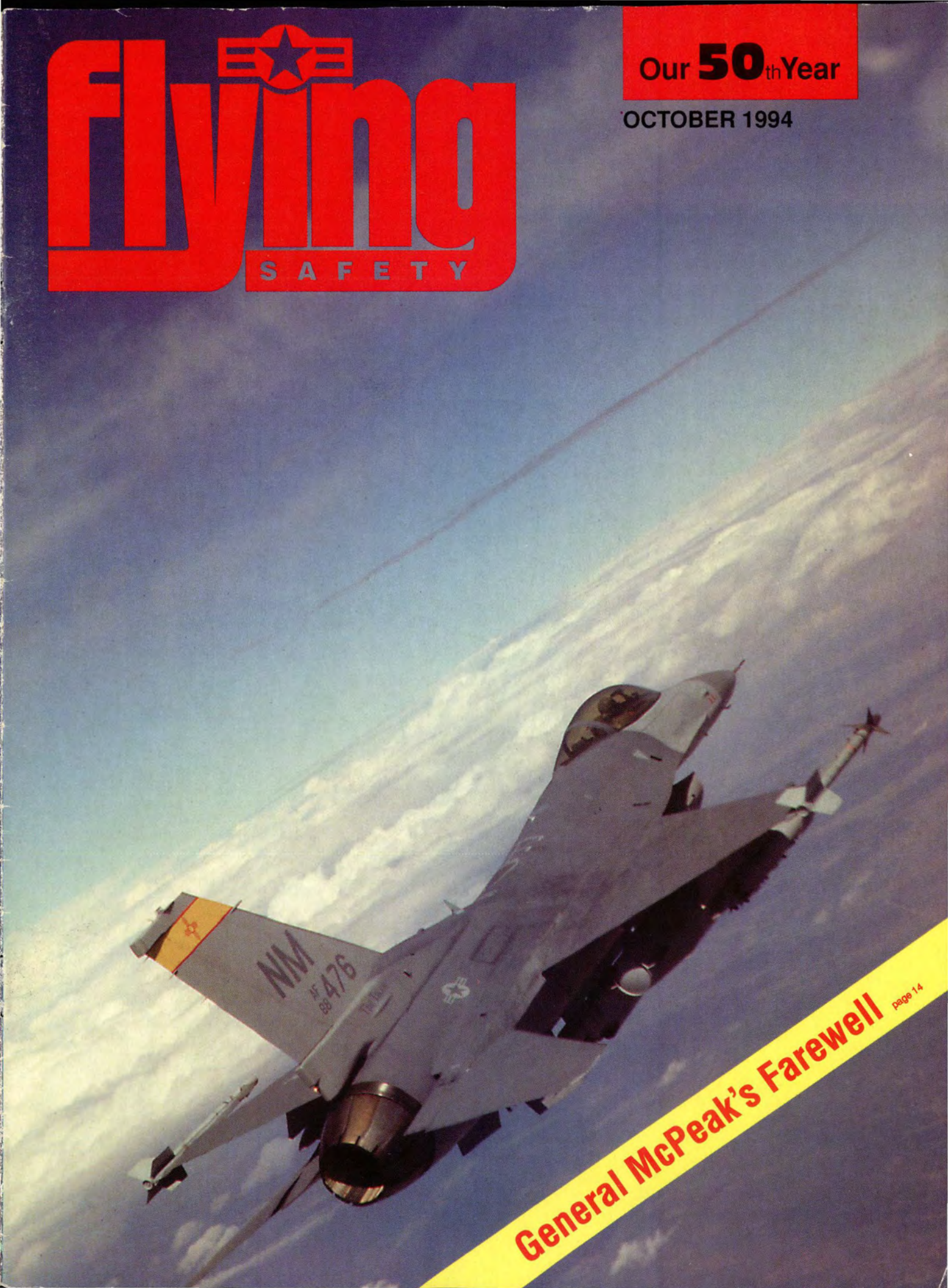
flying SAFETY

Our 50th Year

OCTOBER 1994



General McPeak's Farewell

page 14

THERE I WAS

■ Our C-130 crew was returning from a Friday night air drop training mission to home base. During the high level return trip, the IP was chatting with his students about the birthday party he was having for his soon-to-be 5-year-old son the next day.

As we had to penetrate a frontal area, I suggested we call metro when we were 45 minutes out. The IP agreed and dialed in the frequency of an enroute Air Force base we were passing.

Our Friday evening arrival weather was anything but encouraging, suddenly below minimums for any approach, with heavy fog. The nearest alternate was 30 minutes away on the other side of the front. Weather at that location was better, but with locally heavy thunderstorms.

I took this occasion to question my navigator student as to what he would do if it were his decision. His correct judgment was that we had enough fuel to continue to our destination but needed to depart the local area with at least 9,000 pounds of fuel to be legal at our alternate. We informed the pilot of our decision that we could hold at destination, but only for 20 minutes.

After two trips in the holding pattern with no improvement in the weather, as the IN, I suggested a diversion. Three holding patterns later and following a heated discussion over the pilot's shoulder, we headed toward our alternate.

Our fuel overhead the alternate now appeared to be over 1,000 pounds below the command-directed minimum of 6,000 pounds. Realizing the gravity of our situation, the pilot showed good judgment by asking for a direct clearance and declaring minimum fuel.

Twenty miles out we asked for and received clearance for a visual straight-in from Approach Control.

Shortly afterwards, we were shocked to learn from Tower that the airport was closed because of an overhead thunderstorm and was not expected to reopen for another 15 minutes.

At this point, I informed the pilot that the airborne radar was good and I felt we could get through a hole if we could get a special VFR landing clearance. Down to only one alternative, we accomplished it, landing after an "exciting" final approach with less than 3,800 pounds of fuel and made it to the ramp without a flameout. ■

Our 50th Year

UNITED STATES AIR FORCE

Flying SAFETY

OCTOBER 1994

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ABOUT THE COVER:
F-16 from the New Mexico ANG's 150th Fighter Group flying a mission.
Photo by SrA Andrew N. Dunaway, II

CONTRIBUTIONS

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SPECIAL FEATURES

REGULAR FEATURES

DEPARTMENT OF THE AIR FORCE • THE CHIEF OF SAFETY, USAF

PURPOSE — *Flying Safety* is published monthly to promote aircraft mishap prevention. Facts, testimony, and conclusions of aircraft mishaps printed herein may not be construed as incriminating under Article 31 of the Uniform Code of Military Justice. All names used in mishap stories are fictitious. The contents of this magazine are not directive and should not be construed as instructions, technical orders, or directives unless so stated. **SUBSCRIPTIONS** — For sale by the Superintendent of Documents, U.S. Government Printing Office (USGPO), Washington D.C. 20401; send changes in subscription mailings to the USGPO. Back issues of the magazine are not available. **REPRINTS** — Air Force organizations may reprint articles from *Flying Safety* without further authorization. Non-Air Force organizations must advise the Editor of the intended use of the material prior to reprinting. Such action will ensure complete accuracy of material amended in light of most recent developments. **DISTRIBUTION** — One copy for each three aircrew members and one copy for each six direct aircrew support and maintenance personnel. Air Force units must contact their base PDO to establish or change requirements.

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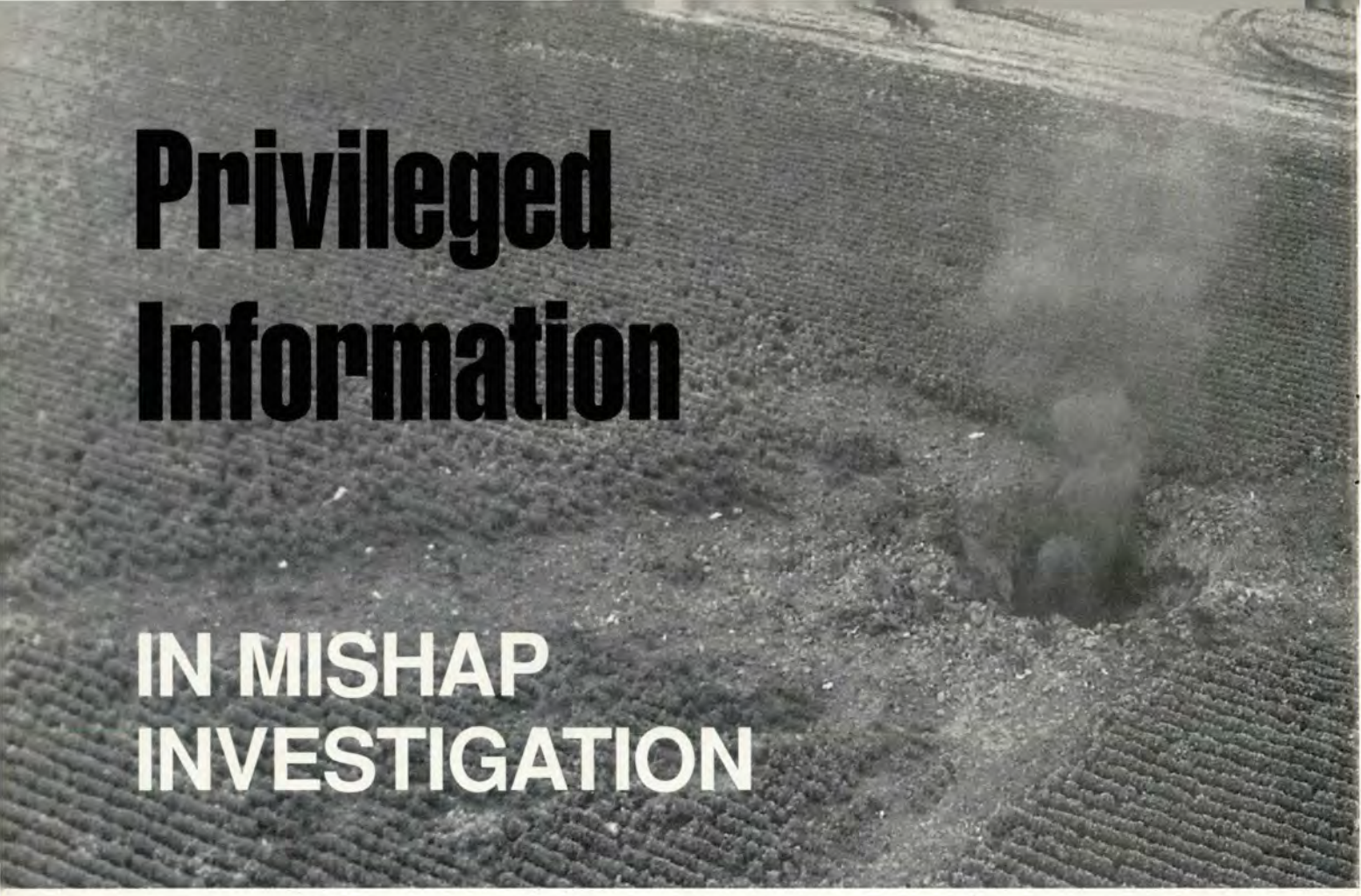


Privileged Information

IN MISHAP INVESTIGATION

"Aviation in itself is not inherently dangerous. But to an even greater degree than the sea, it is terribly unforgiving of any carelessness, incapacity, or neglect."

CAPT PHILLIP T. DUROCHER
19th Airlift Squadron
Travis AFB, California

■ This popular, uncredited quote can be found on many a pilot's wall. From the very beginning of aviation, pilots have always sought to overcome the adversities of the regime of flight and go higher and faster than those before them. The lessons learned in aviation have often required the greatest sacrifice of all, the loss of a human life.

The professional aviators within the USAF rely heavily on their safety officers to help ensure these lessons are learned prior to the ultimate sacrifice or loss of valuable national assets. However, when aviation mishaps do occur, an Air Force Safety Investigation Board is convened to determine the cause and lessons learned.

A report of the facts and findings are published to share this information throughout the flying safety community to prevent the same misfortune from falling upon fellow aviators. This report is divided into two parts. The first contains only the hard facts of the investigation and is releasable by the Safety Agency to the general public. The second contains all of the confidential witness testimony and contractor-consultant reports, and the recommendations and other deliberations of the safety board. This portion is protected by government privilege from disclosure outside of the Air Force safety community.

The objective of the USAF Safety Office is quite clear — to prevent mishaps. In order for the Air Force Safety Investigation Board to determine the cause of a mishap, the findings of, and testimony to, investigating members of the board are completely protected from use in punitive action by making the testimony to, as well as the findings of, the board privileged information. By taking away witnesses' fear of prosecution, the ability of the board to determine the actual cause of the mishap is greatly enhanced.

The protection of this material within the flying safety community

USAF Photo

Our privilege to grant immunity from prosecution and retribution to those who testify before Air Force Safety Investigation Boards is at the core of our safety efforts. The need for it has been legally challenged and sustained in court cases all the way up to the Supreme Court. We must continue to safeguard that right.

is enforced by handling it as "Limited-Use, Privileged," which allows it to be shared with all whom it may affect in the future. If the Air Force Safety Investigation Board didn't have the authority to promise confidentiality, the men and women of the USAF would pay a much higher price, in both lives and equipment, as we would constantly relearn the lessons of those before us.

"Privileged," as defined by *The Merriam-Webster Dictionary* is: "not subject to disclosure in a court of law." It also has another definition which is quite relevant: "a right or immunity granted as an advantage or favor especially to **some and not others**."

As I continue to expand on the use of privileged information in Air Force safety investigations, you will clearly see facets of both definitions. I also hope to convey the importance of protecting this "right" before we, the people of the USAF, are part of the "and not others" group instead of the chosen "some."

The concept of privileged information is not unique to the world of safety. In fact, it is present in many areas of our daily lives. One of the most commonly known fields where information passed is held in complete confidence is that of the clergy. Another is that of the legal and medical professions.

The right of privileged conversation with members of the clergy is based on the right of freedom of religion. Although this is a common example of privileged information, it is not entirely appropriate in comparison to the use in safety. I would, however, like to expand and compare the legal profession's use of privileged information to that of the Air Force Safety Investigation Board in order to more clearly present the necessity of protecting this right.

When a lawyer is hired, or appointed, to defend an individual in the courts of this country, the right of attorney/client privilege usually protects information volunteered to the attorney by the client. The client may confess to a serious crime, but the attorney has made a vow and risks disbarment if he or she ever divulges this information. This right is given to the client and the attorney in order for the attorney to have all necessary information to represent the client properly in the court of law and to be able to give his or her client the best possible advice on which course of action to take.

You may ask how this compares to an Air Force Safety Investigation Board and its analysis of a mishap. Just as the lawyer requires complete and honest information to prepare his or her best defense, so does the safety board in accurately determining the cause of a mishap. In both cases, the information received is protected from retribution to stop filtering of facts which may greatly affect the outcome and successful completion of both a legal defense or mishap determination.

The findings of the safety board are protected by publishing all conclusions and associated testimony to the board in Part II of the formal USAF Mishap Report. As mentioned before, this portion of the report is completely protected as privileged information and may be disseminated in sanitized form throughout the flying community for each member to learn the valuable lessons and prevent similar mishaps in the future.

There is an inherent irony in the fact the information found in Part II of a USAF Safety Report is privileged. Yet it is our duty, and the duty of both the operations commanders and the maintenance commanders, to disseminate the findings to those who need to learn the valuable and often costly lessons.

A summary of the information in Part II of the mishap investigation report is initially provided to Air Force safety officers who can sanitize the reports for anyone in the Air Force who needs the information for mishap prevention purposes. Within limits, this benefit is sometimes extended to include civilian contractors, other federal organizations, and even foreign governments which are heavily involved in our daily national security operations.

With all of this flow of information, how can one truly protect it from reaching unauthorized personnel? The solution is similar to one every member of the military hears over and over again — **operational security, or OPSEC!!!**

The information carries restrictions of "For Official Use Only" and "Limited Use, Privileged" which, if breached, can bring dismissal or dishonorable discharge, a fine, or forfeitures up to 2 years jail time, or other disciplinary action.

The greatest punishment, however, may not be to the individuals who compromise the information. The heavy burden of such action may fall upon the men and women who continue to fly with a safety program with reduced capabilities, who are unable to get the cooperation of the next mishap participants.

The biggest advantage a safety investigator has is that a witness interview begins with the statement all

continued

Privileged Information IN MISHAP INVESTIGATION

continued

information is privileged. The mishap investigation witness statement worksheet contains the following statements to convey the promise of confidentiality to all potential information sources:

"I, _____, having first been advised that this investigation is being conducted solely for mishap-prevention purposes within the U.S. Air Force and that this statement will not be disseminated outside the Air Force or used as evidence in disciplinary actions or adverse administrative actions such as a Flying Evaluation Board, determining line-of-duty-status or pecuniary liability, or elimination from the U.S. Air Force, but is to determine all factors relating to the mishap and to avert recurrence, do hereby make the following statement."

The worksheet is concluded with: "FOR OFFICIAL USE ONLY. This is a Limited Use Document not releasable in whole or in part to persons or agencies outside the Air Force without the express approval of the disclosure authorities specified in AFR 91-204 (formerly AFR 127-4).

This is a far different start than an investigator involved in the Air Force Accident Investigation Board under AFR 51-503 (formerly AFR 110-14). Note the word "safety" is not the objective of this latter board. This is an investigation intended to gather all of the evidence from a mishap which can be used for disciplinary action, claims and litigation, or other purpose.

The interviews of these investigators start with "Do you swear to tell the truth ...," and they sometimes even start with "You have the right to remain silent ..." As you can imagine, this doesn't always invite a deep feeling of cooperation or lead to a complete unfiltered version of what happens.

The testimony given to the safety board is free from all retribution, both formally in legal channels and informally from superiors. This is very helpful, especially when a problem in supervision or policy has played a part in an aircraft mishap. It also increases the involvement of the contractors in the safety investigation process.

As the true experts in the system design, they are often the only participants with the knowledge necessary to locate a possible mechanical flaw. The participation of these contractors would not be as open and truthful if they were subjected to the possibility of civil liability or criminal prosecution based on their own testimony.

Occasionally the Air Force Accident Investigation might not receive all of the necessary information to make a full and final determination of the cause and, in their case, accountability for the mishap. This difference between the two boards can lead to conflicts in the findings. Sometimes, it might be perceived a fall-back determination of "pilot error" is reached by the Air Force Accident Investigation, especially in cases where the only live witness was fatally injured. The Air Force Accident Investigation Board's investiga-

The promise of confidentiality is critical to our mishap investigation effort. It also increases the involvement of the contractors in the safety investigation process.

USAF Photo

Photo by SrA Andrew N. Dunaway, II

The charter of the Safety Investigation Board is to determine *exactly* what happened in order to prevent another mishap from occurring.

tion can be completed when it is determined a human error caused a mishap.

The Safety Investigation Board is not always satisfied with this general explanation, even when it is an obvious human error which led to the mishap. The charter of the safety board is to determine exactly what happened in order to prevent another mishap; therefore, the board's efforts go beyond who is at fault into what led to that "pilot error." For example, it might be determined the "pilot error" was a direct result of a preventable factor such as training or cockpit engineering.

In the past, it seems, civilian news correspondents were more content to accept information provided via official military press releases. Today, the multimillion dollar media industry rewards "investigative reporters" who produce a prime exclusive story. Aircraft crashes are spectacular, and they "sell a lot of newspapers," especially if they are combined with rumors of a "government coverup."

When the privileged information in an Air Force Safety Report is not properly justified and protected, the ever-increasing cry of "coverup" is sure to follow, especially when someone thinks the publicly announced mishap investigation report tells a different story.

While it is possible for the accident investigation to be reopened to gather more evidence or reevaluate the evidence originally collected if the convening authority's safety investigation report varies greatly from it, the findings and conclusions included in Part II of the safety investigation report are not allowed to be used in any part of the mishap investigation proceedings.

The most publicized case in recent US Air Force history occurred with the 15 November 1982 fatal mishap of a General Dynamics F-16 Fighting Falcon in the Republic of Korea. When the Air Force Accident Investigation Report was released, it implied the primary cause of the mishap was "pilot error." However, after substantial independent investigation by the pilot's wife, it was suspected another factor other than simple "pilot error" was the cause of the mishap.

An unnamed party, who had access to the information from Part II of the Air Force Safety Investigation Report which considered numerous scenarios, took it upon himself to share this information with the family of the deceased pilot. This began a long process of press meetings and court proceedings where the family, in understandable attempt to clear their loved one's name, was inaccurately portrayed as raising the "government coverup" call across the media markets. General Dynamics was sued in civil court proceedings, and the case initially resulted in a 3.1 million dollar product liability verdict against the manufacturer.

Later, in an appellate court ruling, the status of General Dynamics as a government contractor led to the overturn of the initial ruling. The dramatic story of the pilot's life and the widow's action was produced as a Home Box Office movie, "AFTERBURN," starring Laura Dern.

Needless to say, this was a public affairs nightmare, but the potential damage to the integrity of the Air Force Safety Program caused by straining the trust of privileged communication may be measured in the future as lives of aviators, rather than dollars awarded in a lawsuit.

The USAF is committed to its safety programs and to trying to achieve the ideal 0. 0 mishap rate in all areas of operation. We, as aviators, must do our part to protect the rights afforded to us by the Executive Branch of the United States Government.

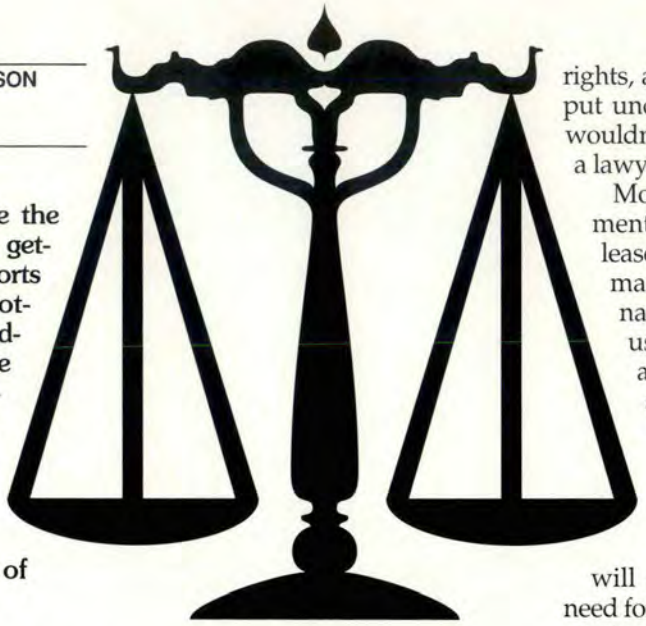
Brigadier General James L. Cole, former USAF Chief of Safety, is quoted regarding privileged information: "If an Air Force member, regardless of his position, takes it upon himself to release privileged information, it can be argued that the Air Force as a whole is not making a consistent effort to protect such information." He continues: "This represents a major threat to our mishap prevention program."

Privileged information is just that — a privilege which can be taken away. We need the information provided to us in the Air Force Safety Investigation Reports to properly execute our "Global Reach — Global Power" mission. If we lose the ability to freely share this information with the operators and maintainers out on the line — because we can't trust them to safeguard the information — we will begin a steady march backward in our goal of mishap-free operation.

Aviation may not be inherently dangerous, but if we allow the experiences of those aviators before us to go unlearned, especially those paid for in blood or life, we will surely see how unforgiving the skies can be. ■

It's a privilege

COLONEL CHARLES MATTHEWSON
Staff Judge Advocate
HQ Air Force Safety Agency



Question: Why are the media and the prosecutors getting access to the safety reports from the Blackhawk shootdown? Looks like the headlines are heralding the demise of the safety investigation process as we know it. Next time I'm involved in a safety investigation, do I need to have a lawyer with me? What happened to the promise of confidentiality?

Answer: Whoa! Let's back up a couple dozen steps! First, the Blackhawk shootdown was not investigated under the safety reg (at that time, AFR 127-4; now, AFI 91-204). It was done under the JAG's AFR 110-14 (now AFI 51-503). Since it was a "friendly fire" incident occurring under combat conditions, it was not deemed a "mishap" in the safety sense. Obviously, there are safety ramifications involved and safety lessons we're learning, but it wasn't a "safety investigation."

That being the case, there was no authority for the investigators to make any promises of confidentiality to the witnesses. In fact, the witnesses were read their Article 31 rights if they were suspected of having possibly committed a UCMJ offense (like "dereliction of duty" that some AWACS crewmembers have been charged with).

If there had been a safety investigation, the witnesses would have been promised confidentiality, they wouldn't have been read their rights, and they wouldn't have been put under oath. And they certainly wouldn't have been allowed to have a lawyer present.

Photo by SrA Andrew N. Dunaway, II

More importantly, their statements wouldn't have been released to the press, given to commanders or JAGs for disciplinary action, or **anything but** used to support the findings and recommendations of the safety board focused **solely** on mishap prevention.

Rather than heralding the demise of the safety privilege, this "friendly fire" investigation and its aftermath will greatly help us defend the need for confidentiality in mishap investigations. We'd have a terrible time getting the truth about an incident — especially one attributable to "human factors" — if the witnesses had to guard every word against possible use in court, in the newspapers, or in a performance report.

Offering and enforcing promises of confidentiality are clearly the best way to be sure we're getting the truest picture of what happened in a mishap. Relying on the criminal justice system to give us solid causal findings (for preventing mishaps) would never work — this case makes it very clear just how important the safety privilege is.

Leave your lawyer at home! Normally, it's "safety first" — then the legal team has its turn with the witnesses (with lawyers, if desired) and the physical evidence. The Blackhawk shootdown was different — right from the start. ■

Editor's Note: This is the first presentation of what will be a regular feature in this magazine. You may call questions in to our Safety Hotline, DSN 246-0950, or you may send them to us by mail. Colonel Matthewson is the staff judge advocate at AFSA.

"...on the leading edge of excellence"

From a distance across the flightline, their aircraft looked just like all the rest of the KC-135s. In fact, all the types and models of airlifters and tankers present on the McChord ramp looked sharp. But upon closer examination, anybody could tell this particular aircraft was the exception: a real masterpiece! Somebody was definitely out "...on the leading edge of excellence."

CMSGT DON A. BENNETT
Technical Editor
Photos by Msgt Joe Pastre

Roundup of the Best

■ The occasion was the Air Mobility Command's "RODEO 94," held for the first time at McChord AFB, Washington. It was the 14th roundup of international air mobility competitors representing the Air Mobility Command (AMC), Air National Guard, Reserve, and 12 international teams. The U.S. Transportation Command event is a world-class showcase of air refueling, airdrop, and supporting ground operations.

According to AMC Rodeo officials, this competition provides an opportunity for the world's best aerial refuelers and airlifters to demonstrate capabilities, improve procedures, compare notes, and enhance standardization for worldwide operations. It also tests the skills of flight and ground crews as well as the related skills of combat control, Security Police, aerial port, and maintenance team members.

Mission capability isn't something a unit has — it's something a unit continuously works hard at to achieve. And the men and women responsible for this KC-135R certainly have every right to be proud of their aircraft and themselves. Their flying work of art had just received a perfect score on a highly competitive KC-135 preflight inspection. The announcement excited, but did not surprise, the ground maintenance team. It was just another day in the trenches. And it was just another preflight.

Great First-Time Rodeo

This particular maintenance team represented the 121st Air Refueling Wing (ARW) out of Rickenbacker Air National Guard Base, Ohio. Air-

continued

"...on the leading edge of excellence"

continued

crew members and maintainers of the 145th Air Refueling Squadron and the 166th Air Refueling Squadron combined with their Security Police contingency to make up the Wing's Rodeo 94 team. And their ability to work together for a common cause was very evident. There were *"no showboaters" or "hotdoggers."* They were all business. They were a team!

"We took our own KC-135 and standard training from Rickenbacker and were able to go toe to toe against the very best. Keep in mind these were members of the 121st who had never been to a Rodeo competition before," said Captain J. J. Maass, Rodeo team captain for the 121 ARW.

You see, the 121 ARW is a combination of the original 121st Tactical Fighter Wing (TFW) (the A-7 unit) plus the deactivated 160 ARG (KC-135). This consolidation was completed 1 October 1993. The 160 ARG had flown the KC-135 for many years but had just converted to the "R" model prior to the consolidation.

No one could tell this was the 121st team members' first crack at the AMC Rodeo. Everybody acted like they had been there before, and the results reflected this. Besides maintenance capturing the Best KC-135 Preflight Award, they also placed 3rd out of 15 teams in "Best KC-135 Maintenance" category. The Security

Police team posted an impressive 2nd place finish in the Combat Tactics event. The aircrew members distinguished themselves with a 2nd place finish among 15 other aircrews in the highly competitive "Best KC-135 Aircrew" award. All together as a wing team, Operations, Maintenance, and Security Police combined to take 4th out of 15 for the "Best KC-135 Wing," 5th out of 19 in "Best Tanker Wing," plus a respectable 9th place finish out of 55 national and international teams for the top "Best Air Mobility Wing" award. Not bad at all for this team's first time "at the roundup"!

Maintainers Step Off Smartly

"The maintenance guys set the tone very early by earning that perfect score and trophy. That really helped to motivate our other teams who wanted to do just as well," said their Rodeo team captain.

The 121 ARW maintainers' just-another-preflight attitude was not one of cockiness. Besides the confidence in their training and technical skills, one other important ingredient made up the basis for their unabashed attitude: proper mindset — a positive, quality, and safety mindset that would almost guarantee them a successful outcome in every endeavor. The kind of organizational mindset that creates and sustains the foundation for the proper environment and culture that ensures safe, quality ground and flight operations! Everybody from Brigadier General John H. Smith, Wing Commander, to the lowest ranking member of the 121st rodeo team had that same characteristic: do it right, the first time, every time!

Both their maintenance officer, Captain Jim Reagan, and the air-

The 121 ARW organizational mindset created an environment and culture that ensured safe, quality ground and flight operations.

craft's crew chief, Staff Sergeant Jeff Cantrell, had the same business-as-usual attitude while being interviewed for this article. They both admitted a lot of hard work was invested in preparing the jet for the rodeo competition, but that was mostly for appearance's sake. As for the perfect preflight score, Sgt Cantrell didn't hesitate or bat an eyelash when he said the preflight was performed "like we always do a preflight." He made it clear it didn't matter whether they were performing maintenance for a local training sortie or an operational mission or during RODEO 94, their maintainers' goal was to produce the same high standard of quality.

"The umpires pointed out several relatively technical aspects they really liked pertaining to the performance of our maintainers," said Capt Maass.

And they had an admirable past record of producing high quality work during competitions. Before the conversion to KC-135s, the old 121 TFW had participated in "GUNSMOKE" competitions. Not once, but twice, the maintainers took home top honors as "Best of the Best Maintenance" during GUNSMOKE meets. They are the only Guard unit to win the award and the only unit throughout the active, Reserve, and Guard to win the award twice!

There were no "showboaters." They were all business. They were a team!

The maintainers of the old 160 ARG (which deployed for Desert Storm) were the Winners-Concours D'Elegance "SKY TANKER 85" International Air Tatoo and Winners-Concours D'Elegance "SKY LIFT 87" International Air Tatoo. Both of these were worldwide events held in Great Britain. Talk about bragging rights!

No Micro Managers Here!

After talking with both the operations and maintenance team members, it didn't take long to figure out another significant strength the 121st team possessed: strong, active, effective leadership. The big shots were out on the flightline with the flight crew and maintenance team, but there wasn't any micro management going on. The bosses knew their people were thoroughly trained and capable of outstanding performance without worrisome intervention. Capt Maass praised MSgt Ken Griffis of the wing's Security Police team. *"Griffis did an outstanding job as their leader. They are a very confident group, especially now they proved they can perform as well, if not better, than any other Security Police team."*

The 121st Wing Commander, BGen Smith, was also out on the ramp as the No. 1 morale booster and to be available for the kind of decisions Wing Kings have to make once in a while. He had tons of confidence in the wing's Rodeo 94 team and it showed. Equally, and more importantly, the 121 ARW's Rodeo 94 team members had enormous respect and confidence in their leaders and supervisors. This showed, too.

"I am proud of our participation. There was not one event or category we did not perform well in. We were as prepared as anyone else, and our plane was ready for the task. Captain Maass did an outstanding job as the Rodeo team captain. This was a total team effort, and everybody should be proud of their contributions," commented Gen Smith.

The General had every right to be proud. He had successfully fielded a Rodeo 94 team full of professionals from a home station that was way, way out there ***"...on the leading edge of excellence."*** ■

All direct quotes of Capt J. J. Maass and BGen John H. Smith were extracted from an article written by TSgt Mike Myers in *Wing Watch*, August 1994, a 121st Air Refueling Wing newsletter.

Just Look and Shoot

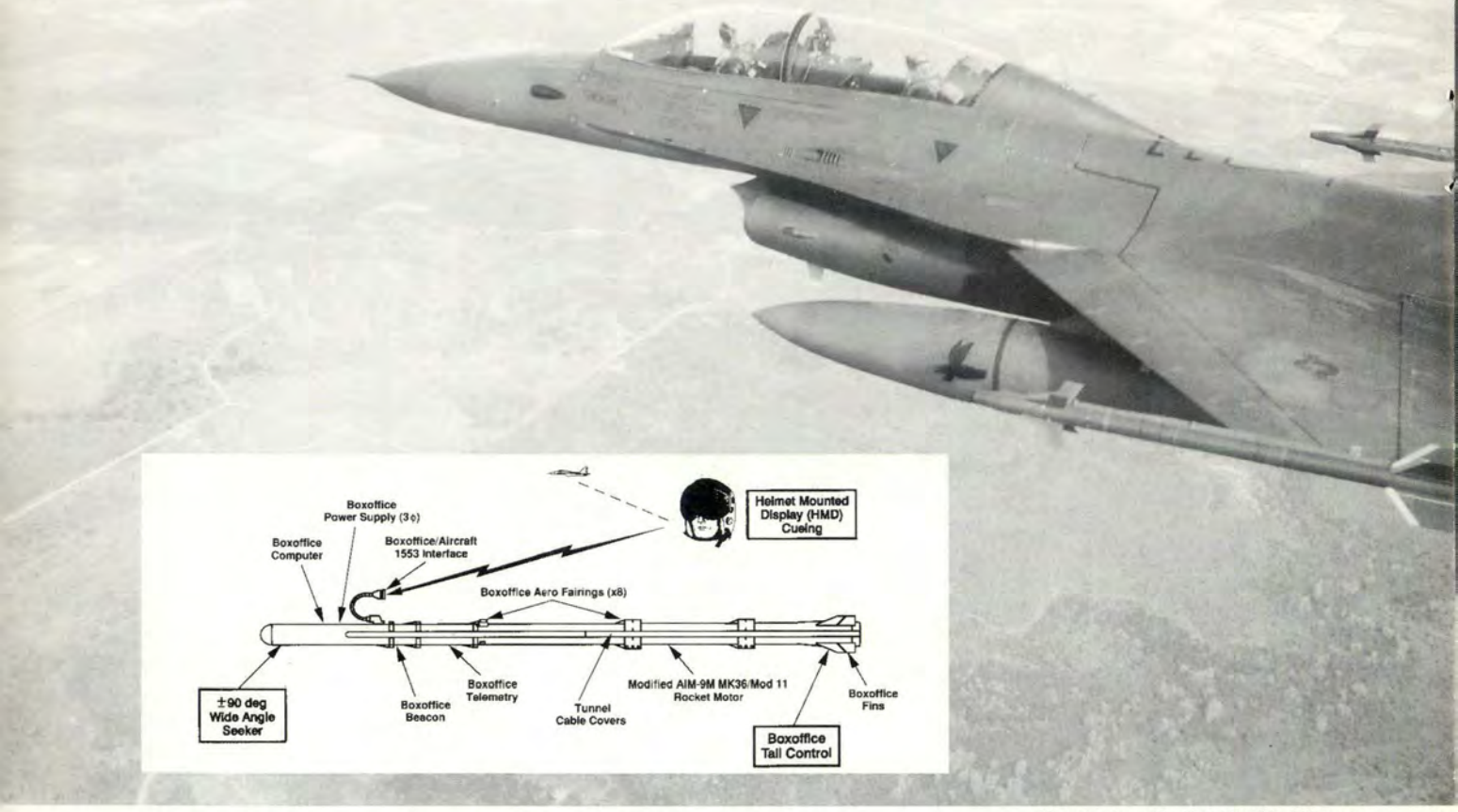


Photo courtesy of Lockheed Fort Worth Company

PEGGY E. HODGE
Managing Editor

■ Look and shoot — a deadly concept for within-visual-range air combat! Imagine being in a dogfight and locking up a missile shot in an instant by cueing with your head — up to 90 degrees off the aircraft nose! You don't need to imagine it.

The Look and Shoot Program made it a reality by showing the combined effect of helmet cueing, advanced missile seeker, and advanced missile airframe through numerous air engagements and a live missile firing. After seeing this system in action, one experienced fighter pilot remarked, "This capability redefines air-to-air combat as we now know it."

The Background

In within-visual-range air combat, the ability to target and fire upon an opponent in this manner will be a great tactical advantage and a force multiplier. Air Combat Command (ACC) and industry have recognized this, but the goal has been elusive until now.

The Look and Shoot Program's objective was to develop and fly a complete state-of-the-art system. This was accomplished through a high performance industry consortium consisting of Lockheed Fort Worth Corp performing system integration on the F-16 test bed, Raytheon Missile Systems providing the modified AIM-9 missile, and Honeywell Military Avionics providing the helmet mounted display (HMD).

The extensively modified AIM-9 missile has a newly developed seeker-head capable of infrared (IR) acquisition and tracks out to 90 degrees and contains a multielement detector array and digital electronics. (See the diagram.) IR contact ranges are over twice those of the AIM-9, the seeker is field reprogrammable, and is much more robust than the AIM-9 in IR countercounter measures (IRCCM). The Boxoffice demonstrates significantly better range and G capabilities as compared with a standard AIM-9.

The missile seeker is slaved to the line-of-sight of the pilot's HMD so when the pilot looks at a target anywhere within 90 degrees of the nose of the aircraft, the IR seeker in the missile is able to acquire and track that target. Once the IR seeker "sees" the target, and the target is confirmed through an aural tone to the pilot (just as it is for the AIM-9M), the missile may be immediately

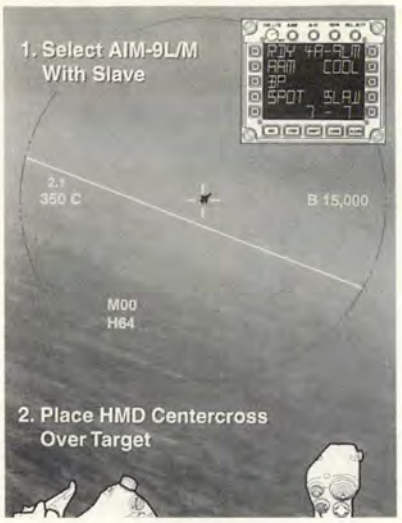


Figure 1

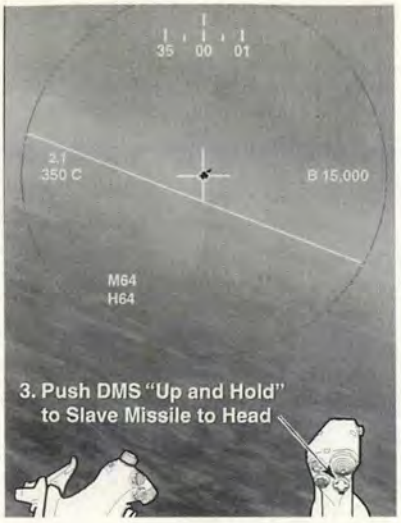


Figure 2

Figure 3

Figure 4

Figures courtesy of Lockheed Fort Worth Company

launched and the added agility of the Boxoffice Missile airframe makes the outcome a certainty.

The helmet is similar in size and shape to a standard issue helmet and is only a few ounces heavier. The display capabilities within it are remarkable. The HMD symbology is projected on the pilot's visor directly in front of the right eye. They are focused at infinity, in the same way as the symbology on the pilot's HUD. In fact, the symbology is designed to appear similar to the existing HUD symbology, and the display is very much like having a HUD which can be placed anywhere in the cockpit by moving the head.

The HMD has performed extraordinarily. Multinational pilot evaluations found it comfortable, optically correct, and unaffected by G loading. The integral head tracker follows virtually wherever your head moves in the cockpit.

The Workings

Pilots have found it to be a very quick and natural system to use. Their reaction has been unanimously enthusiastic. Figures 1, 2, 3, and 4 detail just how the system appears to the pilot.

In figure 1, you can see the horizon line, and above that line is the target aircraft. The pilot places the HMD center cross symbol on, or near, the target by moving his or her head. This establishes the HMD line-of-sight (LOS) angle to the target, and this angular information is relayed digitally to the missile which is, at this point, boresighted (looking straight ahead along the longitudinal axis of the aircraft).

Having designated the LOS to the target with the HMD, the pilot then uses the Display Management System Switch (DMS), as shown in figure 2, to allow the missile to slave to that LOS. The missile slaves to that angle to "see" the target and an aural tone, which duplicates the tone provided by the present AIM-9M seeker, confirming the seeker has acquired the target. Once the pilot is satisfied the missile has found the intended target, the missile is released to self-track the target and is no longer slaved to the HMD LOS (see figure 3). From that point, the missile autonomously tracks the target, and the only remaining switch action for the pilot is to initiate rocket motor ignition.

In figure 4, the missile is self-track stabilized over target and is ready for launch.

The Test

More than just a captive carry demonstration system, an actual live launch was performed on 11 February 1994. This live launch showed the reality of an operational capability far in excess of that now available. The missile successfully intercepted a maneuvering MQM-107 target drone located 67 degrees off-boresight, 1.3 NM away, and 2,000 feet above the aircraft at missile launch. The engagement occurred at 20,000 feet altitude with the F-16 chasing the drone.

Just prior to missile firing, the pilot in the launch F-16 "looked" at the target aircraft and "designated" it to the missile seeker.

Throughout the engagement and regardless of target maneuvering, the wide angle seeker with its advanced multielement detector maintained a solid lock on the target and guided the missile to a successful intercept.

Our Gain

With this system, the U.S. now has a baseline performance level for offensive within visual range technology that is applicable to current and future fighters. The addition of the HMD and the off-boresight missile would significantly enhance our fighter aircraft lethality in the dynamic, close-in "dogfighting" combat arena. ■

JP-8
A Conversion Update

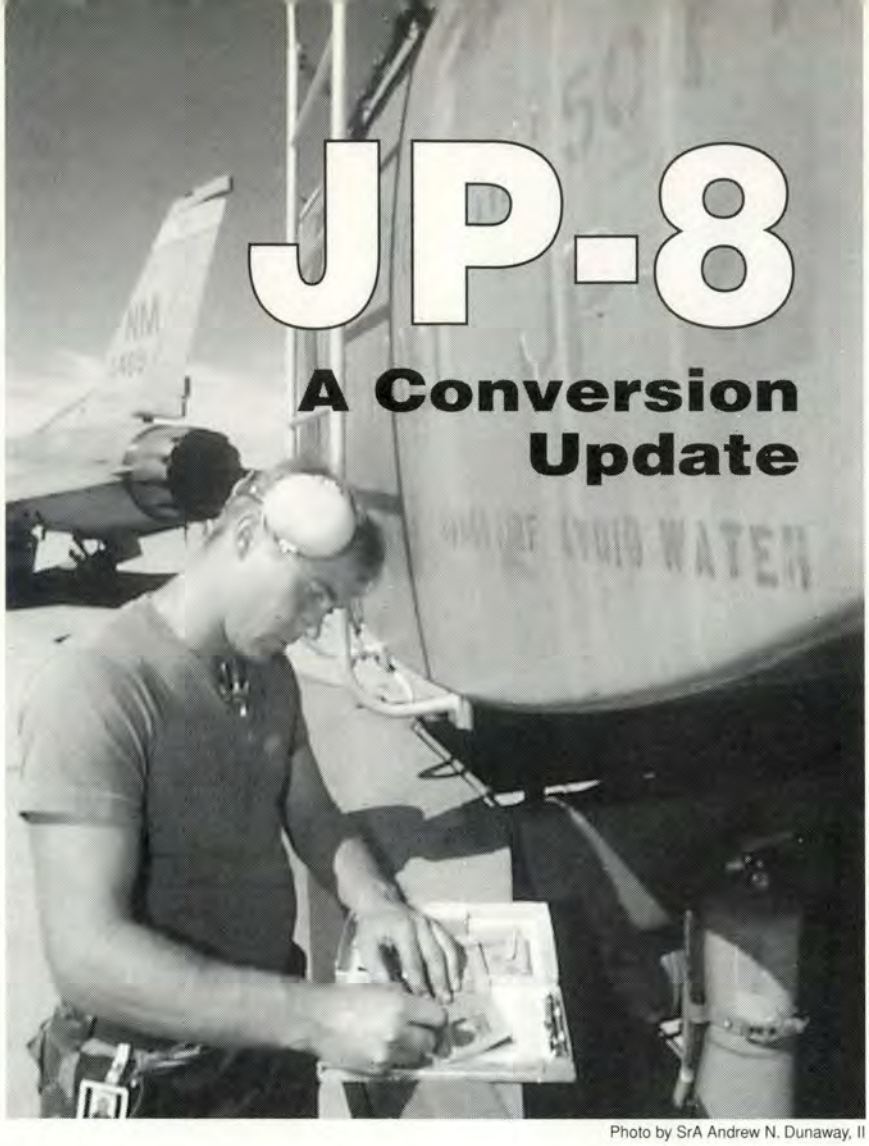


Photo by SrA Andrew N. Dunaway, II

NICK J. MAKRIS
San Antonio Air Logistics Center
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■ As the Air Force converts to JP-8, many questions and concerns are being raised by field personnel as to what problems can be expected. This article is intended to provide field activities with some of the history behind JP-8 and an insight into the conversion process.

The Beginning

JP-8 fuel was originally developed as a result of a TAC Required Operational Capability which was submitted in 1967 to reduce combat losses from gunfire-induced fuel fires and explosions. Early in November 1974, the USAF Scientific Review Board published a report which concluded the Air Force should convert to JP-8 as its primary fuel. The Honorable John L. Lucas, then Secretary of the Air Force, concurred with the report and stated, "We should ensure that future aircraft are designed to operate on JP-8 as the primary fuel."

Conversion 9 Years Later

A DOD directive requiring that all new aircraft be designed to use JP-8 was published in 1975. General Creech, then Air Force Assistant Vice Chief of Staff, directed the formation of a full-time task force in November 1977 to accelerate the conversion to JP-8 in Europe.

The United Kingdom (UK) conversion was completed in February 1979 as a pilot program for NATO. Maintenance trends were tracked in the UK for 3 years. No significant impact on maintenance or reliability could be identified.

In December 1981, the United States formally agreed to proceed with the conversion of USAF bases in NATO Europe. After delays, due to economic and operational considerations, conversion of NATO — with the exception of Turkey — was completed in 1988.

Conversion to JP-8 in PACAF is nearing completion, and the CONUS is presently being converted by regions. The figure shows the conversion schedule in CONUS. Regions 1 and 2, which consist of the West, Gulf, and East Coasts, have been converted. Region 3, the midwest states, will begin converting in October 1994. The last region to be converted will be the mountain states. This allows smaller refiners to gear up to meet the demand.

Safety and Energy Characteristics

JP-8 is essentially commercial Jet A-1 turbine fuel with the addition of several military additives. Early studies by the former Air Force Systems Command determined the higher flashpoint and lower vapor pressure make it much less susceptible to ignition and sustained fires than JP-4.

JP-8 has a minimum flashpoint of 100°F while the flashpoint of JP-4 is typically around -20°F. From these values, it is obvious why there is such improved safety when handling JP-8. Studies have shown gunfire-induced ignitions are reduced 31 percent with JP-8. Since it produces a significantly lower overpressure upon ignition, structural damage with unsustained flash fires is reduced by 60 percent. JP-8 also reduces the probability of post-crash fires by 12 percent.

JP-8 is slightly heavier than JP-4, averaging 6.7 pounds per gallon compared to 6.3 pounds per gallon for JP-4.

Another important characteristic of turbine fuel is the energy content measured in BTUs per pound or per gallon. Due to the higher volumetric energy content of JP-8, an increase in range of approximately 5 percent can be expected for most aircraft which are not weight limited. For those aircraft that are weight limited, a range reduction of less than 1 percent occurs when JP-8 is used instead of JP-4.

Other advantages of JP-8 over JP-4 include:

- Avoidance of equipping fuel sys-

tems with expensive vapor emission controls required by the Environmental Protection Agency for volatile fuels.

- A dramatic reduction in incidents of internal tank fires in aircraft.
- The same degree of reduction in fuel storage and handling equipment fires which have destroyed millions of dollars worth of Air Force assets.
- A savings of over 20 million gallons of fuel per year by decrease in fuel evaporation.
- The reduction in fuel cell purging requirements which significantly decreases aircraft down time and manpower costs.
- The most important advantage, reducing injuries and saving lives because of handling the less hazardous JP-8 fuel.

Worldwide Availability

Jet A-1 is the commercial fuel grade used by most countries outside of CONUS. Since the basic properties of Jet A-1 and JP-8 are the same, the conversion to JP-8 considerably expands the availability of fuel which can be used by the military in contingency operations.

Desert Shield/Storm was a prime example of fuel standardization contributing significantly to the success of the conflict. In this case, the war effort was simplified because of the use of host country Jet A-1 by coalition forces, many of them being NATO nations.

Conversion Drawbacks

Conversion of JP-8 is not without its drawbacks. JP-8 is a kerosene product. JP-4 is a naphtha-kerosene blend. Consequently, more JP-4 can be produced from a barrel of crude oil. This caused concerns during early conversion planning. Commercial aviation uses the same kerosene fraction of the crude as JP-8. Could sufficient JP-8 be produced to satisfy our wartime demands? Conversion, however, is running relatively smoothly with supply not appearing to be a problem.

Increased cost is also a concern. DOD standard price for JP-8 is slightly higher than that of JP-4, primarily because military and commercial aviation are now using the same middle distillate portion of the crude. The advantages in aircraft survivability, fuel-handling safety, and environmental protection benefits will far outweigh the increased fuel cost.

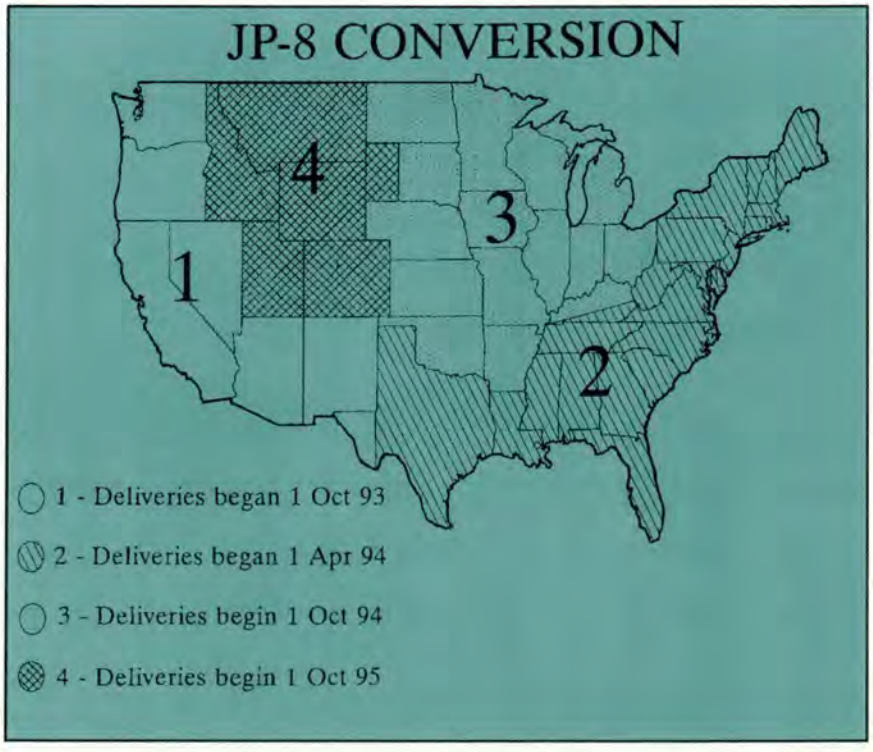
Due to a lower vapor pressure and higher viscosity, there is some degradation of altitude relight capability for some aircraft. These same fuel characteristics also present similar ground starting problems, particularly for some of our aircraft based in the northern tier regions of CONUS and Alaska.

The most common concerns raised at base level during conversion of the first two regions in CONUS were fuel leaks in aircraft and fuel-handling systems. This is due to the lesser amount of low-molecular-weight aromatics in JP-8 compared to JP-4. These types of aromatics, such as benzene and toluene, produce a swelling effect on fuel-wetted sealants, gaskets, and O-rings (also known as elastomers). When the fuel is switched from JP-4 to JP-8, the aircraft's elastomers will contract, resulting in leaks. This problem is normally solved by replacing the sealant and the elastomers and retightening fittings.

Who to Call

The Air Force Materials Command has designated the Directorate of Aerospace Fuels Management, located at Kelly AFB, Texas, as the Material Group Manager (MGM) under the Integrated Weapons System Manager concept. The MGM has formed Integrated Product Teams (IPT), consisting of technical experts from the aircraft, propulsion, civil engineering, materials, health and fuel research and development community, to address these JP-8 conversion problems.

Currently, the IPT is addressing conversion problems associated with aircraft cold weather starts, aircraft ground support equipment, ground filtration equipment, and aircraft fuel system leaks. Although minor problems have occurred during JP-8 conversion in Regions 1 and 2, most of these problems were quickly resolved by fuel-handling crews and aircraft maintainers shortly after completing conversion. IPTs are briefing activities in Region 3 and 4 to assure a smooth transition. Colonel Grat H. Horn, Jr, SA-ALC/SF, is the AFMC Material Group Manager for JP-8 and can be reached at DSN 945-4455. ■



MISHAP PREVENTION:

Taking the long view

MERRILL A. McPEAK
GENERAL, USAF
Chief of Staff

Photo by TSgt John McDowell

■ As my active Air Force career comes to a close, I'm often asked to comment on the changes from the Fifties, when I came into the service to the Nineties. Frankly, I find it much more useful to look at the Air Force in terms of *continuity*, the unbroken strands of tradition and heritage. While the methods of applying air power may have changed, the need for that power has not. While today's volunteer Total Force is different from yesterday's conscripted force, the demands we place on our people are not.

Our continuing drive to prevent the loss of life and materiel is a perfect example of this theme. The Air Force's safety program rates among the best in the world. It's been refined to the point of being a doctrine all its own. Major General I. B. Holley once said that doctrine is "that mode of approach that repeated experience has shown usually works best." He was talking about maneuver warfare, but the same principle holds for accident prevention. Over the years, we've developed safety doctrine that *works*. The reason it works isn't due to revolutionary change; it's the result of steady, undramatic improvements and a lot of attention to detail.

The quest for continuous improvement began the first day the Air Force stood up as a separate service, and we have come far. Our people are better trained, the aircraft we fly and fix are more reliable, and our investigative and corrective action processes are more sophisticated and certain. One good safety record is a natural outgrowth of the search for better ways of getting the job done.

However, safety doctrine goes deeper and is much more firmly rooted in Air Force and military tradition than it may appear at a glance. Its core concept is that each *commander* is his or her unit's safety officer. This sounds like a cliche, but it's the simple truth. Commanders set the tone for their units. Over the years, we've used a variety of leadership philosophies and techniques, but the fundamentals — discipline, personal example, enforcement of standards — have been around since the earliest days of organized armies. Just as these attributes form the basis of cohesive, effective fighting units, they form the basis of strong, effective mishap prevention.

Although the commander sets the tone, safety is the job of the entire organization. Supervisors at all levels instill a sense of responsibility in their subordinates and keep commanders up to date on potential problems that could result in losses. Equally important, personnel at all levels must be accountable for their own actions. The same kind of discipline is required to execute a night low-level attack or to service a piece of aviation ground equipment without supervision. We have to be able to trust people to do such jobs reliably and well — or lives can be lost.

As I say farewell, I challenge every member of the Air Force to help us prevent that next mishap. Take the long view — recognize safety for what it is, an integral part of mission accomplishment. Let's keep the safety program of the world's most respected Air and Space Force on track. ■

Let There Be Light

MR. JIM QUICK
HQ AFSA/SEFC

■ "Nothing turns night into day like the sun." So says Col (Dr.) Bill Berkley at the Armstrong Night Vision Lab. Yet, the Air Force is involved in intensive and extensive efforts to put more light on the subject of night warfare, for indeed, there can be no denial of the effectiveness of denying Saddam the night.

This recent success highlights the importance of drawing together technology and training in the evolution of a given capability. As technology continues to expand artificial night vision, it is vitally important human performance and training programs complement each other to maximize the technology while preserving equipment and lives.

Obviously, night warfare and training are more demanding than that conducted in daylight. Simply stated, the airplane does not know or care whether it's flying in light or dark, but the crew certainly does. Shedding light onto the night mission are two devices which work well and result in increased situational awareness.

Night vision goggles (NVG) amplify ambient light and present it to the wearer in a green, totally flat (no depth perception) presentation, while forward looking infrared (FLIR) devices portray a picture based on heat generation, with similar "real world" limitations. Air-delivered flares (aircraft or artillery) lend additional help in the human visible spectrum.

The Air Force has fielded numerous weapons systems with a stated night capability. Some have been developed solely around the night mission, while others have seen extensive modifications in hardware or software in an attempt to subtend the night. All systems provide night capability, and development of new capability is one of the true growth areas in DOD. continued

The Air Force has fielded numerous weapon systems with a night capability. NVG (top) and FLIR (above) devices are two of the more common systems used.

Let There Be Light continued

The remainder of this article discusses findings from research into 46 USAF Class A night or reduced visibility mishaps, particularly the operational human factors that placed pilot and crew at risk. These are truly hard lessons.

Looking at the chart (see the figure), the left column lists those categories of human behavior that caused mishaps, and across the top are those areas found at fault. You can see human behavior accounts for fully 50 percent of the mishaps. Tracking across the situational awareness behaviors, you can see the majority of mishaps took place in this category.

Origins of Causal Behaviors Night/Reduced Vis, Fixed/Rotary Wing

Causal Behavior	Man	Training	Discipline	Leadership	Equipment Design	
Crosscheck	7 (60%)	2 (16%)	1 (8%)		2 (16%)	12
CRM	3 (60%)		1 (20%)	1 (20%)		5
Sit Awareness	6 (30%)	2 (10%)	4 (20%)	4 (20%)	4 (20%)	20
Mission Planning	1 (100%)					1
Contingencies	2 (75%)		1 (25%)			3
Crew Rest/Fatigue	4 (80%)		1 (20%)			5
	23 (50%)	4 (9%)	8 (17%)	3 (11%)	6 (13%)	46

MAN
Cross-check

Problem: Inside/outside scan pattern, ADI, channelized attention, misprioritization.

Solution: Back to basics. All night mishaps in this category could have been prevented by referencing the ADI. Evidence indicates the crews had zeroed in on the FLIR/NVG night scene at the expense of aircraft control. Emphasize sound instrument cross-check procedures, and train to understand the limitations of night vision devices.

MAN
Crew Resource Management

Problem: Crew interaction failure, poor team building, lack of communication, unshared cockpit and intra-flight tasks.

Solution: Flight resource management, to include crew resource management (CRM). Continue Human Factors Mishap Analysis Program.

MAN
Situational Awareness

Problem: Biggest killer, related to all subareas.

Solution: Latest technology NVGs, FLIR (Nav and Targeting), aircraft lighting (cockpit and aircraft exterior) for night compatibility, better avionics, realistic task loading, elimination of fatigue and circadian desynchrony. Fact: Twenty percent of the general population can never satisfactorily adapt to a night schedule.* Building block, slow paced training program with pilot feedback as to intensity (step down). Pilot process management teams which continually analyze risk and risk behaviors.

*Sleep and Wakefulness Handbook for Flight Medical Officers (1982)

MAN
Mission Planning

Problem: Crews (pilots) don't plan ahead. Failure to look at all options and flight conditions. Failure to recognize equipment limitations.

Solution: Adequate time for mission preparation. Understanding of mission element variables which could result in at-risk situations.

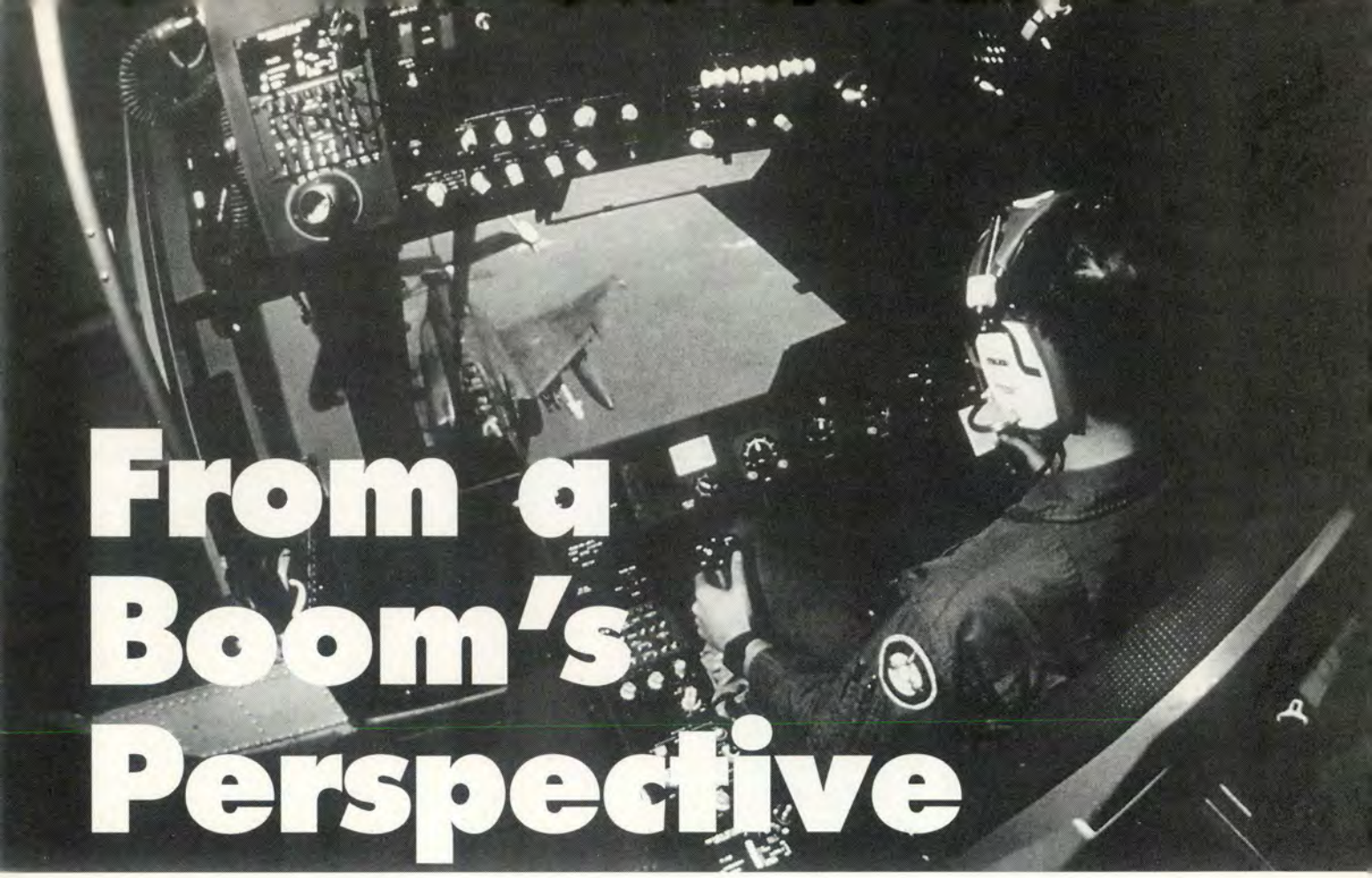
MAN **Contingencies**	**Problem:** Failure to plan and properly modify mission due to unanticipated in-flight events.	**Solution:** Have clear operational limits establishing knock-it-off criteria and abide by same. Know limits of NVGs, FLIR, other avionics. Set minimum A/C system operational limitations against conditions as dictated by proficiency, degree of darkness, and weather and man-made lighting.
MAN **Crew Rest/ Fatigue**	**Problem:** Disruption of rhythm, cumulative and acute fatigue act synergistically to greatly diminish human performance.	**Solution:** Realistic flying schedule, top-down understanding of impact on aircrews hence mission success, recognition of "danger signals," benevolent operational attitude, know your airmen. Cadre train only one-fourth of the aircrews at one time. Monitor landing times, and limit to one sortie per night.
TRAINING **Cross-check**	**Problem:** War at night demands higher, tighter training standards.	**Solution:** Increased levels of currency, building-block approach at increased intervals. Simulator, PTT with dual or chased supervision, training videos, crew coordination training. Ten ride initial checkout in fighters, five ride periodic workup entering training cycle, two ride workup for war.
TRAINING **Situational Awareness**	**Problem:** Night visual and mental fixation is a killer, night means high task loading and saturation, inadequate means to turn night into day.	**Solution:** State of art FLIR/NVGs with night A/C compatibility rolled into tight training cycle, monitor fatigue, limit AGL minimums, define ROE. Limit tactics to level bunt and direct pops to IPs in fighters (as core cadre for war workup). Step-down training to 500 feet minimum. Define A-, B-, or C-level requirements.
DISCIPLINE **Cross-check**	**Problem:** Cockpit scan/cross-check procedures are not standardized. Crewmembers look at one avionic/instrument too long.	**Solution:** Ground school/flight simulator with full-up avionics suite. Explore flight/tactical limitations of night vision systems. Type I (pilot is spatially disoriented and does not know it) and Type II (recognized spatial disorientation) training is critical.
DISCIPLINE **Crew Resource Management**	**Problem:** Clear division of labor in task management results in poor crew discipline and mission execution.	**Solution:** CRM training for aircrews. Establish minimum UE time for night mission. Change the name of CRM for fighter pilots; program elements still apply.
DISCIPLINE **Situational Awareness**	**Problem:** Missing, unclear or impractical unit and ops standards. Mission not adequately defined in DOC statement.	**Solution:** Define operational equipment standards, complete ops manuals, establish infrared visibility criteria, mandate minimum illumination standards (moon angle or degree or illumination). Establish minimum equipment for mission demands. Good ops procedures and minimum illumination standards set.

continued

Let There Be Light continued

DISCIPLINE **Contingencies**	**Problem:** Failure to allow adequate time or to possess knowledge to analyze potential at-risk situations during flight.	**Solution:** Develop risk inventory for preflight planning. Look at risk behaviors.
DISCIPLINE **Crew Rest/Fatigue**	**Problem:** Personal accountability fails to adequately ensure crew rest requirements are met.	**Solution:** Unit culture adjustment that creates atmosphere where crew rest violations are not tolerated. Continual education on effects of fatigue and circadian desynchrony. Know the people and the stresses they are under. Foster an environment in ops which encourages openness in human factors issues pertaining to stress, rather than "train till you bleed" mentality.
LEADERSHIP/ SUPERVISION **Crew Resource Management**	**Problem:** Unit leadership fails to support or participate in CRM which creates an atmosphere based on double standards.	**Solution:** Realistically monitor stress and crew rest requirements. Document actual night training effectiveness against target training goals. Closely monitor individual training progress during night workup. Pilots lose day currency just as they do night currency. Not all squares can be filled at night. Evidence indicates day bombing scores become degraded, as do other "day-simple" tasks such as overhead traffic patterns and air refueling.
EQUIPMENT DESIGN **Cross-check**	**Problem:** Cockpits are not NVG compatible, NVGs not mission compatible, and are improperly maintained or adjusted. Exterior lighting not NVG/night compatible. FLIR disorientation/narrow field of view.	**Solution:** Modify aircraft for full mission integration. Monitor technology improvements. Establish night labs at all NVG units. Continue to invest in latest technology.
EQUIPMENT DESIGN **Situational Awareness**	**Problem:** NVG/FLIR "real world" presentation is single dimensional and not adequately detailed: poor water or power line definition, etc. Situational awareness (SA) not adequate to employ advanced tactics (popup attacks) or very low, nape-of-earth flying.	**Solution:** Night devices enhance SA, but with severe limitations, generally centered on narrow field-of-view targeting pods or degraded definition NVGs. Stay on top of developing technology. Ground collision avoidance systems resurrect SA.

The Air Force has the lead in night capability, and hopefully, the lead will continue to widen, but with a good grip on lessons learned. The analysis of mishaps, when done in large numbers such as the above, can certainly provide corporate perspective, while looking at our many night successes and ongoing training programs in this perspective can save lives and equipment. ■



From a Boom's Perspective

SSGT JEFF SIDLES
KC-10A Evaluator Boom Operator
Barksdale AFB, Louisiana

■ "Oh great, call departure, 10 on 10 air refueling up towards Memphis, drop into Navy Memphis for 90 minutes of transition, all followed up by an hour and 15 behind a Guard -135 on AR 203. *I don't remember ticking off the boom scheduler.*

"Hey, pilot, when we're headed back south, make sure the flight engineer wakes me up in time to do the drogue check prior to descent.

"If you want a lunch, the phone number's in the book. I should be back from the BX in time for the 1100 cell brief ... Man, I hate flying locals!"

Ah yes, another day in the life of a KC-10 boom operator. Too much work for too little pay. Tanker air refueling simply gives pilots — other than the ones in my aircraft — an opportunity to kill me.

"Pilot, boom ... pilot, boom ... Hey, is anyone awake up there?" Gee, I wonder why no one's listening to the boom? If you exclude yourself from being part of the crew from the onset, no one may be listening when you've got something to say. Boom operators are part of the flightcrew, and they should act like it and be treated like it.

During our daily operations, we often tend to overlook the importance of what it is we are doing. Even on what would appear to be the most mundane mission in the local area, the potential to challenge and endanger is present.

Many areas falling under the heading of crew resource management (CRM) are potential areas for pitfalls. By identifying these areas, we can both anticipate potential problems and have workable solutions in mind. This way, when problems do occur, we are neither surprised nor confused and can work through them uneventfully. As integral crewmembers with previous aircraft experience, our inputs and integration with the rest of the crew can make even the most challenging and dangerous of missions seem simple.

Although there is no such thing as a typical KC-10 mission, tanker air refueling (boom or drogue) is a part of most of our missions. It is also one of the major areas of responsibility for the boom operator.

As the eyes in the back of the aircraft, the boom operator must stay in control of the air refueling operation by keeping everyone involved and informed. To do this, he/she must know the job well and remain situationally aware at all times.

Although air refueling is only one of the facets of our diverse mission, the principles of CRM and timely, effective communication will all but eliminate any potential problems which may arise during any phase of the mission, including air refueling.

Internal communications can be confusing or even missed during an aircraft emergency. Unlike nearly every other aircraft in the inventory, crewmembers in the KC-10 can speak freely across the cockpit due to our extremely quiet flight deck. This virtually eliminates cockpit interphone transmissions.

When the boom operator is in the

continued

Photo by SrA Andrew N. Dunaway, II

From a Boom's Perspective continued

air refueling operator compartment, the only link to the cockpit is by interphone or by making a transmission over a radio being monitored in the cockpit. During "normal" operations, this works fine. But during an emergency, the situation can rapidly deteriorate.

If people don't routinely use interphone, they may not hear a call made over interphone. In accordance with TO 1-1C-1-33 (Tanker Air Refueling Manual), during air refueling, the boom operator and the pilot flying will limit their monitoring to interphone and the air refueling frequency. However, how often have you heard, "Hey, Boom, did you say something? I was talking to ATC."

Tanker air refueling is boring if you're sitting in the cockpit. I know — I've sat up there for a few of them. However, the cockpit crew should be kept aware of the situation by giving them a running commentary of the events occurring in the back. If it does nothing else, it lets you know they're paying attention. There are no emission control (EMCON) procedures for interphone. Don't, however, monopolize the interphone or shoot the bull — just keep everyone informed.

External communications can become equally indiscernible when using common interplane frequencies, tanker common frequencies, or cell formation frequencies. Many times we tend to use our common interplane frequency even when we are on an air refueling track depicted in the AP/1B. We monitor communications/rendezvous (C. R.) plan frequencies so "we can hear if anyone else is using the track." If anyone else is using the track, they, too, are probably only monitoring the frequency, eliminating our additional deconfliction protection.

If you are refueling on a track, use the C. R. plan even if it is "just" 10 on 10 A/R. If you are refueling in an anchor area and there is a GCI controller, let them know your expectations. Establish with the controller when you want to assume responsibility for communications with the receivers and what you want them to do.

If there are subsequent flights inbound, tell the controller to hold them at a half mile, and have them check in on the A/R frequency. Then you can clear them in when you are ready for them. It will eliminate having to tell each flight the same information over the air refueling frequency while an air refueling is going on.

During large cell missions or fighter drags, when the cell frequency and air refueling frequencies are the same, some transmissions are both necessary and required. Relay the call for the pilot, or let him know when he is clear to transmit on the radio. Having a plan will eliminate potential problems so even an uneventful flight will run more smoothly. If a problem does develop, communications should occur between the appropriate parties to eliminate the problem or at least prevent the compounding of the problem.

One final note on communications: During our simulator training, we fall into the same trap the sim instructors fall into. We all end up "role playing" to some degree.

The challenges and responses we give and receive are predictable and "canned." The pilot, flight engineer, and receiver pilot are really just "roles" the sim instructor is playing.

Help your fellow crewmembers to understand your emergency procedures by paying attention to your responsibilities as they relate to their emergency checklists. You can help make the responses predictable and "standardized" in the aircraft by accurately assessing your situation and soliciting the appropriate responses.

Things may not happen in the aircraft just as they do in the simulator, but you've identified a potential for confusion. During an emergency is not the time to give or listen to a systems class. Know your job, and let the rest of the crew know your expectations during any contingency.

A stable receiver and good weather can make any boom operator's job easier during air refueling. Being an effective crewmember takes more than physical skills. KC-10 crewmembers have the luxury of flying a very versatile and reliable weapon system. However, as the time on the airframes increases, maintenance problems will become more evident. Conversely, with continued drawdowns of both personnel and weapon systems, we will find less experienced crewmembers asked to do more and more with less and less.

Our continued integration into AMC will definitely find our roles ever changing and our taskings increasing. As tankers and airlifters, we need to learn more about each other's capabilities.

The KC-10 exemplifies the new mission of AMC, and we have begun to demonstrate our capability more frequently than ever before. We, as individual crewmembers, must ensure we are as technically proficient and knowledgeable as we can be. Learn others' responsibilities and help them to better understand yours. Use every asset at your disposal, including time! Stay ahead of the game, and anticipate crunch points. The easiest mishap chain to break is the one you can see coming.

The intent of this article is to give a KC-10 boom operator's perspective on the air refueling procedure. However, one individual's perspective may only be as accurate as one person's perceptions. With proper planning and interaction with both the receivers and the rest of the tanker crew, each boom operator has the responsibility to contribute his or her own perspective to the air refueling.

Writing or reading articles in safety magazines won't necessarily make us safer fliers, but articles such as this one may help to stimulate your thought processes. During the next cell briefing, galley rally, or hangar flying session, listen critically and ask questions. You may bring up a point no one has yet considered. What is more important is your question will clarify confusing areas to you while establishing your position as part of the crew. ■

FSO's CORNER

Risk Management and QAF

MAJOR DALE T. PIERCE
919th Special Operations Wing/SE
Eglin AFB, Florida

This article provides an overview of how we introduced the AFSOC risk management program to our wing operations, maintenance, and support (OM&S) complex and the potential value of the effort. If, after reading this article, you are interested in receiving a copy of our risk management training package for your organization, call me.

■ Three years ago, I was talking to one of the major command Quality Air Force (QAF) gurus. He told me a lot of interesting things about implementing QAF in his command. One of the most interesting, at the time of our discussion, was only about 20 percent of the top leaders in his command had "bought-in to Quality."

He went on to tell me the strongest holdouts up and down the line were from operations. I asked him how any "ops type" could look at a "smoking hole" and report the process couldn't be improved. Surely no one believes losing a squadron of aircraft and aviators each year is an acceptable cost of doing business during peacetime.

Since the World War II era, the safety business has done fairly well without QAF. *In recent years, the Air Force recorded its lowest mishap rates ever.* We've "advanced" to where we're destroying only two to three dozen aircraft and killing two to three dozen aviators each year.

Compared to the World War II era statistics, we're doing very well. However, it seems to me (and many others) there's still room for improving the process. So what's the next step? A change of paradigms is required.

The old safety paradigm says, "After a mishap occurs, you investigate it and prevent someone else from doing the same." It was a good concept when it was created. It served the Air Force well by reducing the outrageous mishap rates of the World War II era to those of today. But this paradigm is reactive management.

Even with the small steps toward becoming proactive, we're still focusing on the old reactive paradigm. The flattening of the mishap rate reduction curve shows us the old paradigm has run its course. It's time for a change.

Consider this new paradigm. "Waiting for the next mishap to occur before finding and fixing a problem is criminal mismanagement of human life, public resources, and public trust. All personnel on the OM&S team are responsible for identifying and preventing potential mishaps at the lowest possible level, before they present a risk to life, public resources, or mission accomplishment."

Did that hurt? Paradigm shifts usually do. They represent change. This paradigm represents a shift to proactive management of risk.

How could we employ QAF under this new paradigm? The folks at HQ AFSOC decided one of the goals in their QAF Strategic Plan should be to "Eliminate command mishaps to maximize mission success." They picked three objectives to support that goal. One of these was to "emphasize risk management." In support of their objective, they implemented a risk management program to provide the tools needed for proactive management of risk.

Risk management tools help personnel systematically examine everything they do, starting in the planning stages and continuing through implementation. Using these tools, personnel look for potential mishaps and eliminate them before they strike.

As envisioned by Lt General Bruce L. Fister, former AFSOC Commander, now 15th Air Force Commander, "Successful mission accomplishment is the sum of using common sense, professional discipline, and an assessment of actual and potential risks to determine the smart way to get the job done. When common sense, professional discipline, or the risk assessment shows the risk is too high for success, the true professional stops to either reduce or eliminate the risk or make the tough call that there is no smart way to do the job, even if that call is unpleasant or unpopular."

In the 919 SOW, we developed a risk management training package

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based on the HQ AFSOC work and cascaded the training through the management structure in our wing. That is, the Wing Commander trained his staff and subordinate commanders, who then trained their supervisors, who then trained their people.

In addition, based on this material, we added an "Introduction to Risk Management" block of instruction to our Supervisor's Safety Course. Are we good at it yet? Of course not. But with some practice, we'll get there.

Consider what could be achieved if everyone on the Air Force OM&S team fully employed risk management and QAF tools to ensure 100 percent mission reliability. The dream of military professionals throughout history could be achieved in our Air Force: namely, all taskings met, all missions effective, and all human and materiel resources safe and ready for the next mission.

Zero noncombat losses and an absolute minimum of combat losses may not be achievable, but it's a worthy vision. If we just get real close, it'll be worth the effort.

With a paradigm shift in the safety business and force-wide application of QAF supported by risk management, the vision can be achieved. I believe risk management will play a significant proactive role in future Air Force safety programs.

Through QAF and risk management, in 10 years' time those reading about the record low mishap rate of FY91 might consider it as outrageous as we now consider the mishap rates of the World War II era. ■

If you would like a copy of the 919 SOW Risk Management training package, call me (Dale Pierce) at DSN 872-5378 or 872-4557 (USAFWC); DSN FAX 872-5212; or send a note to 919 SOW/SE, 506 Drone Street, Ste 6, Eglin AFB FL 32542-6644. Specify hard copy of Powerpoint file on either 3.5-inch or 5.25-inch disk. I'll need your full "3-line" mailing address with your 9-digit zip code, point of contact, and DSN number.

The Lessons Learned Program Wants You!

BOB KERR
Program Manager
USAF Lessons Learned Program
Wright-Patterson AFB, Ohio

"Ac-cen-tu-ate the positive, e-lim-i-nate the negative..."

■ I'm sure some of you recognize these as words to an old song, but they are also what the US Air Force Lessons Learned Program strives to accomplish every day.

Lessons Learned is a corporate memory bank of past program experiences, both positive and negative, available to US government and industry personnel through on-line access, as well as a personal computer version. The program, managed by the Deputy for Acquisition Modeling, Aeronautical Systems Center (ASC/CYM), Air Force Lessons Learned Program, is located at Wright-Patterson AFB, Ohio. The purpose of the program is to transfer experience from those who have it to those who need it.

"Lessons Learned" can save money and man-hours by identifying problems early, thus reducing repair time, by providing helpful information for Request for Proposal (PFP) requirements in design that could eliminate multiple configurations for the same mission items. Lessons Learned can and should be used in every phase of an acquisition program.

At the present time, there are more than 4,000 active lessons in the data bank. New ones are being added weekly. These include the shared Lessons Learned of the USAF, Navy, Army, Federal Aviation Administration, and National Aeronautical and Space Administration.

The Lessons Learned staff continually receives the data bank to update or delete lessons when appropriate. User feedback helps ensure lessons in the data bank are significant, valid, and applicable. We can get more from our limited resources by accentuating the POSITIVE and eliminating the NEGATIVE. Lessons Learned is the key to the readiness of future weapon systems and programs. It's also a key to improving the way we all do business.

You can enhance the Lessons Learned Program by participating yourself. Access to the program is available to all government employees and all certified contractors

Have you discovered a new process or innovative technique (best practice)? Can design improvements be made? The objective of the program is to improve the acquisition process by not repeating the same mistakes. While the bulk of lessons maintained in the data base are acquisition related, we are also expanding to include lessons learned in other areas. ■

The US government and industry can benefit from your experiences. You can take advantage of the lessons available in the data bank, use the services of the Lessons Learned Program Office, provide input, or obtain on-line access by contacting:

ASC/CYM
2060 Monahan Way
Wright-Patterson AFB, Ohio 45455-6503
or call commercial **(513) 255-3454.**

Courtesy PSQ, Product Support Quarterly, Pratt & Whitney, Spring 1994.

FUEL CELLS HAVE TO BREATHE, TOO!

CMSGT DON A. BENNETT
Technical Editor

This Class A ground mishap may have been at the extreme end of the spectrum of recent blocked fuel vent mishaps. But we can't miss the fact all were human-caused; therefore, they were preventable.

■ One of the things all maintainers should know is when we remove fluid from a relatively closed container, without an open vent, it will eventually cause the container to collapse. This is because a vacuum is created when air isn't allowed to replace the fluid being removed. The container, as well as fuel cells, has to have a way to "breathe"!

Some years ago, a bomber was destroyed on the ground because a fuel system vent was blocked. As there is always the possibility of serious injury to nearby personnel, it could have been much more destructive.

This Class A ground mishap may have been at the extreme end of the spectrum of the recent, relatively few blocked fuel vent mishaps. But we can't miss the fact all were human-caused; therefore, they were preventable. In addition, there is the high risk of loss of life.

Other Blocked Fuel Vent Mishaps

Consider the potential for greater disaster in these two Class C mishaps.

■ A bomber was undergoing a postflight inspection when a specialist observed an external fuel tank was venting. The crew chief was notified who, in turn, told a flight line supervisor. The supervisor directed a fuel transfer be accomplished to stop the venting.

A misunderstanding ensued between the crew chief and the specialist, so the transfer wasn't performed until the specialist's supervisor intervened. After the transfer was completed, the specialist observed a rag stuffed in the external tank's fuel vent. When both mishap participants were preparing to remove the rag, the tank collapsed, resulting in a Class C ground mishap. **The bomber previously mentioned didn't fare as well.**

■ A transporter was being ferried from overseas to the continental United States. On the first leg of the trip, the aircraft had a cabin pressurization problem. At the first stop, maintenance couldn't duplicate the problem on the ground.

After takeoff, the cabin pressure abnormality reappeared. Almost 2 hours into the second leg, one of the two pilots went to the back and discovered the two temporarily installed ferry tanks were buckling. One was already leaking fuel.

What happened next? There was a series of problem-solving discussions, repair attempts, continued leaking, periods of light-headedness, the donning of oxygen masks between trips back and forth to battle the leaks, and a return to the departure base.

Eventually, the fuel stopped leaking. However, the pilots' dilemma did not end. Over 100 gallons of fuel had leaked inside the aircraft. This created a tremendous fire and explosion hazard plus excessive fuel fumes and odor. In addition, when their oxygen system was depleted, they worked feverishly to establish a vent and fresh air source through an emergency exit. Breathing through wetted-down personal clothing probably helped quite a bit.

In this situation, crew resource management, improvising, tenacity, training, confidence, good judgment, teamwork, and survival instincts were combined to prevent a Class A flight mishap.

It was discovered *both* ferrying fuel

tanks had the vent stand pipes blocked, apparently for storage purposes. But they were not unblocked upon installation in the aircraft.

There are other examples, but those above graphically point out the extreme seriousness of this maintenance practice and the great potential for disaster. They also point out the failure of the mishap units or participants to guard against blocked fuel vent mishaps.

How to Prevent Blocked Vent Mishaps

First, let's establish the fact that blocking off equipment or aircraft fuel system vents is not — repeat — **is not** illegal or unsafe if done properly by following the applicable weapon system or equipment tech data. *Failing to remove the item blocking the vent* when it **is not** needed is what causes the problem.

There are legitimate reasons to block off fuel system vents, reasons such as fuel system tests, troubleshooting, and pressure checks. Long-term storage of fuel tanks and cells requires vents be plugged. But just like all maintenance procedures having a high potential for flight or ground mishaps, *it must be done properly.* Even then, the procedures require a high degree of care and attention to details.

Second, **use and follow tech data.** This should go without saying, but it seems there are maintainers who **do not** use, or **do not** follow, the applicable tech data. All commanders, maintenance managers and supervisors, and wrench turners must be keenly aware of the potential for mishaps if tech data discipline is violated. Enough said!

Third, probably *all* mishaps caused by blocked vents could be avoided if the aircraft or equipment forms (or condition tags) were properly documented.

A form entry is a very simple maintenance procedure. Yet, as critical as it is, form entry is sometimes overlooked or ignored. Training on how to fill out aircraft and equipment forms, along with constant vigilance to ensure compliance, would help stop — or at least reduce — forms-related mishaps. Unfortunately, properly documented forms, accurately reflecting an aircraft's or equipment's maintenance condition, **are not** always properly cleared.

Fourth, why use a rag to block a fuel vent? Why not use a rigid material with a "Remove Before Flight" streamer? A lot of aircraft already have manufactured plugs, but some maintainers still revert back to using rags. Why not have the plugs designated controlled items, such as our control of other tools and equipment items? Even if the "red flag streamer" has to be locally manufactured to 6-foot lengths, so what? At least it would be highly visible — certainly more visible than a rag!

Food for thought: *Why can't a ferrying fuel tank vent be blocked by a bright fluorescent plug with a 6-foot streamer attached, especially during storage?*

Another suggestion, talk with your weapons system managers and engineers. Let them help you solve problems. Use the chain of command and base support agencies as well.

Last, continue developing a safe, quality culture that **does not** allow unacceptable maintenance practices to develop or breed. Set organizational standards which will be consistently enforced and instilled in all organizational members. The goal should be for all maintainers to do everything right the **first** time and **every** time.

Summary

We're all human and therefore subject to making mistakes — always have been and, most likely, always will be. But still, **a lot of the Air Force flight and ground mishaps caused by maintainers and maintenance supervisors are preventable.**

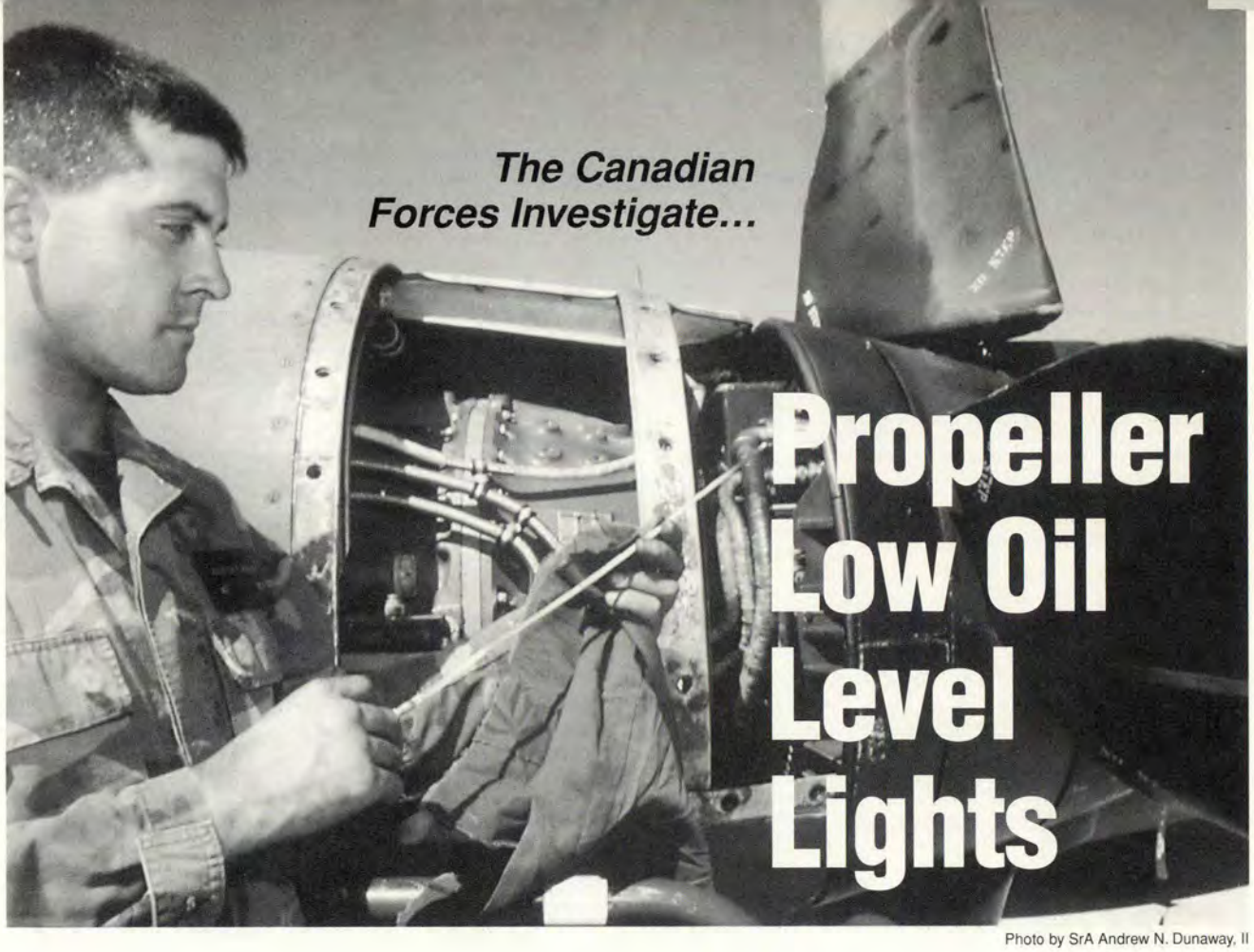
Our goal is to minimize or completely eliminate human-caused mishaps. To be successful, there must be responsible, active leaders, managers, and supervisors who will do whatever it takes, safely and legally, to stop preventable mishaps from happening again. This applies to all maintenance malpractice.

The bottom line: Supervisor involvement is critical to ensure the unit's maintenance credibility is now impeccable and remains that way!

Stay focused and proactive, or something as simple and inexpensive as a benchstock rag could ***force*** *you to be focused and unpleasantly reactive.* ■

USAF Photos

Our goal is to minimize or completely eliminate human-caused mishaps. To be successful, we must have responsible, active leaders, managers, and supervisors who will do whatever it takes, safely and legally, to stop preventable mishaps from happening again. This applies to all maintenance malpractice.



The Canadian Forces Investigate...

Propeller Low Oil Level Lights

Photo by SrA Andrew N. Dunaway, II

MAJOR BOB MAIER
CAPTAIN DAVE NOWOSAD
Air Command Headquarters
Canadian Forces
Westwin, Manitoba

■ Propeller low oil light indications have plagued the Canadian Forces (CF) for a number of years. These incidents were of grave concern because in some circumstances, the required procedure for such indications is to shut the engine down in flight.

In August of 1991, a decision was made to form a working group to investigate the high rate of propeller low oil light occurrences and make recommendations on how to solve the problem. The purpose of this article is to share our experiences and findings with other Hercules users so they too may benefit from them.

Working Group

The working group reviewed flight safety data in order to determine if any trends existed. Propeller serial numbers were checked to determine if the problems could be attributed to specific propellers. The resulting analysis showed this was not the case and the majority of problems were due to improper procedures or techniques, with no one predominant cause attributing to the high incident rate.

The working group then identified all the factors that appeared to contribute to this problem and made recommendations to rectify them. Each of these factors and suggested solutions will now be discussed in turn.

Flight Incident Reporting

The reporting of propeller low oil level lights through the flight safety net at each user unit was found to be somewhat inconsistent. Steps were immediately taken to standardize flight incident reporting at each user unit in order to ensure valid history data would be provided.

Standardization of Technical Publications

The technical publications used by the flight engineers and technicians were reviewed for inconsistencies in the procedures. Steps were then taken to standardize all of the Canadian Forces publications to the correct procedures laid down by the propeller manufacturer, Hamilton-Standard.

Atmospheric Sump Dipstick

The current design of the dipstick and tube assembly is such that it is possible to get an incorrect fluid level reading if a small amount of residual fluid is retained in the hollow bolt which supports the dipstick tube (figure 1). We found this

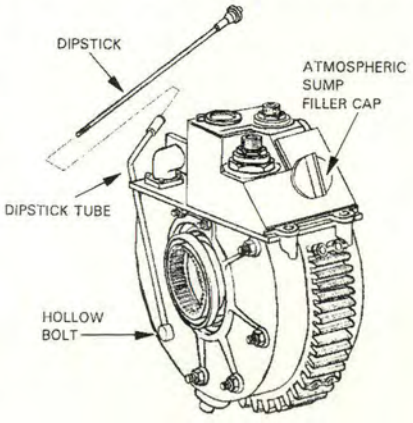


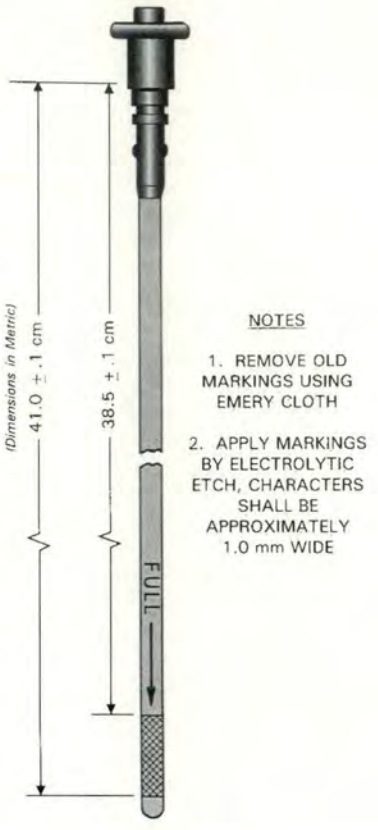
Figure 1

can lead to underservicing of the propeller which may result in a low oil level light indication in flight.

An optimum fluid level for the propeller was determined through practical experimentation. For our tests, we made use of a special Plexiglas™ cover for the Hamilton-Standard NSN 1610-21-843-4664 pump housing assembly that had been developed to assist maintenance technicians during desnagging activities and as a training aid. After completion of these tests, authorization was obtained to modify all dipsticks to raise the full mark and indicate an operating level.

Difficulty in reading the dipstick under poor light conditions had also been reported by both technicians and flight engineers. To help remedy this situation, a cross-hatch pattern was etched in all dipsticks to make them easier to read. Figure 2 shows the new design. *Other operators who may be interested in these modifications are cautioned to seek appropriate authorization before making any changes to existing equipment.*

Figure 2



Propeller Oil Level Check

The published procedures for our aircraft state the propeller oil level check must be carried out within 30 minutes of engine shutdown or overfilling may result. Tests we performed on the propeller firmly underscored the importance of this point. Even on a warm day, the oil level dropped 1/2 inch on the dipstick after only 45 minutes had elapsed. Therefore, if a technician starts his fluid-level checks 20 minutes after shutdown, and it requires 40 minutes to service all four propellers, the last two propellers could easily end up being overserviced.

In order to ensure the propeller oil level readings are taken within 30 minutes of engine shutdown, three servicing technicians must be utilized, one located in the flight station while the other two service two props each.

An alternate method would be to have one technician take the readings of all four propellers before adding fluid as required. The actual dipstick check itself must also be

continued

Figure 3

PROPELLER FLUID LEVEL RECORD

PROPELLER SER #

*NOTE: ALL FLUID ADDED TO RECTIFY AN UNSERVICEABILITY OR PROP LOW OIL LIGHT MUST BE RECORDED.

PERIODICITY EVERY 50 HRS +/-5

ENTER OIL ADDED OR REMOVED IN QUARTS OR PART QUARTS (IE, 1/2 QUART, 1/4 QUART, ETC)

TAIL NO.	POSITION	A/F HRS DUE	A/F HRS DONE	AMOUNT ADDED (+) OR REMOVED (-)	AMOUNT ADDED AFTER FIRST FLIGHT OR MAINTENANCE	UNSERVICE-ABILITY	PROP LOW OIL LIGHT ON AT A/F HRS	NAME/SIGNATURE PLEASE PRINT	LOCATION & TIME OF SERVICING

Propeller Low Oil Level Lights

continued

carried out exactly according to the procedure described for your aircraft. A summary of the method used by the CF is as follows:

Shut down the engine and connect external electrical power to the aircraft. Position the No. 1 blade at the 12 o'clock position to ensure the propeller hydraulic system is purged of air and to help prevent static leakage. Use the propeller auxiliary (feather) pump to cycle the propeller blades through the full range of positions from ground idle, to feather, to reverse, and back to ground idle *twice*. Be sure to observe the pump's duty cycle restrictions when carrying out this procedure.

While the pump is still running, remove the atmospheric sump dipstick and wipe it with a lint-free cloth. Insert and lock the dipstick in the tube. Remove it again and check the oil level. Shut off the propeller auxiliary pump after the reading has been obtained.

Leaking Propellers

It was determined that 30 percent of propellers routed to the shop for maintenance work to repair leaks could have been fixed on the wing. In a number of cases, no fault at all with the propellers could be found.

In reviewing the maintenance records, we discovered the record sheet then in use did not contain a sufficient amount of information about the propeller to serve as a truly useful desnagging tool.

A new record sheet was introduced that included such missing items as fluid amounts added and removed, information on when the propeller is changed, purged, or replenished, and the serial number of the propeller to ensure the sheet will be used for one specific propeller and that propeller only. Figure 3 shows the newly designed record form.

Cold Weather Operations

The procedure used for starting engines during cold weather operations was reviewed and the following procedure for starting engines cold-soaked at temperatures below 0°C (32°F) was implemented:

Run the engine in low-speed ground idle until the engine oil temperature rises to 10°C. When this temperature has been reached, the engine may be upshifted to normal ground idle. Then run the engine in normal ground idle until the engine oil temperature reaches 60°C, or has been 50°C or above for 5 minutes. At no time during this procedure is the blade angle to be changed by throttle movement until all the conditions noted above have been met.

Propeller Static Position

The technical orders used by the CF direct the no. 1 blade of the propellers on static aircraft is to be placed above the horizontal split line or roughly at the 12 o'clock position. It was emphasized to all technicians and flight engineers during training sessions that positioning the propeller as per regulations is essential to prevent oil from draining from the propeller hub through the beta feedback shaft and filling the atmospheric sump, causing static oil leaks.

Clogged Breather

On at least one occasion, an unnoticed clogged propeller oil system breather caused the atmospheric sump to become pressurized and resulted in a propeller leak. The propeller servicing procedures were therefore changed to direct the technicians to place a finger over the dipstick tube briefly during feather pump operation to establish that no back pressure exists. This practice will ensure the breather is not clogged.

Propeller Servicing Training

It is essential that senior supervisors fully appreciate the time required to properly desnag and service a leaking propeller and not place undue pressure on the technicians. It is also important that the technician be thoroughly trained with regard to the correct procedures for propeller servicing.

An extensive training package was prepared for all technicians, senior supervisors, and flight engineers. The training was introduced into several basic training courses and also taught by a special team which went to the major user units in order to get to as many personnel as quickly as possible. The half-day course focused on the proper procedures for the servicing of propellers and was comprised of the following topics.

THEORY

- Basic propeller construction
- Hydraulic system operation
- Servicing techniques, including:
  Initial installations
  Post-runup servicing
  Post-flight servicing
  Ongoing servicing
- All notes and cautions listed in the technical pubs.
- Fluid-level servicing sheets

PRACTICAL

- Filling procedures
- Cycling of the propeller
- Reading of the dipstick
- Procedure on removal of fluid in the event of overservicing.

Conclusions

Since the completion of the working group report and the implementation of their recommendations, there has been a significant reduction in the number of propeller low oil level light illuminations. The incident rate has dropped from a high of 2.93 per 1,000 flying hours to a low of 0.94 per 1,000 flying hours.

The most meaningful point to remember is there was no single "magic fix" which led to a solution of our propeller low oil light problem. Rather, it was a combination of the improved techniques, tightened procedures, and enhanced training that brought the problem under control. ■

Courtesy Lockheed *Service News*

*U.S. GOVERNMENT PRINTING OFFICE 1994-573-261/03002

UNITED STATES AIR FORCE

Well Done Award

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

CAPTAIN

Rich Schneider

Headquarters 9th Operations Group, Beale AFB, California

■ Captain Schneider (posthumously promoted to major), an instructor pilot at Beale AFB, was ferrying a U-2R to a deployment base. Weather in the area consisted of a solid cloud deck from 15,000 feet upward. Shortly after leveling the aircraft at FL450, while still in a cirrus deck with no discernible horizon, the engine compressor stalled several times and flamed out.

As the cockpit immediately depressurized and the canopy frosted over, Capt Schneider transitioned to his standby attitude indicator to maintain flight and initiated a turn back towards Beale. However, due to an incomplete power transfer to the emergency electrical system, an OFF flag remained in the standby ADI. As Capt Schneider established max-range glide speed on his standby airspeed indicator, he transitioned to the turn and slip indicator and magnetic compass to complete the turn.

The cockpit depressurization and resulting pressure breathing made communication with Oakland Center to declare his IFE and state his intentions nearly impossible. After establishing himself on an approximate heading back to Beale AFB, Capt Schneider was able to restart the engine. However, as he attempted to move the throttle, the engine chugged and started running rough. Leaving the throttle at a low power setting, Capt Schneider continued his max-range glide through the weather using no-gyro vectors, the unreliable standby ADI, the magnetic compass, and the turn and slip indicator.

When he broke out of the weather at 15,000 feet, he visually acquired the field and completed a flawless flameout pattern and landing. Maintenance inspection of the engine revealed a faulty fuel control unit.

Capt Schneider's prompt, decisive actions, expert assessments, and superior flying skills resulted in a flawless recovery of a national asset under the most difficult and stressful conditions.

WELL DONE! ■

Major Rich Schneider was fatally injured in an aircraft accident on 13 December 1993. A highly respected aviator and leader, he will be sorely missed by his peers and the Air Force.

LASERs CAN:

1. Cause FLASH-BLINDNESS

2. Cause temporary and permanent EYE DAMAGE

3. BLANK OUT head up displays

The Air Force Phillips Laboratory's STARFIRE Optical Range goes to great lengths to prevent aircrews from being inadvertently exposed to LASER activity. Commercial concerns using LASERs may not take the same precautions.

DON'T BE A LASER VICTIM!

1. AVOID flying over known areas of LASER activity during hours of operation.

2. REPORT incidents of your aircraft being "LASED" to your unit Flying Safety Office immediately.

3. SEE A FLIGHT SURGEON to have your eyes examined if you suspect you have been "LASED."