading cause of death in the 30-40 age group, second only to accidental trauma.

- From time to time, heart attacks, proven to be due to coronary artery disease, occur among relatively young aircrewmen. Recently a 37-year-old pilot flew a mission during a period when he was suffering from an acute blockage of a

TIGER?

coronary artery, proven during medical work-up in the hospital after landing. The pilot attributed his chest pain to a respiratory infection.

• Ten to 14 per cent of our major aircraft accidents (fatal accidents, aircraft destroyed or missing) are finally closed out as "cause undetermined." Pilot incapacitation is suspected in many of these: when hypoxia and spatial disorientation can be fairly well ruled out, preexisting disease remains as the prime suspect. And coronary artery disease is by far the most common cause of sudden incapacitation from silent preexisting disease.

So what do we do about this—making more sure we have real tigers in our den? WE EDUCATE OURSELVES—that's what we do. So give us your undivided attention for a few more minutes.

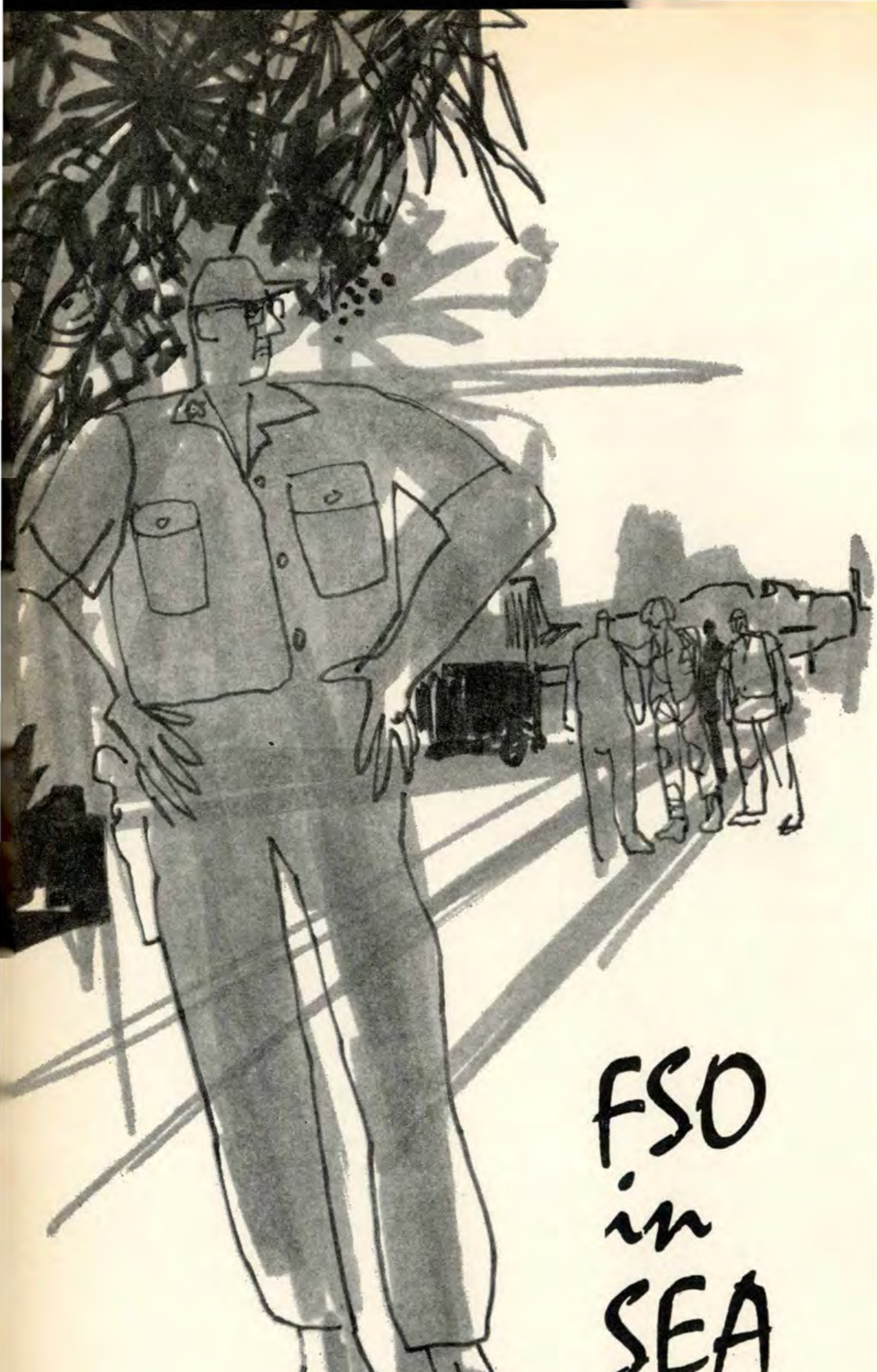
Narrowing of the coronary blood vessels occurs through altered blood chemistry. Fatty deposits accumulate in these vessels, particularly where blood eddies at vessel branchings. These fatty deposits are the result of abnormal food metabolism. We cannot be certain of all the answers, but we do know that either excessive caloric intake (of all food elements) or excessive fat intake, or both, is the basis for the precipitation of the fats out of the blood stream. So the lesson here is—eat slim!

Lack of regular exercise produces an inadequate coronary circulation. A good flow of blood through these vital vessels, and one which can be multiplied many fold when required, is a product of a good, vigorous consistent exercise program (carried on as a discipline as regularly as eating and sleeping). A 30-minute handball game once a week or once in a while is definitely not the answer. That just produces a strain, without the response of a better coronary system. Graded exercises of all types (see article in AEROSPACE SAFETY, March 1966, entitled "Flying Status Insurance") should be carried out religiously through the years, tapering off into less strenuous but continued activity when middle age is reached. Daily walking, long distance swimming, bicycling as well as more strenuous action, such as calisthenics or handball make up the program. The lesson—keep that pump active!

Smoking constricts (narrows) the coronary vessels and tends to reduce the blood flow. The incidence of coronary blockage is definitely much higher among smokers and increases in linear proportion to the amount of smoking. Abstinence is mighty good insurance—moderation is a little better than the pack-a-day or more habit. The lesson—obvious, isn't it?

This program applies to all, but it is particularly important for those big boned, big muscled athletic types who won all the letters in high school and college, and then found themselves in their thirties spending most of their time in overstuffed chairs in the ready room or at home. It is particularly important to those tigers who like to indulge to the hilt in the "good things" in life. And it is particularly important to those whose fathers suffered coronary disease relatively early in life. There appears to be a hereditary tendency. We can't change ancestry, but we *can* change habits.

So you Tiger Leaders—look around at your charges. Are they all really the tigers you are counting on? Maybe you and your trusty flight surgeon had better take another look just to make sure. ★



FSO in SEA

Maj George H. Holbrook, 3646 Plt Tng Wg (DCSEC), Laughlin AFB, Tex 78840

I sleep better at night. No longer does the hot, humid air seem to turn the mattress into a cold, sweat-soaked sponge. No longer does the telephone ring at all hours of the night announcing another airborne emergency. Gone is the sleep-shattering whine emanating from the jet aircraft scurrying to and fro on the crowded flightline nearby. Gone also is the muffled CRUMP — CRUMP — CRUMP of not-too-distant artillery and mortar fire signalling the onset of another bitter, life-and-death struggle amidst the almost impenetrable underbrush and slime of Vietnam's monsoon-drenched forests.

Yes, my tour in SEA is completed and "Ol' Ish" is happy to be back enjoying the comforts and safety of the homeland. Yet I am filled with mixed emotions, for I fondly recall the many fine friends met and the numerous comical and adventurous events survived during the tour. A statement made by the previous FSO best sums up my feelings: "I wouldn't take a million dollars to come back here, but I wouldn't take a million dollars for the experience."

Unfortunately the tour was marred by several disappointments, first and foremost being my assignment as more or less a support troop (Wing Flying Safety Officer) rather than a full time combat pilot. Nevertheless, establishing an effective safety program in Vietnam that would save lives and equipment was important. Confident that I would have the full cooperation of the other "blue suiters," I determined that I could do a good job. Lack of cooperation, however, provided my second disappointment. Surprisingly, the first example of this lack of cooperation occurred even before departing Travis. My roommate on the night prior to my departure was an old, Lt Colonel pilot who, when he learned of my future job in Vietnam, growled, "Safety has no business in a war zone." War zone-itis, I discovered, existed even back in the States.

It soon became evident that the old Colonel was but one of a rather vocal, albeit numerically small, group of people who possessed anti-safety feelings. On the plus side, their blatant opposition to safety rules permitted rapid identification and quick remedial action. However, there was a larger group who, though possessing similar feelings, remained silent. They, officers and enlisted men alike, professed their support of safety practices when forced to openly state their position; but their failure to enforce even basic safety practices spoke more clearly than their forked tongues. Their silent opposition hampered identification and so allowed much harm to be done. Thus, the burden on the FSO was greatly magnified.

And believe me, no one can adequately comprehend the magnitude of the burden borne by a Wing FSO or, for that matter, by any commander or staff member during the great 1965 buildup. In the safety field, the problems were overwhelming. No safety plans existed; trained safety people were few and far between. The aircraft parking ramps were supersaturated; the living quarters were overcrowded and the conditions (mud, heat, mosquitoes, etc.) deplorable. The original runways and taxiways were obsolete and poorly constructed and were in the process of breaking down under the strain of handling more and heavier aircraft than those for which they were designed. The overruns were inadequate and the runway shoulders hazardous. The weather, especially during the monsoon season, was atrocious and dangerous. The pilots were often fatigued by long and frequent combat missions followed by inadequate rest under poor living conditions.

Despite all these handicaps, the job of fighting the war was done—and done safer. Obviously, all the problem areas mentioned could not be corrected immediately. As a matter of fact, many of them still exist and remain a major headache to the presently assigned FSOs. But much was corrected and what we could not correct, we learned to live with and work around.

What proved to be the most difficult and dangerous problem of all has been mentioned previously: *war zone-itis.* This plague to all FSO's accounted in part or in whole for at least five major and two minor accidents. And a study of these accidents reaffirms one of the basic commandments of safety: *"The Safety Officer Requires Command Support."* All seven accidents occurred to TDY units which either rotated all aircrews and aircraft monthly, or which kept aircraft at the base permanently but rotated all crewmembers en masse every sixty days. This constant shuffling of personnel helped to frustrate our attempts to inculcate the spirit of safety into the thoughts, actions and operations of the commanders and crewmembers. Instead, we were met by frowns and a gruff "Hello! See you around. We're busy fightin' a war." If it hadn't been for the aircraft replacements flown in in just a few hours to replace accident losses, these commanders would not have had aircraft with which to fight the war.

In sharp contrast, a squadron of F-4s from the States arrived on a permanent assignment several months after my arrival. Their Commander was hard but fair and very safety conscious. We didn't have to beg to see him whenever we discovered a problem involving his operations. He invited us to visit him anytime. In fact, if he didn't see some safety people around his shop several times a week, he would phone us demanding our attention and inspection. When he had a safety problem, he didn't try to hide it in hopes it might go away, a procedure used by some of the TDY troops. He coordinated with us so that the problem could be tackled from all angles. Believe me, working with that commander was a privilege and pleasure. It came as no surprise then to see his unit operate accident-free and gain a flying safety award.

I left Vietnam with a strengthened knowledge that safety is important everywhere and especially so in a war zone. The events of the tour reaffirmed my belief that the Commander, not the Flying Safety Officer, determines the safety record of the unit. Only by his constant, personal attention to all safety problems and by his full support of his safety officer will the Commander obtain maximum effectiveness in his unit. Only he can control his pilots and, through his leadership and influence, instill a safety spirit in the young bucks as well as the old heads. If the Commander makes the pilots toe the mark, there will be no midairs, no losses due to target fixation, and no breeches of air discipline such as occurred all too frequently in Vietnam.

So, Commanders and future Commanders, take note. Only you can prevent accidents. You are the key to saving the aircraft and the lives of the crewmembers entrusted to you. Live up to this heavy burden of command and earn yourself the treasured title of LEADER. ★

C5-WAY OUT

LtCol Henry W. Compton

Seventy-five passengers in that upper aft troop compartment! Holy smoke, how long will it take to evacuate them if a C-5A lands wheels up or has some other emergency?

Over two years ago the C-5A System Program Office analyzed the Handbook of Instructions for Aircraft Design, AFSCM 80-1, and found that the requirement for full evacuation of transport aircraft was 30 seconds or less. It takes longer than that to open some doors of some aircraft and get the ladder in place, if the bird has a ladder. Even though the C-5A exits should open easily in 10 seconds or less, in an emergency there would probably be a larger number of passengers who would have to get out safely.

The latest AFSCM 80-1 says that there will be a sufficient number of doors, hatches, and emergency exits to permit complete abandonment of the aircraft by crew and passengers in 60 seconds or less (with half the exits blocked). The C-5A contract guarantees this requirement. "Prove it can be done," said the Air Force, whose job is to see that the many aircraft safety features are incorporated.

Making C-5A egress tests involved several civil and military agencies and consumed the time and talents of many people.

Getting the 75 passengers safely out of the upper deck aft troop compartment was the first problem tackled. The upper deck compartment was fitted with four escape hatches, each having an inflatable slide; these slides are tailor-made because none existed which were long enough. As soon as the facilities were deemed adequate, arrangements had to be made with the Army to procure more than 900 troops, with the Military Airlift Command to transport the troops, and with the System Program Office for their overall management of the program. Other agencies, including the FAA and the Air Line Pilots Association, sent observers down to the Lockheed plant at Marietta, Georgia, for a look at the first tests using a large, full-scale, transport mockup for evaluating emergency egress features prior to release of the design drawings for production. As in most pre-production tests, there were limiting factors. An excellent example was the use of young, combat-ready, agile, motivated and superbly conditioned troops from the 82d Airborne Division as representative passengers. The availability and durability of these troops outweighed the importance of using a random passenger sample for these first tests.

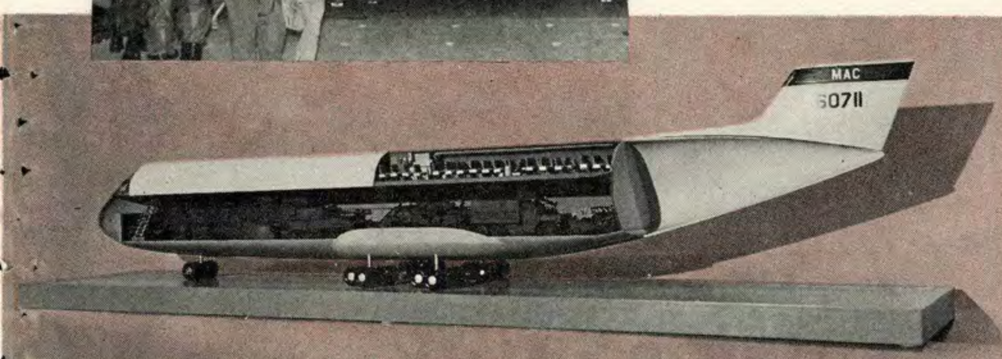
The high potentials of this facet of System Safety Engineering can best be shown by scanning a few of the Directorate of Aerospace Safety conclusions.

The upper aft troop compartment demonstrations provided basic data on:

- How best to arrange the seats in relation to exit locations.
- How large the exits should be and how high the bottom of the openings should be above the floor.
- What type of opening mechanisms should be used on the doors.
- How long it takes to go down the slides and whether they are tough and reliable.
- The mechanics of slide deployment. Because the slides occasionally deploy at slight angles there is a requirement to determine the effects of wind and rough terrain.
- Whether one loadmaster can brief and control 75 passengers during emergency egress; whether new passenger briefing techniques and methods are required; whether passengers will require special egress indoctrination before riding in the C-5A; whether aircrew members should proceed aft and aid in slide alignment or assist passengers in clearing the area at the bottom of the slides.
- Whether untrained passengers will be able to open hatches and deploy slides.
- How the time element changes when the upstairs passengers have to exit through the lower compartment.

It is planned that the egress tests will continue using production aircraft, toward a goal of rapid, safe evacuation of the aircraft during ground mishaps. ★

BIG THREE DISCUSS SAFETY. Thomas R. May, Pres., Lockheed-Georgia Co.; General Howell M. Estes, Jr., Commander, Military Airlift Command; Brig Gen Frank K. Everest, Jr., Director of Aerospace Safety. Between Gen Estes and Gen Everest in the background is Colonel James S. Keal, C-5A Project Officer and Chief, System Safety Engineering Group, Directorate of Aerospace Safety.



Troops of the 82d Airborne Division proceed to the upper aft troop compartment, are given a standard passenger briefiing and evacuate the C-5A when the emergency signal is sounded. A cut-a-way model shows the exact position of the upper troop compartment. The inflatable slides are quickly and easily deployed by CO_2 bottles.

ICING FACTOR for AIRCRAFT

Paul W. J. Schumacher and 2d Lt Donald A. Reilly
Aeronautical Systems Division, Wright-Patterson AFB, Ohio

Pilots can usually avoid enroute weather, except for the giant thunderstorm, by going around or by climbing over it. Therefore, the major concern is with weather at departure and arrival bases. Icing conditions encountered on the ground prior to departure are of the freezing rain type and any buildup of ice can be observed on structural parts of the aircraft—the windscreen being a good indicator. Climb characteristics of most aircraft are excellent and allow the aircraft to pass through icing layers rather quickly following the takeoff. So what's left to cause trouble? PLENTY! Imagine this example:

Blue Dot 7: Descend to and maintain Flight Level 210.

> Temperature is −16°C, dewpoint spread is 2°C. Five minutes later.

Blue Dot 7: Descend to and maintain Flight Level 190.

> Temperature is −12°C, dewpoint spread is 1.5° C. Nine minutes later.

Blue Dot 7: Descend to and maintain 13,000 feet msl.

> Temperature is −3°C, dewpoint spread is 1.8° C. Six minutes later.

Blue Dot 7: Descend to and maintain 8000 feet msl.

> Temperature is 8°C, dewpoint spread is 2°C. Four minutes later . . .

and so on.

When an aircraft descends from high altitude, following a thorough cold soak, to lower altitudes containing high humidity, rain or snow at near freezing conditions with a dewpoint spread of about 3° C or less, any one or all of the following can conceivably occur: airframe icing, engine duct and lip icing, and severe fogging or frosting on the windscreen.

Holding in the traffic pattern plus the low approach and the go-around maneuver all tend to aggravate the safety of flight of aircraft in icing conditions.

Statistics from a number of sources on effects of dewpoint are summarized nicely in a statement in Air Weather Service Manual 105-39 and are shown in the following tables.

TABLE I

ICING INTENSITY AS RELATED TO RADIOSONDE TEMPERATURE DEWPOINT DIFFERENCE. (PROBABILITY IN PER CENT)

	Temperature Dewpoint Difference Equal to or Less than 3°C.					More than 3°C.	
Conditions of Flight Level	No Icing	Trace Icing	Light Icing	Moderate Icing	Heavy Icing	No Icing	Trace Icing
Cold-Frontal Zone	0	18	45	35	2	67	33
Cold-Air Advection	10	33	44	13	0	54	46
Neutral Advection	22	46	29	3	0	100	0
Warm-Air Advection	67	20	13	0	0	100	0
Building Cumulus	0	6	70	24	0	—	—
Overall	20.5	30.5	35.5	13.0	0.5	84.0	16.0

Considering only the dewpoint spread, it is 80 per cent likely that there will be some icing when the spread is less than 3°C. If the spread is greater than 3°C, 84 per cent of the time there will be no icing.

When the dewpoint spread is 3° C or less at flight level in a cold-frontal zone (frequently an area of intense cold-air advection), the probability of icing approaches 100 per cent.

With a dewpoint spread greater than 3°C, trace ice is probable in regions of cold-air advection and in cold-frontal zones.

Table II shows various icing frequencies when the dewpoint spread is less than 3°C and precipitation is present. Disregarding building cumulus conditions, note the occurrence of icing when there is no precipitation and when there is.

TABLE II

ICING INTENSITY AS RELATED TO THE PRESENCE OF PRECIPITATION (PROBABILITY IN PER CENT)

Temperature Dewpoint Difference Equal to or Less than 3°C.

	Precipitation Absent					Precipitation Present				
Condition at Flight Level	No Icing	Trace Icing	Light Icing	Moderate Icing	Heavy Icing	No Icing	Trace Icing	Light Icing	Moderate Icing	Heavy Icing
Cold-Frontal Zone	0	32	55	13	0	0	5	35	56	4
Cold-Air Advection	15	18	52	15	0	3	50	37	10	0
Neutral Advection	41	38	21	0	0	9	52	34	5	0
Warm-Air Advection	75	13	12	0	0	11	67	22	0	0
Building Cumulus	0	0	77	23	0	0	25	50	25	0
Overall	32.5	22.5	37.0	8.0	0.0	5.5	40.5	34.5	18.5	1.0

The order of events most likely to occur on aircraft while holding in and descending through icing conditions, or while making a low approach or go-around following the holding maneuver are:

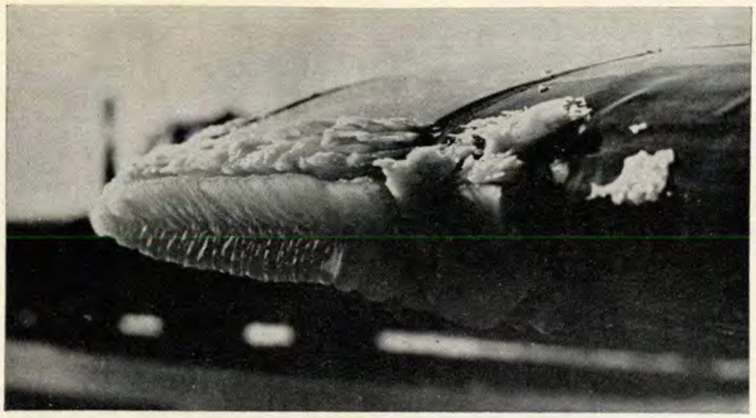
- Severe fogging, frosting or icing of the windscreen critically affecting visibility.
- Icing on the engine inlet duct surface and engine inlet lip, the ingestion of which seriously affects jet engine performance and operation and flight safety of the aircraft.
- Icing on the airframe causing problems with aircraft control and response.

In six minutes of icing conditions, for example, jet engine icing would likely become a much more critical factor than visibility through the windshield; fogging and frosting of the windshield apparently is not a problem on most aircraft. When the condition was experienced during Air Force Category II All-Weather Tests, operating procedures for coping with it were put in Section IX of the Pilot's Flight Manual. Operating the aircraft in IFR conditions under the observation of radar approach control minimizes the visibility problem. Airframe icing itself would not become a critical factor in six minutes of icing even on light training aircraft unless the rate of accretion were heavy.

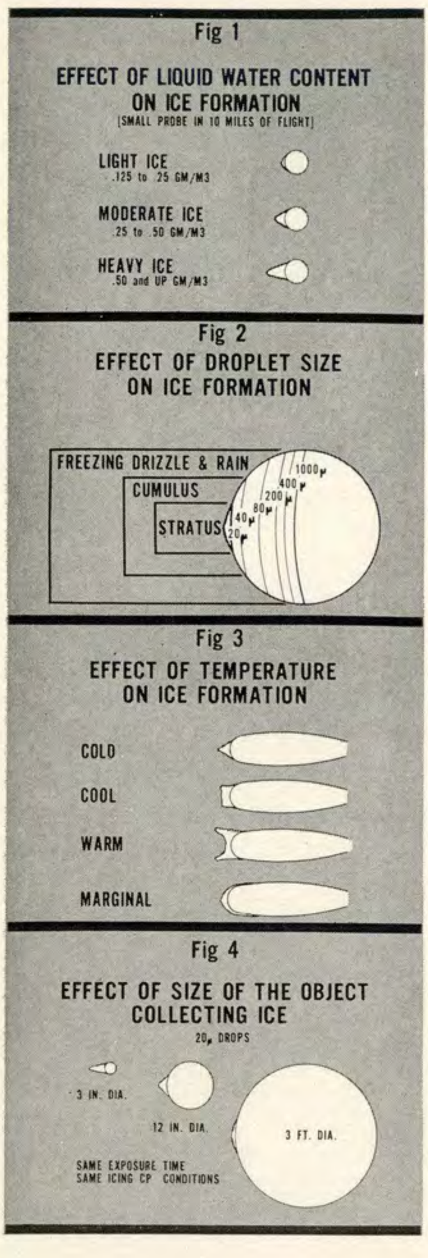
Structural ice causes higher stall speeds, poor handling characteristics and poor visibility. (The build-up of structural ice is clearly visible on the leading edge of an airfoil in the photo on page 18.) However, jet engine failure can be expected to occur before structural ice becomes critical.

AN ICING MODEL

The geometric pattern and physical properties of ice formations depend upon four main variables: (1) Content of liquid water in the cloud, (2) Size of the water droplets, (3) Ambient temperature,



Ice buildup on leading edge of airfoil.



and (4) Size of the collecting body or surface. The relative effects of these variables are illustrated in Figures 1 through 4.

A pilot who is unable to avoid flying through an icing environment might be able to estimate beforehand the ice buildup by referring to Figure 1. A light icing condition is usually associated with a Liquid Water Content (LWC) up to 0.2 gram of water per cubic meter of air, medium icing condition with a LWC up to 0.5 gm/m^3, and a heavy icing condition with a LWC above 0.5 gm/m^3. By approximating the expected icing environment, and noting the distance to be flown through it, the thickness of ice buildup may be determined.

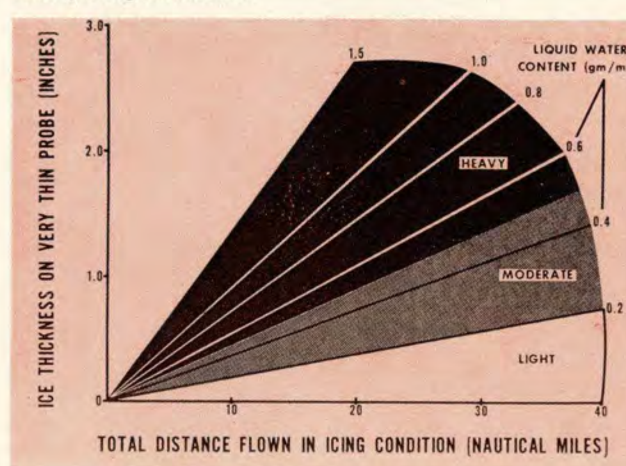
A very good mathematical model of icing is illustrated in Figure 5 for a small probe exposed to an icing environment (assuming 100 per cent collection efficiency, holding some variables constant). For this model, it is assumed that none of the ice ever breaks off.

For example, weather data that describe the icing environment and the size of the frontal or cloud activity can be used to assess the thickness of ice that may be expected to accrete on a body that has a radius of curvature less than one-half inch. The photo on page 16 shows an example of an ice buildup on a small probe.

Flying a holding pattern in an icing environment increases the hazards to the aircraft and requires close management of altitude, fuel, airspeed, and other factors that are not often as critical under normal flight conditions. A mathematical study was made on ice accumulation in a typical race track holding pattern. Assuming that the collection efficiency is constant, the thickness of an ice accumulation on a small probe during one circuit increases with: (1) a decrease in the angle of bank in the turns, (2) increase in speed, or (3) an increase in time for each of the legs.

Figures 6 and 7 show expected ice buildup on the aircraft in a

Fig. 5. Ice accretion on a small probe in light, moderate and heavy icing conditions.



typical holding pattern having one- and two-minute legs, respectively. If the speed in the pattern and the angle of bank in the turns are known, an ice thickness can be determined for each complete circuit of the pattern flown. For example, an aircraft flying a pattern with one-minute legs at 280 knots with 30-degree banked turns in a heavy icing environment (one gram water per cubic meter of air) should expect to accumulate about two inches of ice on a small probe for each complete pattern flown. Note also, that the distance around the pattern may be easily determined by using the left hand side of the chart. At low altitude, about 23 nautical miles were covered in the above example.

ENGINE ICING

Engine icing is the main icing problem to pilots of any jet powered aircraft. While the first visible signs of ice may not always be easily noted by a pilot, airspeed of the aircraft and power setting of the engine may to some degree affect any rate of ice accretion. A combination of high power settings and low airspeed in ice prolongs the icing exposure and increases the hazard. *Most of the time, however, survival is a simple struggle involving time and distance.*

Engine damage from ingested ice can occur during the icing encounter but is most likely to occur immediately after departing the icing condition, particularly where the outside air temperature rises to above freezing, or where throttles are advanced to recover some lost RPM, airspeed or to maneuver.

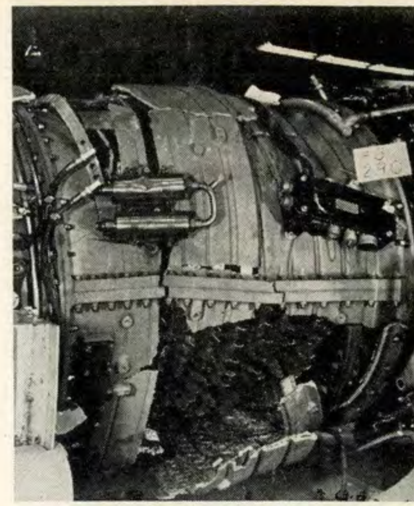
Interested in what happens when ice is ingested by an engine? Look at the photo on page 19.

LESSEN ICING

Minimize the exposure to icing by avoiding the prolonged holding procedure, and by climbing and descending rapidly through icing clouds. Most aircraft, even the unprotected ones, have the capability to penetrate regions of light icing with little danger of sustaining engine damage.

Unprotected jet engine aircraft can survive only for a limited time (perhaps four minutes) while holding in any icing region, but cannot survive for any appreciable length of time in icing regions at low speeds and high power settings such as would be found in a GCA or instrument approach pattern.

The technique of reducing both airspeed and power to lessen ice ingestion is believed to be instrumental in reducing jet engine damage. Consequently, advance throttles cautiously while flying in icing conditions or after departing an icing area. ★



Damage to jet engine from ice ingestion.

Fig. 6. Ice accumulated in a holding pattern having two-minute legs.

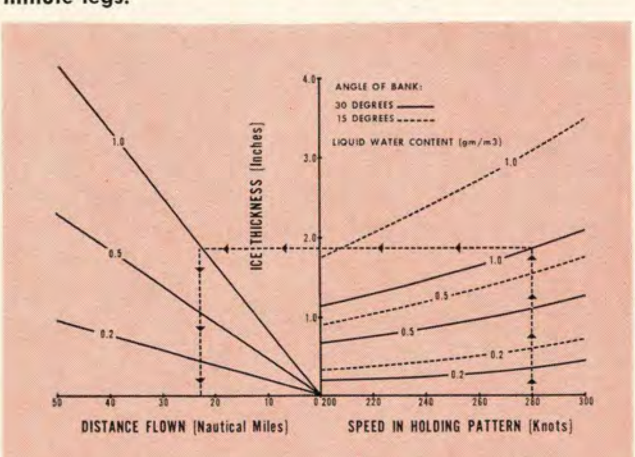
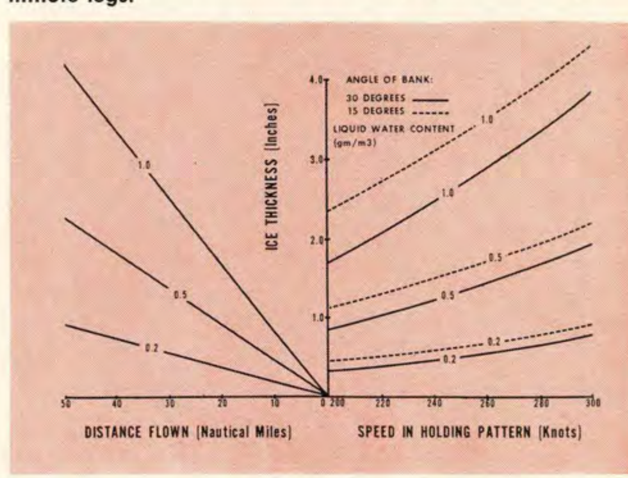


Fig. 7. Ice accumulated in a holding pattern having one-minute legs.



HUSTLER TATTLE TALE

Leonard V. Fuentes, SAAMA, Kelly AFB, Tex

The B-58A and TB-58A will soon be the first Air Force aircraft equipped with a hard landing indicating system. Heretofore, the only way to determine when a hard landing had been made was through the pilot's own sense of feel, from the seat of his pants. In most aircraft, the pilot has little difficulty feeling a hard landing; however, a delta winged aircraft, due to its lift characteristics, lands in an extremely nose-high attitude, which often conceals the landing shock.

On the B/TB-58, for example, the crew compartments are located some 18 to 36 feet forward of the main landing gear. With the airplane in a nose-high attitude at touchdown, the crew is subjected to a nose-down pitching acceleration (negative inertia loads) as well as landing impact deceleration (positive inertia loads). This nose-down pitching acceleration tends to cancel the positive inertia loads of the landing impact. As a result, the crew may not feel the hard landing sensation even though the impact was high enough to cause structural damage.

In 1965, a major B-58 landing accident was believed to have been caused by structural failure from overstresses experienced during previous undetected hard landings. The B-58 SSM at SAAMA was then requested to determine if it would be feasible to install a device which could measure the landing impact forces. An engineering project was established and an aircraft subsequently instrumented and tested at Bunker Hill AFB, Ind. Results of the tests indicated that a hard landing indicating system was feasible. Since no acceptable off-the-shelf system was available it was necessary to design a system specifically for the B/TB-58A.

The system, as finally developed, consists of a transducer, an indicator, and interconnecting wiring. It is electrically operated and activated when the landing gear is extended. The transducer, located near the airplane's center of gravity, senses the landing vertical impact loads. Two sensing switches in the transducer are triggered by positive load factors equal to or exceeding 2.5 G and 3.0 G, respectively. The hard landing is then displayed by lights on the indicator. One light indicates a hard landing of between 2.5 and 3.0 G; two lights indicate it was over 3.0 G. When a light, or lights, comes on it will remain on as long as electrical power is on the airplane. If the power is interrupted, the light comes on again when power is restored. The only way the light may be turned off is by resetting a switch with a special key.

The entire system is simple and uncomplicated. It operates on 115V, 400 cycle, single-phase AC and weighs approximately three pounds. Except for the occasional replacement of a burned out bulb, very little maintenance is anticipated. After each landing, the airplane crew chief will check the indicator box, located in the second crew station of the B-58A and in the third crew station of the TB-58A. If either or both lights are illuminated, he will reset the indicator, using the special key, and make an appropriate entry in the aircraft record forms. The aircraft will then be automatically grounded until an inspection has been completed and any structural damage repaired.

This black box is not intended as a substitute for the pilot's "pants seat". Nor is it intended to impugn his integrity when he fails to write up a hard landing, since it is possible he wouldn't feel a hard landing at the pilot's compartment. (The term "Tattle Tale" is used in the title only facetiously.) Rather, this system provides another tool to assure that the aircraft is kept properly inspected and structurally sound. ★

Snow Removal–In Reverse

Maj Stanley W. Elsea, 21 Composite Wing, APO Seattle 98742

If you told the average Base Operations Officer you intended to dump eight to ten inches of snow on his runway, you would probably have either a coronary or a basket case on your hands. The Operations Officer at Elmendorf AFB, Alaska, is the notable exception to this statement. In fact, he gave his blessing to just such a nutty scheme not once, but twice last winter. This apparent lunacy is all a part of a new procedure adopted by the 21st Composite Wing to recover birds with gear problems.

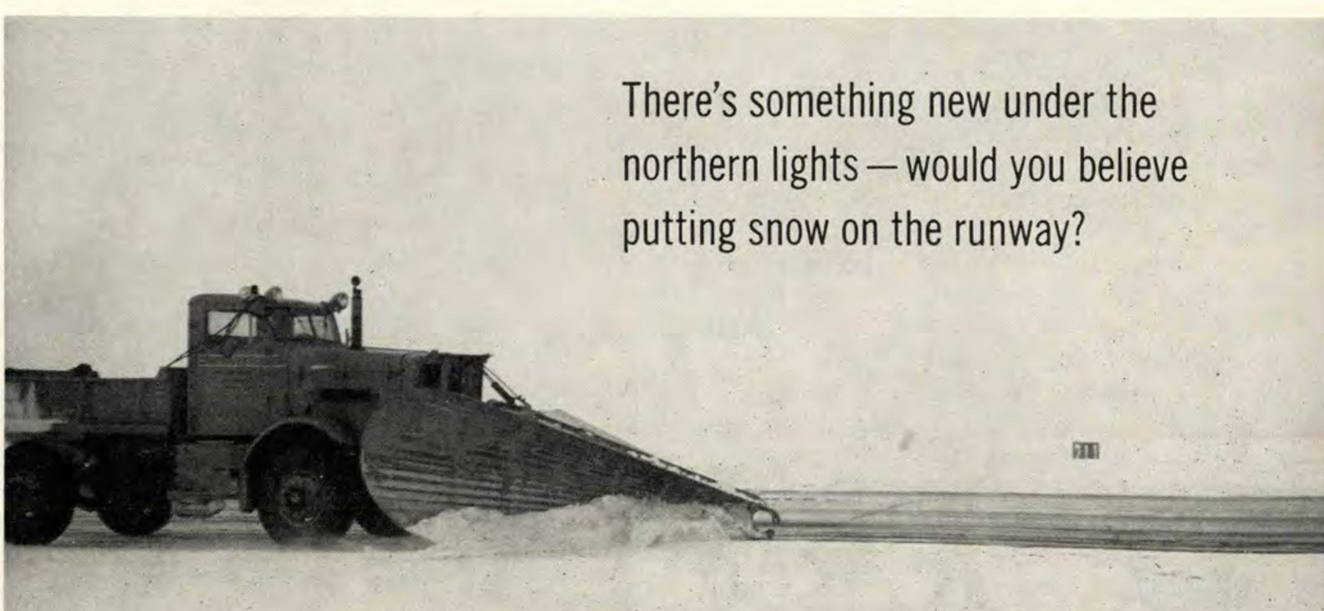
Anyone who has been around flying machines very long knows that standard procedure for recovering a bird with bad legs is to lay a strip of foam on the runway. Except for smelling like the tail end of hard times, foam is great stuff as long as the temperature is above freezing. When you start talking sub-freezing temperatures, the picture changes rapidly and the value of foam becomes questionable for several reasons:

- The dispensing equipment may malfunction due to freeze ups unless equipped with a heater.
- Frozen foam almost completely loses its fire retardent properties, although it still serves to reduce friction between the bird and the runway.
- Frozen foam residue is virtually impossible to completely remove from the runway, which makes subsequent aircraft operations more hazardous.

One night last winter the aircraft commander of a C-141 inbound to Elmendorf discovered he couldn't lower his nose gear. After playing with the gear for awhile, he finally managed to batter the nose gear door out of the way with the nose wheel. This got the gear down but left the door rubbing on the wheel and tire. At this point the aircraft commander requested the crash crew to foam the runway.

The temperature on this particular night was a balmy ten below zero, so it didn't take excessive smarts to predict that anything with water in it would be an odds-on favorite to freeze on the runway. After a short discussion, the operations type and the Fire Chief conconcluded that snow on the runway would probably work as well, if not better than foam, and be easier to remove. So, as brother Gleason would say, "Away we went."

We knew that we wouldn't set any speed records getting the snow on the runway, because it was our first experience with this type of an operation. However, the '141 driver indicated he had plenty of gas to wait us out so we used dump trucks to haul the snow to the runway and motor graders to spread it out. This system proved to be even slower than we had anticipated. In fact, you have to drive a stake to see if we were actually



An Army U-8 coming in on "snowed" runway at Elmendorf. Snow packs into wheel well, acting as coolant and insulator to retard fire danger.

Aircraft glided in without bending a prop and only minor skin damage.

moving. After we had spread about half of the desired 5000-foot strip, the pilot called for the runway so we finished with foam. Actually, this was a blessing in disguise because it gave us a chance to draw several comparisons between snow and foam.

During the landing roll there were no sparks visible in the nose wheel area until the aircraft came out of the snow into the foam. Flying snow may have partially obscured any sparks, but after inspecting the nose wheel area we were convinced that the cooling effect of the snow had a lot to do with it. Also of interest was the amount of snow packed in the nose wheel well. Snow is one of the best insulators going (ask any Eskimo) and there was enough snow packed in the wheel well to have insulated the area from any ensuing fire for several minutes.

This whole episode led us to several conclusions:

• If we were going to use such a system we had to find a more rapid means of applying the snow to the runway.

• Snow would provide a low friction surface as good or better than foam.

• The fire retardent properties of snow are superior to frozen foam due to the cooling effect as it sprays over an affected surface.

• Snow will pack in affected areas and act as an insulator from ensuing fires.

• Snow can easily be removed from the runway using existing snow removal techniques while foam is practically impossible to remove. (Thirty minutes were required to remove the snow and we weren't rid of the foam after five hours of scraping and alcohol.)

A few days later, when everyone had had a little time to think things over, the operations types, the Fire Chief and the Roads and Grounds people met to refine our method of applying snow to the runway. See page twenty-three for the resulting procedure.

Your next question should be, "Well, how does your new technique work?" We lucked out shortly after we devised the new technique and got the Army to check the system out for us using a U-8 with an unsafe nose gear. The pilot elected to land with the mains retracted and let the nose collapse on landing. He chose this configuration because this would prevent the possibility of nosing over and, since the mains retract just like a Gooney, he could still get braking action. I'll have to admit that the pilot made the prettiest landing I have ever seen. I doubt that Mrs. Wright's kids could have done better flying dual; however, the system still got a pretty good shakedown and the results were very satisfactory.

• Only one shower of sparks appeared and that was on initial contact.

• There was only minor skin damage to the aircraft.

• Lots of snow packed into all three gear wells.

• The runway was open to normal traffic 20 minutes after the aircraft was removed. The RCR at this time was 23.

• The pilot seemed to feel the snow idea was the greatest thing since sliced bread.

• The cost for applying and removing 5000 feet of snow was $350 as compared to $2,000 for the equivalent in foam. Consider what this bonus could do for your Cost Reduction Program.

OK—so what's wrong with the system? Most of you have probably already found a couple of shortcomings.

You need snow and lots of it. No problem in Alaska and at many of our northern bases.

Time—obviously this system is too slow to help the fighter jock who gets back with 20 minutes of petrol. Compared to foaming time, roughly twice as much time is required to apply a given strip of snow. However, as your crews become proficient they can probably cut that margin down.

If you have the time and snow available, we at Elmendorf feel that snow is the best solution. So friends, if you're interested in more poop on the system you can get it by sending your name and address along with one thin dime to Commander 21st Composite Wing, Attn: 21 CSA, Elmendorf AFB, Alaska. Ask for Wing Regulation 92-6. Offer good only in cold climates. ★

HOW TO SNOW A RUNWAY . . .

1. PRE-POSITION A WINDROW OF SNOW.

Place a windrow of snow about two feet high just inside the runway distance markers. Be careful to avoid getting rocks in this snow. Flatten the windrow to a depth of approximately 12 inches to reduce hazard to aircraft which may veer off the runway and cross the windrow. Check the windrow daily to insure the snow isn't getting hard and crusted. If so, loosen by running it through the rotary snow plow.

2. USE ROLLOVER PLOWS to move pre-positioned windrow to the runway lights.

3. MOVE THE SNOW TO THE RUNWAY.

Use two rotary snow plows to "blow" the snow across the runway lights. Each plow takes half the windrow to speed the operation.

4. SHAPE A WINDROW ON THE CENTERLINE.

Use rollover snowplows with both the rollover and belly blades down to shape a windrow on the centerline.

5. STRADDLE THE WINDROW WITH A ROLLOVER PLOW.

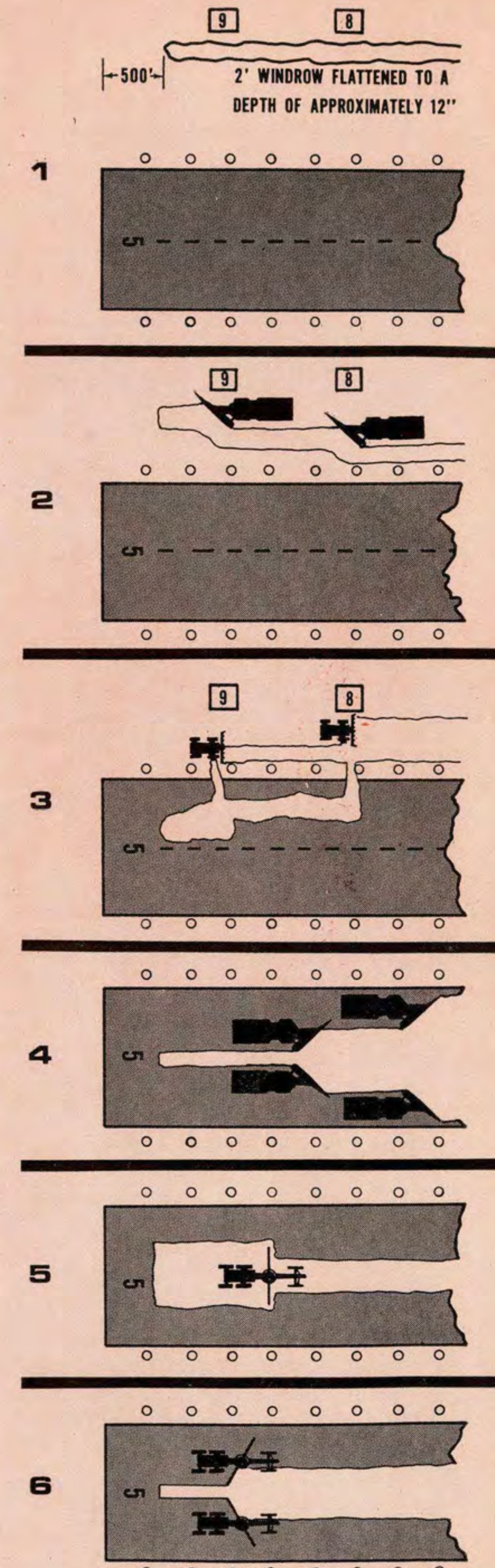
Set the belly blade approximately eight inches off the runway to spread the windrow.

6. SWEEP TO IMPROVE BRAKING ACTION.

If the particular situation demands, sweep up each side of the windrow with a power broom and kick any loose snow back into the windrow.

The original two foot windrow is now positioned on the runway eight to nine inches deep and about eight feet wide, and the whole thing, from beginning to end, can be completed in 45 minutes by a good crew.

This procedure is the one we use for nose gear problems. For a situation where one or both mains are retracted, we forget about the windrow on the centerline and simply cover the entire runway with two-four inches of snow. Obviously a two foot windrow won't hack that much area so you will have to pull extra snow to the runway from beyond the distance markers. How much will depend on the width of the runway and depth of application.



Banish the... Bold Face Blues

continued from page eight

ENGINE FAILURE DURING TAKEOFF

SINGLE ENGINE

If Decision is Made to Stop:

1. **ABORT**

If Takeoff is Continued:

1. **EXTERNAL LOAD—JETTISON**
2. **ZOOM IF POSSIBLE AND EJECT**

TWIN ENGINE

If Decision is Made to Stop:

1. **ABORT**

If Takeoff is Continued:

1. **THROTTLE—MAXIMUM** (Normal Operating Engine)
2. **EXTERNAL LOAD—JETTISON**

ENGINE FIRE DURING TAKEOFF

SINGLE ENGINE

If Decision is Made to Stop:

1. **ABORT**

If Takeoff is Continued:

1. **THROTTLE—MAINTAIN TAKEOFF THRUST TO SAFE EJECTION ALTITUDE**
2. **EXTERNAL LOAD—JETTISON** (If Necessary)
3. **IF ON FIRE—EJECT**

TWIN ENGINE

If Decision is Made to Stop:

1. **ABORT**

If Takeoff is Continued:

1. **THROTTLE—MAXIMUM** (Normal Operating Engine)
2. **THROTTLE—OFF** (Engine Indicating Fire)
3. **EXTERNAL LOAD—JETTISON** (If Necessary)
4. **IF FIRE CONTINUES—EJECT**

AFTERBURNER FAILURE DURING TAKEOFF

If Decision is Made to Stop:

1. **ABORT**

If Takeoff is Continued:

1. **THROTTLE—MILITARY**
2. **EXTERNAL LOAD—JETTISON** (If Necessary)

TIRE FAILURE DURING TAKEOFF

If Decision is Made to Stop:

1. **ABORT**
2. **ANTI-SKID—OFF** (If Applicable)

If Takeoff is Continued:

1. **EXTERNAL LOAD—JETTISON** (If Necessary)

*2. **DO NOT RETRACT GEAR**

*This step may be omitted for some aircraft (F-104).

IN-FLIGHT PHASE

EJECTION

1. **ORDER CREWMEMBER TO EJECT** (dual)
2. **ARMRESTS OR LEG BRACES—RAISE**
   — or —
   EJECTION RING OR FACE CURTAIN—PULL
3. **TRIGGER(S)—SQUEEZE** (if applicable)

ENGINE FIRE DURING FLIGHT

SINGLE ENGINE

1. **THROTTLE—MINIMUM PRACTICABLE POWER**
2. **IF ON FIRE—EJECT**

TWIN ENGINE

1. **THROTTLE—OFF** (Engine Indicating Fire)
2. **IF FIRE CONTINUES—EJECT**

LANDING PHASE

BARRIER ENGAGEMENT

1. **THROTTLE(S)—IDLE (OFF FOR FIRE)**
2. **SPEED BRAKES—CLOSED** (For aircraft where extended brakes interfere with engagement)
3. **DRAG CHUTE—DEPLOY**
4. **EXTERNAL LOAD—JETTISON** (As Necessary)
5. **ARRESTING HOOK—EXTEND**

TIRE FAILURE DURING LANDING

1. **ANTI-SKID—OFF**

Some present BOLD FACE procedures are recommended for downgrading to non-critical; however, it may be desirable to retain the present procedures but not as BOLD FACE procedures.

GENERATOR FAILURE	F-102, F-105
FUEL CONTROL FAILURE	F-106
BELLY LANDING	F-106
NOSEWHEEL SHIMMY	F-104
EJECTION SEAT FAILURE	F-100, T-33
DITCHING	F-102, F-106
HYDRAULIC FAILURE	F-102, F-106, F-4
WINDSHIELD FAILURE	F-102, F-106
OIL SYSTEM FAILURE	F-102, F-5
ARTIFICIAL FEEL SYSTEM INOPERATIVE	F-102, F-106
ASYMMETRICAL WING FLAP CONDITION	T-33, T-38
AIRSTART	F-4, F-5
FLIGHT CONTROL OSCILLATIONS	F-102, F-105
COMPRESSOR STALL	T-38
ENGINE FAILURE IN FLIGHT	F-104
REFRIGERATION UNIT FAILURE	F-106
PITCH TRIM RUNAWAY OR INOP	F-105
EMERGENCY GEAR LOWERING	F-102
FUEL BOOST PRESSURE LOW WARNING	F-102
EMERGENCY ENTRANCE/EXIT	F-101A
FLIGHT WITHOUT CANOPY (DUAL)	F-100
ENGINE VIBRATION OR FLUCTUATING FUEL PRESSURE	T-33
FUEL TANK PRESSURIZATION FAILURE	F-102
EXTERNAL LOAD JETTISON	F-100, F-101A
ELECTRICAL FIRE	F-100, F-101, F-106
ENGINE DUCT INSTABILITY	F-105

Removing these miscellaneous emergencies from the CRITICAL format will strengthen the overall presentation of Section III of the flight manuals and add emphasis to the truly CRITICAL procedures that remain.

NOTE: The aircraft specified in the above list are the only ones that presently treat the associated procedure as CRITICAL i.e., by eliminating the CRITICAL procedure for GENERATOR FAILURE in the F-102 and F-105, it will then have been eliminated from all of the fighter manuals.

In addition some procedures should be retained in critical format but have only a limited application or are unique to each aircraft. They are:

1. COMPRESSOR STALL (F-102, F-104)
2. POST STALL GYRATION (F-4)
3. SPIN RECOVERY (F-102, F-105, F-106)
4. NOSE COMPARTMENT DOOR MALFUNCTION (T-33)
5. AIRSTART (ALL SINGLE ENGINE JETS)
6. BLC SYSTEM MALFUNCTION (F-4)
7. NOZZLE FAILS OPEN (LANDING PATTERN) (F-104)

In summary the following table shows the changes proposed:

Aircraft Type	Total Number of Critical Procedures Required		Total Number of Critical Individual Steps Required	
	Present	Proposed	Present	Proposed
T-33	14	11	45	30
T-38	10	9	22	24
F-4	11	12	32	33
F-5	9	10	20	27
F-100	16	12	47	34
F-101A	12	10	32	28
F-101B	16	10	50	28
F-102	27	13	57	37
F-104	20	13	47	39
F-105	16	13	38	39
F-106	24	12	71	35

Some interesting facts can be seen from this chart.

1. The number of critical individual steps for the T-38, F-4 and F-5 have increased.
2. Those for the F-106 have decreased by 50 per cent.
3. The F-101A and F-101B are now identical, as they should be.
4. The smallest change occurred in the F-4, the flight manual for which is generally regarded among fighter pilots as the best manual we have at the present time.
5. The high number of steps in the F-105 (39) is now due to the spin procedure which we have not attempted to rewrite. This procedure contains seven BOLD FACE steps.
6. The number of F-104 procedures remains high, due to nozzle failure in the landing phase.

The benefits identified in the study may be rather subtle and intangible but in some cases are readily identifiable. Some listed were:

1. FLYING SAFETY

Added emphasis has been placed on CRITICAL emergency procedures. Those selected as meeting the criteria for CRITICAL are clear, concise and positive. They are short enough to be memorized and comprehensive enough to enable the pilot to cope with the emergency.

2. OPERATIONS:

Initial qualification, requalification and multiple currency will present fewer problems to aircrews and flight managers.

3. TRAINING:

Cross-training will be expedited. A minimum of unlearning-relearning will be necessary during check out in new aircraft.

4. STANDARDIZATION:

Application will have positive effects in Safety, Operations, and cost reduction.

Although this study is over a year old and further studies have been done on other types of aircraft, turbo-prop and reciprocating, the approach is fresh. The continuance of the good principles involved are now up to the members of the flight manuals review boards. ★

Phonetic Alphabet "SMARTS"

Robert D. Nagle, Electronics Engineer, Directorate of Aerospace Safety

An incoming message reporting an accident is quoted in part: ". . . flying in ITEM FOX ROGER weather conditions on VICTOR FOX ROGER flight plan." We went all out on the use of the approved phonetic alphabet some years ago. One recommendation made good was the printing of this alphabet in all USAF base telephone directories. Of course, there are some WWII types that refused to conform. Have you ever wished that everyone in the world spoke a common language? Well, here's your chance to participate in the only common language we know of, even though it's just to make communication links faster and safer. Furthermore, its use is directive in the worldwide aviation community and by all U.S. military agencies.

Another thing you should know is that radio operators are taught the approved alphabet and they never heard of ABLE, BAKER, ZEBRA, etc., until they had it thrown at them by people who cannot plead ignorance.

ROGER is a proword meaning "I have received your last transmission satisfactorily." It is not used for an affirmative reply to a question. That would have to be AFFIRMATIVE or NEGATIVE; or simply YES or NO. It definitely is not the phonetic for R. For a list of prowords and definitions see AFM 100-15, which also contains the phonetic alphabet, beginning on page 69. Also, the Allied Communication Publications (ACP-125), the IFR Supplement U.S., the WAC index and some Local Aeronautical Charts (reverse side).

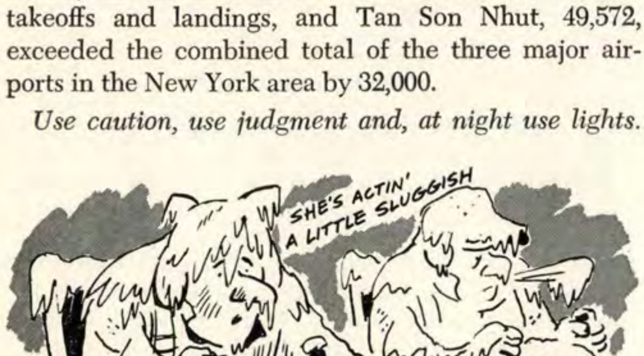
This is not meant to be a polite reminder. After all, the use of the new phonetic alphabet was directed eleven years ago! ★

THE PILOT flying at night in South Vietnam has, among other problems, the dilemma of whether to use navigation lights and risk the chance of being hit by ground fire, or flying without lights with the risk of a midair collision. Seventh Air Force policy is that the chance of a collision between unlighted aircraft is much greater than the possibility of the aircraft being hit with lights on.

If only 7th AF aircraft were involved, the problem would be easily reconciled: all aircraft would display navigation lights. But there are many aircraft operating in Vietnam that belong to other commands, other services and civil carriers. Therefore, pilots flying in SEA should be aware that there could be blacked out aircraft operating in the same airspace. This is particularly hazardous in the traffic pattern when tower operators cannot see VFR aircraft flying without lights.

The following figures provide an idea of the traffic density in Vietnam: In one month, Bien Hoa, 64,492 takeoffs and landings, and Tan Son Nhut, 49,572, exceeded the combined total of the three major airports in the New York area by 32,000.

Use caution, use judgment and, at night use lights.



AIRSPEED ZERO—A recent OHR told this hairy tale: A C-130 was on GCA final approach at 2100 feet experiencing what the pilots thought was moderate ice, when the airspeed began to fall slowly. Power was applied and the wing anti-ice system was activated. The airspeed continued to drop to 80 kts and then to zero on both pilots' indicators. Maximum power had been applied by the time the airspeed read zero and the plane broke out at an estimated 1000 feet. About one minute later both airspeed indicators came back in and indicated 210 kts. After landing, the pitot system and the exceeding of the gear and flap extension speeds were written up. The pilot said that the entire fuselage was coated with one inch of ice.

The gear and flap systems were checked with no evidence of malfunction. On the next flight all airspeed indications were normal and it is suspected that the zero readings resulted from temporary severe icing conditions. The pitot heads were carefully checked and were within design limits; therefore, there is a possibility of pitot heat system overloading when flying into forecast moderate or heavy icing conditions in the C-130.

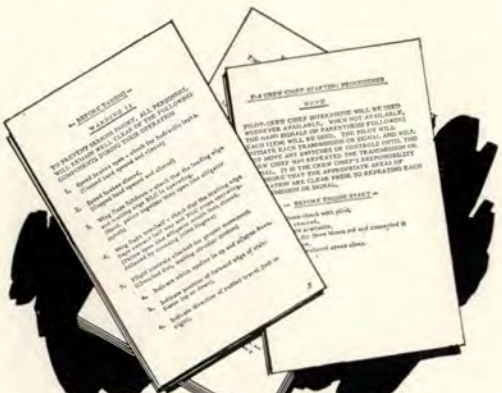
STAY AWAY FROM FOREST FIRES. A contract pilot for the U.S. Forest Service has had two recent near misses. "While circling a forest fire at an altitude of 2100 feet MSL, a single engine jet passed *directly* below me. I was on the upwind side of the fire just above the smoke tops. The jet approached from the downwind side which I believe would have made it impossible for him to see me in time to avoid collision, if his altitude had been a few feet higher. THAT'S ONE!

"A few month later while circling left around a forest fire, a single engine jet passed less than 500 feet from my right wing at my exact same altitude. THAT'S TWO!

"The average elevation in these areas is 1000 feet. I would classify both cases as a 'near miss.' I'm a bit worried about THREE!

"It seems to me that these jet and civilian pilots should be informed that: (1) there are many aircraft flying for the purpose of detecting and controlling fires; (2) report via radio any smoke they might see; and (3) stay away from them. We pilots fighting fires are a bit too busy while circling fires to scan the skies continuously for 400 mile per hour assailants."

Stay away from forest fires!



THROW-AWAY X-C Checklists—Ever take a fairly new bird into a strange base and say "Fill 'er up," only to be greeted by blank stares? This happens all too often and results in the pilot's playing crew chief when he really shouldn't have to.

In order to alleviate this problem, some TAC units, notably the 479 TFW at George AFB., have developed a locally produced "throw-away" cross-country servicing checklist. The idea has caught on and now TAC has directed all units to come up with similar checklists for their particular aircraft. This item is handy at a strange base where oxygen, fueling, oil, drag chute servicing, as well as electrical and starting cart requirements, are unknown.

In fact it's not a bad idea for any aircraft with servicing peculiarities that are not well known.

How about your command? Could you use a throw-away, cross-country checklist?

Maj Raymond L. Krasovich
Directorate of Aerospace Safety

MISSILANEA

MISSILE MISHAP REPORTING—Several recent missile mishaps were not properly reported or investigated. Attempts were not made to hide them but it was apparent there was a lack of knowledge as to what constitutes a reportable missile accident or incident. This reporting gap could adversely affect the USAF missile accident prevention program. Whenever an event occurs which results in missile or OCE damage, it should be promptly brought to the attention of the unit safety officer. He can then assist the commander in determining if the mishap is reportable under para 6(d) or 6(e) of AFR 127-4. Prompt and timely investigation and reporting will follow. If the damage is not reportable under AFR 127-4, the safety officer may suggest a method to eliminate the unsafe condition or hazard. He might also assist in determining whether other hazard or deficiency reporting is applicable.

Captain R. A. Boese
Directorate of Aerospace Safety

TITAN II LONGERON MOD (TO 21M-LGM-25C-677)—The Thrust Mount and Shock Isolation System Modification, to correct for cracks due to stress corrosion in Titan II longerons, was initiated 17 June 1967 at Missile Site 732-4, McConnell AFB, Kansas. Essentially, the modification consists of installing a stress plate at the base of each longeron to distribute the stress over a larger area. All work is being accomplished by Air Force personnel; the Martin Company is providing safety engineering support. Eleven missiles with critical crack conditions have been modified at McConnell and Davis-Monthan Air Force bases. All remaining thrust mounts in the Titan II fleet will be modified starting at Little Rock AFB.

Work at Little Rock will be accomplished in connection with Project "Low Ebb"—new nickname "Pacer Ebb"—either three days before or after the Electro Magnetic Pulse Modification. Thereafter work will revert to McConnell and Davis-Monthan Air Force Bases in turn, independent of "Pacer Ebb."

The work will primarily be accomplished with the missile installed and fueled. However, to reduce missile down time as much as possible, a second team of technicians is being formed to perform the modification in silos where the missile has been removed. ★

Lt Col K. H. Hinchman
Directorate of Aerospace Safety

FALLOUT

continued from inside front cover

magazine staff but, rather, by a board of officers within the Directorate of Aerospace Safety. Their selections are based on several criteria, one of which is that, in the opinion of the board, the individual used sound judgment. Then, too, no regulations can have been violated.

Certainly it can be argued that recognition of a job well done could encourage others to attempt to emulate the person so honored. But it should be understood that the Well Done is meant to honor skill and judgment, not reckless attempts to be a hero that may involve a display of skill without the exercise of good judgment.

COVER PICTURE — AUGUST

I enjoyed Maj Bond's article on ACM in the August issue and agree with his conclusion. It is unfortunate though that a "safety" type (no offense intended) is beating this drum when it should be an "Ops" type.

The picture on the cover has an inaccuracy. It depicts an element of "Thuds" jettisoning tanks when faced with the MIG threat. The 105s in SEA are all equipped with integral pylon/tank assemblies, making it impossible to jettison one without the other.

Capt William Grieger
154 TacFtrSq PACAF

. . . and from Nellis AFB:

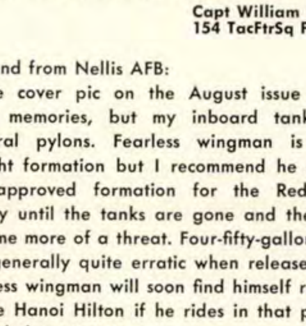
The cover pic on the August issue brings back memories, but my inboard tanks had integral pylons. Fearless wingman is flying a tight formation but I recommend he stay in the approved formation for the Red River Valley until the tanks are gone and the MIGs become more of a threat. Four-fifty-gallon tanks are generally quite erratic when released, and fearless wingman will soon find himself residing in the Hanoi Hilton if he rides in that position at tank-dropping time.

Capt Charles W. Couch
4526CCr Tng Sq

. . . another from 325MME-D, McChord AFB:

Your artist shows enormous weapons configurations, for example:

- The outboard missile on an improper type pylon.
- He shows the inboard fuel tanks being jettisoned without the pylon, when the pylon should go with the fuel tank.



Other than this we are very impressed with the picture and the magazine.

Ex F-105 Weapons Troops.

Maj. Robert Bond, the Project Officer, read your letters and comments as follows:

"Well, like I've always said, 'You've gotta have good eyes to fly jets.' You gents are absolutely right about the integral pylon/tank assemblies. I was so busy harassing our illustrator Dave Baer in an effort to get the ridge, river, altitude, heading, flak, bomb load, single AIM-9B, QRC do-dad, strike camera, safety pack I & II mods, antennas, decals, MIG's, angle-offs and the various relationships of the whole shootin' match that I flat didn't notice the pylons until just before the printer's deadline and then decided to let it go. Would you believe I wish I hadn't?

"As for the formation they are flying, would you buy that they were briefed to go 'through' together and were about to 'pop,' when they picked up the MIGs? With no time to spread out, jettison and then rejoin, they are just taking their chances with the tanks. However, it is nice that they came off so neat, isn't it? Of course, if you flew with that other outfit you probably think they should be up about 16 thousand in that—formation. The point that I'm trying to make here is that air-to-air or air-to-ground tactics are a lot like sex. There are some basic things you have to do and after that it's all technique. If you don't care for either of these approaches would you buy that I wanted a really good picture of a 5 driver on his way to work but in order to make it realistic (and tie it to ACM) I had to have a second aircraft and there is just so much room on the cover? Having to put the aircraft so close together might even be the reason the tanks are falling away so cleanly.

"Reference the comment about beating the ACM drum, I believe that it is absolutely vital that we all support this training requirement. We, the fighter aircrews, are the ones who will benefit most from this training. Of course, it goes without saying that our families will benefit, too! I might point out that my primary AFSC is S1115E and that I have been beating this "drum" for 13 years as a tactical fighter pilot. My present address is temporary (three years).

"With the exception of my goof I would like to publicly compliment Mr. Dave Baer for the outstanding job which he did on that cover. It was shot from his painting and you can imagine the time and effort that went into getting all that detail in paint. In addition it was done primarily from outdated pictures with the project officer pointing out various configuration changes and what the "environment" should look like.

"About those pylon/tank assemblies again: would you buy the story that they were some old 105-B pylons and tanks that were pulled out of the warehouse and—gasp!"

WELL DONE

☆ U. S. GOVERNMENT PRINTING OFFICE 1967 301-209/1

CAPTAIN

CARL I. WALTERS

19 TACTICAL AIR SUPPORT SQUADRON, APO SAN FRANCISCO 96227

Captain Carl I. Walters was flying his fourteenth mission in an O-1 as a Foward Air Controller on 14 January 1967. At the completion of his assigned reconnaissance mission a sudden, violent fire broke out behind the electrical panel on the left side of the cockpit. A screw securing the electrical panel had worked loose, allowing the primary bus to short out on the fuel return line to the left wing fuel tank. The hot bus burned a hole in the fuel line and escaping fuel ignited. Captain Walters immediately made a radio distress call on his control frequency, stating that he was on fire and giving his coordinates. Then, in rapid order, he shut off all electrical switches, disconnected the aircraft battery and switched fuel tanks in an effort to extinguish the fire. Despite his efforts the flames spread rapidly. As he slipped his aircraft toward a road running through the dense jungle-covered terrain, he placed his helmet bag and seat cushion between himself and the blaze and attempted to combat the flames with his fire extinguisher. However, the fire persisted and as he arrived at a low altitude he had to devote his whole attention to landing the aircraft. As he lined up for his final approach to the road on which he intended to land, he saw that there were people on it. Rather than run the risk of hitting them, he decided to land in the small trees and scrub brush along one side of the road.

Despite the painful burns he was now receiving from the flames, he skillfully slowed his aircraft and stalled it into the spot he had selected, thus avoiding possible injury to the civilians on the road. Although the plane was damaged, he was able to evacuate the aircraft and put out the fire with his extinguisher. His distress call and the accuracy with which he pinpointed his position resulted in an immediate cap of fighter aircraft, O-1s, and rescue helicopters. Within 20 minutes of his landing he was being evacuated to a hospital where he was treated for burns on his left leg, hip and arm.

Captain Walters' prompt assessment of the emergency and the professional manner in which he handled it prevented loss of civilian lives and saved his own life and his airplane as well. The professional competence and aerial skill displayed by Captain Walters earned him a WELL DONE. ★

CAPTAIN

WILLIAM R. WYATT

4520 COMBAT CREW TRAINING WING, NELLIS AFB, NEV,

Captain William R. Wyatt was the leader and instructor pilot for a flight of three F-105 aircraft on a training mission at the Nellis AFB gunnery range. As he led the flight members in conventional dive bomb attacks, with his aircraft in a 45 degree dive, at 4500 feet above the ground, Captain Wyatt heard a muffled explosion and the engine started to vibrate severely. Recovering from the dive, he immediately jettisoned the external wing tanks and set course for the nearest suitable landing field—Indian Springs AFB, 23 miles away.

Declaring an emergency, he directed his flight members to escort him on his recovery and to prepare to provide rescap if ejection were necessary. The decision to eject or attempt a forced landing with the failing engine was complicated for Captain Wyatt by the presence of a student pilot in the rear cockpit. Striving for altitude over a mountain range, Captain Wyatt was able to attain 9000 feet, although the extreme engine vibrations continued and the tail pipe temperature rose to a dangerously high 700 degrees. As he approached the emergency landing field, he rebriefed the backseat pilot on proper bailout procedures as he rechecked his own equipment. Then, with an engine that was rapidly losing power, Captain, Wyatt set up a high, short final approach to the 7000-foot runway.

Captain Wyatt minimized all possible risks in that he accurately judged the limited available thrust from the engine, which now had started to lose blades from the turbine, and by using a steep, high airspeed approach he maintained an ejection capability until he was certain of his ability to land. Then, by maneuvering his aircraft over the overrun he dissipated airspeed aerodynamically and touched down 500 feet down the runway. During the rollout the engine failed and the air turbine motor shut down, causing failure of the normal wheel-braking system and nose wheel steering. Using the limited emergency braking system Captain Wyatt brought the aircraft to a stop on the runway without engaging the arresting barrier.

Captain Wyatt's quick and accurate analysis of this inflight emergency and his skillful and professional handling of a serious situation enabled him to save a combat-ready F-105. WELL DONE. ★


GOT THE RIGHT GEAR?
..FOR THIS TIME OF YEAR?
US AF