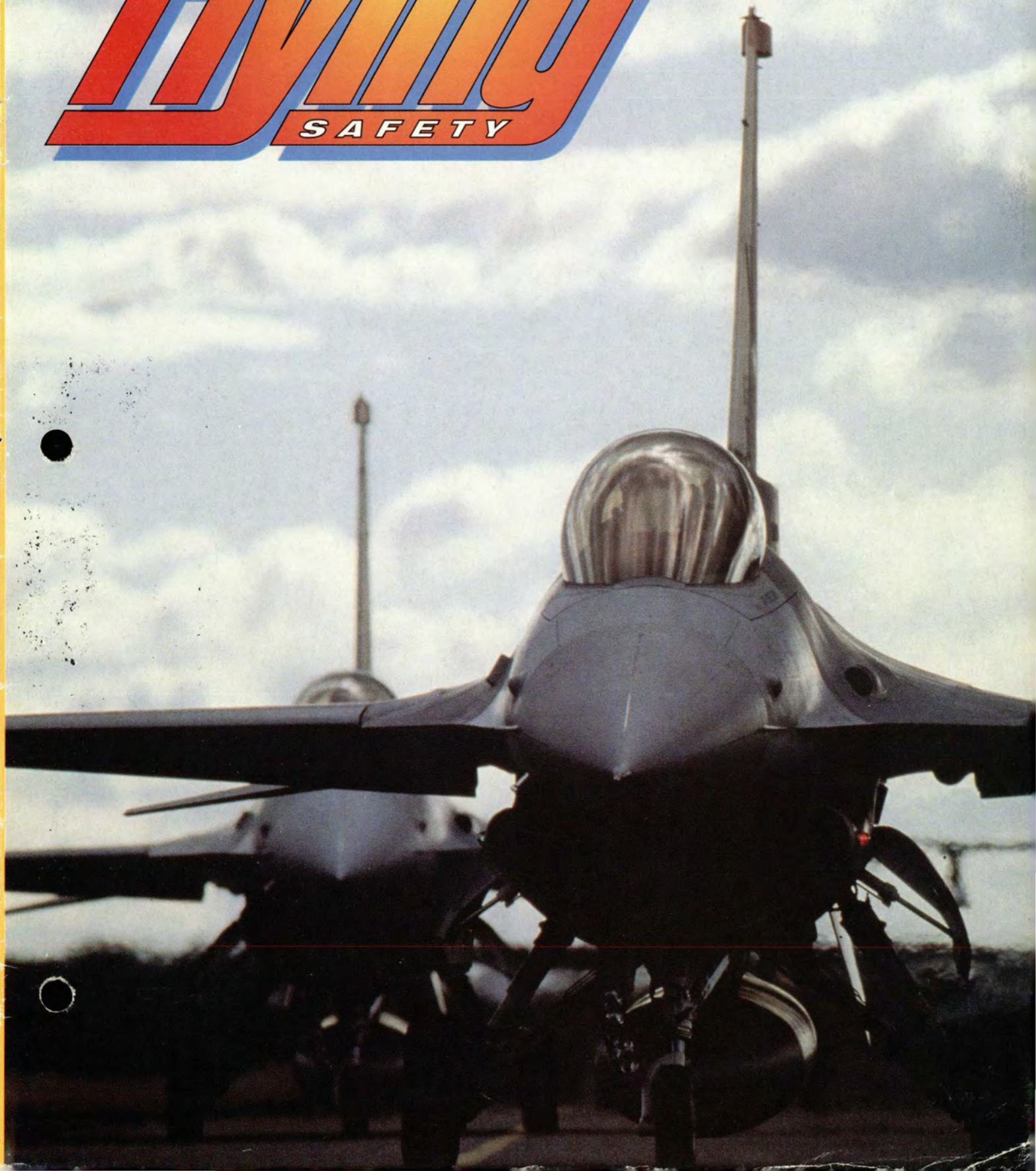
Flying Safety

JANUARY 1996



MAJ GEN DONALD W. SHEPPERD
Director, Air National Guard

"A Program That Works"

■ On 30 September 1995, the Air National Guard finished the fiscal year with the lowest accident rate in its history: 1.24. Even more importantly, we finished with our lowest command and control rate in history: 0.50. In fact, our mishap rate was below that of the active Air Force — this despite the fact we fly 49 percent of our hours in fighter aircraft and much of that in the single-engine F-16, the older model with the older engine. In FY95, we were also faced with our highest optempo in history, large budget cuts, conversions, and turmoil. How did we reduce our mishaps by 55 percent? Well, let me tell you — it wasn't luck. It wasn't that we just "had a good year." We rolled up our sleeves, made hard decisions, and came up with a program that works. Let me describe it:

Our "best ever" FY95 statistics came directly from concentrating not on safety but on "culture and accountability." For years I have watched accident statistics rise and fall, good years and bad years, but the Guard was stuck at a level of about 2.0 - 3.0. A further analysis showed that the vast majority of mishaps were due to command and control factors. That meant we could dramatically improve our rates if we simply concentrated on preventing the ones under our direct control as pilots and commanders. It wasn't maintenance and logistics causing our problem; it wasn't flying hour cuts; it wasn't budget problems or high optempo, turmoil or morale...the problem was pure and simple — US! — the aviators and commanders.

We rolled up our sleeves and launched two programs: One was "Safety Focus"; the other was the "Safety Paradigm Workshop." Safety Focus started as a yearly meeting of commanders and ops group commanders. It has since expanded to other levels, squadron commanders, weapons and tactics officers, and flight commanders. It is a hard-hitting, no-holds-barred analysis of our flying program — the good, the bad, the ugly. It is designed to identify the high-risk, low-payoff events that create high accident potential and to eliminate them. It is designed for honest, straight talk, loud voices, hard work, and tough decisions. It doesn't let anyone off the hook, including me. It is designed as a forum in which the people who really do the flying identify the real problems, make tough decisions, and implement those decisions with buy-in from the group. It works.

At the first Safety Focus we implemented the concept of "personal and peer accountability" — quite simply, this means we will hold you "personally" responsible for your actions in an aircraft — no more "good-old-boy network," but tough love. Further, everyone in the unit is held personally responsible to monitor others through "peer" accountability. We are ALL responsible for the conduct of a mission. We are ALL responsible to see that the mission is briefed and conducted professionally, and if one fails, we ALL fail. We determined collectively that we ALL support taking the harshest actions against individuals and units that break this code of accountability, and we have followed through with very tough actions supported by ALL.

In an honest analysis of our mishaps, we clearly saw that the "culture" within units was a big factor in accidents. We sent in teams that worked with all levels of an organization to identify the real problems. We provided tough, straight-talk, confidential outbriefs to the commanders that said such things as, "Your problem is in operations; no one respects the squadron commander" ... or..."Your biggest problem is in maintenance; the engine shop supervisor is weak"...or..."Your tactics officer has his hair on fire and it is going to bite you soon." These visits uncover real problems that are traditionally hidden from inspection teams. They provide commanders with a tough look at real world problems, make him look in the mirror and encourage him to deal with the problems immediately. We have expanded the visits into workshops that teach commanders how to embed a professional flying culture that endures within their units.

In our cultural quest, we had a great role model — the Army National Guard. About 10 years ago, the Army National Guard had a very bad flying safety record. They went to work on the problem. They flew about 30 percent of the total flying hours of the Army, most of it in helicopters, low level and lots of night vision goggle work — high risk missions. They changed their culture from top to bottom. As of last August, they had completed 29.5 months (919,000 flight hours) without a Class A mishap, an almost unbelievable record. If you jump in an Army National Guard helicopter today, you will see one of the most professional flying operations in the world — discipline, teamwork, and a culture of accountability. Due to their significant contributions to safety, they received the Chief of Staff of the Army, Major Army Command Safety Award for the second time in 4 years ('90 and '94). This award has been presented only four times. The Army National Guard changed their culture from top to bottom. We learned. We are doing the same thing.

Our approach to safety is truly nontraditional. The usual approach is to chase statistics and issue new restrictions that modify risk. Our approach is to go after the root causes of mishaps and to concentrate on those we as pilots and commanders can prevent. We intend to embed professional cultures in our units and produce a cadre of aviators who maintain control through personal and peer accountability. It is working. Our goal is *ZERO* mishaps. We aren't there yet, but we will be — watch us! ■

AIR FORCE SPECIAL PUBLICATION 91-1

UNITED STATES AIR FORCE

Flying Safety

JANUARY 1996
VOLUME 52, NUMBER 1

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Our front cover courtesy SrA Steve Thurow
Official USAF Photo

SPECIAL FEATURES

REGULAR FEATURES

CONTRIBUTIONS

Contributions are welcome as are comments and criticism. No payments can be made for manuscripts submitted for publication. Call the Editor at DSN 246-0936 or send correspondence to Editor, Flying Safety Magazine, HQ AFSC/PA, 9700 G Ave, S.E., Ste 282, Kirtland Air Force Base, New Mexico 87117-5670. The Editor reserves the right to make any editorial changes in manuscripts which he believes will improve the material without altering the intended meaning.

THERE I WAS...

■ It was a dark and stormy night. Well, actually it was day VFR. The visibility was nearly 100 miles — not a cloud from horizon to horizon.

We briefed the two-ship, T-38, standard, one each, mid-formation block sortie, like all the rest. All parties were attentive and eager to fly with that certain autumn chill in the air, a glorious day to fly.

The student in my charge needed a bit of help with his confidence accomplishing turning rejoins. For some reason, he did not enjoy hurling himself toward another aircraft — go figure!

USAF Photo by SrA Andrew N. Dunaway, II

With no coaxing, we could well have exhausted our fuel supply waiting for him to complete one rejoin. I was determined to get him through this anxiety plateau if it was the last thing I did (bad choice of words). Assuming the role of cheer leader, I talked him through a perfect rejoin. I thought to myself, "Wow! That was a cinch! I really am the world's greatest IP!"

And then, my life literally flashed through my ego-inflated head and before my dumbfounded eyes. While I was busy congratulating my student for accomplishing what he thought was impossible, he was busy trying to figure out what to do with the measly extra 5 knots left of overtake. You see, he had never had the opportunity to use idle or select the speed brake option while accomplishing a turning rejoin.

With just a bit of energy left to dissipate, he sensed an imminent collision. I'm sure the thoughts going through his head were "Think! Think! What to do! Oh, yeah, I know! I'll break out!" And he did just that. The only problem was the stick, and he rolled quite rapidly from 30 degrees of right bank (which is what our unsuspecting lead was holding) through 60 degrees of left bank and pulled.

With full stick deflection, the T-38 will roll 90 degrees in less than half a second (that's conveniently the reaction time of a T-38 FAIP in his mid-twenties). So, by the time I could grab the stick, abruptly place it in the lower right-hand corner, and bend the throttles to the forward stops, we were in a very nasty place.

As I made this last-ditch effort, I kept an eye on our lead — not hard to do at this range. To this day (over 7 years later), I can picture every detail of the other guys' cockpits as seen from above. (Remember that canopy-to-canopy scene from the movie *Top Gun*?) It should be noted the student in the other front seat had, on one knee, his checklist open to the correct page, and on the other knee, a very nice local area chart.

I braced for impact. I thought the upper surface of our left wing would strike the upper surface of their left wing, or at least the 8-foot vertical stabilizer would hit something.

And then it happened — nothing.

I calmly stated over the airways that we were "breaking out." The opposing student acknowledged with a canned reply. I took a moment to compose myself and allow the adrenaline rush to dissipate. The next rejoin was a very mellow demo with no verbal instruction.

Who was I mad at the most — the student I had put in a bind, or myself I had put in a bind? I won. The rest of the sortie was average, a bit more mellow and a bit less talking.

After landing and prior to the debrief, I pulled the other IP aside and offered my apologies. I said we could talk about it more later. Guess what he said! "Sorry for what, and what do you want to talk about later?"

Then I realized neither he nor his student saw us nearly destroy the shiny side of their jet. It should be noted, however, the opposing student did ask if we saw the airliner fly over us. You see, he saw a "shadow" pass over his jet.

When I later thought about the image burned into my memory, I could clearly see the tops of two helmets looking forward. The other IP had chosen this time (he knew, based on my student's prior rejoin attempts that it would be a while before we actually joined up) to discuss the local area as seen on an HSI. Hence, they completely missed our very close encounter.

Lessons learned:

- Always have an out.
- Don't push a student beyond your capabilities for recovery.
- It's not over until you hand the forms back to the crew chief.
- If someone is coming at you armed with an airplane, keep an eye on them.

■ **ALWAYS HAVE AN OUT.** ■

THE PHILOSOPHY OF LUCK

STEPHEN COONTS
Courtesy *Approach*, Jul-Aug 95

■ In my novels, Jake Grafton and other characters comment in numerous places on safety — what it is, and how to achieve it. Novels are written to entertain, but I found that you can't write about military aviation in a realistic manner and not touch on the role of chance, or luck, and professionalism. I just separated the two terms, and yet, I am not sure they are completely separate.

One way of looking at it is what my father, a naval officer during World War II, used to tell me: "You make your own luck." I think, in one sense, he was right. That is the kernel of truth Lt Col Haldane states in *The Intruders*: "This thing we call luck is merely professionalism and attention to detail; it's your awareness of everything that is going on around you; it's how well you know and understand your airplane and your own limitations.

"Luck is the sum total of your abilities as an aviator. If you think your luck is running low, you'd better get busy and make some more. Work harder. Pay more attention. Study your NATOPS more. Do better preflights."

That's partly true. You'll certainly minimize your problems, but there's a limit to how much luck you can make. In *The Red Horseman*, Toad Farkington muses, "A little dollop of carelessness could cause you to crash, burn, and die. Sometimes, even without the carelessness, you crashed, burned, and died — at a level too deep for philosophers, luck was involved."

In *The Intruders*, Jake wrestles with the whole concept of luck. People tell him he is lucky to have so narrowly escaped disaster, yet he feels he is unlucky that he got so close to the edge. Luck is like a banana peel, a slippery proposition. Are we unlucky because we had an accident, or lucky that it wasn't worse?

Clearly, the perspective from which we view an event has a huge effect on its psychological import to us. This is the point that one of the characters in *The Intruders* makes to Jake, referring to investments: "There's no such thing as bad news. Whether an event is good or bad depends on where you've got your money."

Mathematicians tell us probability theory predicts everything, and it probably does on a macro scale. Yet humans don't live on that scale. For example, statisticians might tell us that there is a probability that the fleet will experience one cold cat shot* this year. We all breathe a sigh of relief — only one. Yet the pilot it happens to will come face-to-face with absolute catastrophe, a disaster of the first order of magnitude. One cold cat shot a year in the fleet is a statistic, but one cold cat shot happening to you is a major event in your life — perhaps the major event — a crisis you may not survive.

Even though the probability of a mishap is low, you'd think people would be reluctant to gamble with their lives. But people are addicted to it. They play the lottery, bet on sports. They go to extraordinary lengths to meet interesting specimens of the opposite sex because the hoped-for rewards justify the tremendous known risks. Success at a risk-free endeavor is impossible — everyone intuitively understands that.

Risk makes life worth living. Life itself is a gamble. Random chance rules our lives. What you are trying to say is this: Most people try to minimize the negative effect of random chance on them, or, said another way, they want to be the dealer. In aviation, we know how to do that: Know NATOPS, keep emergency procedures fresh and ready to use, stay situationally alert, be mentally and physically ready. If you are, you'll have the tools to make the best of whatever situation random chance throws at you. You'll be lucky.

I've never thought much of the old saw, "I'd rather be lucky than good." I think the good are lucky. Not the morally good, but the professionally good. There is just no substitute for sound, thorough preparation to avoid or cope with foreseeable misfortune. People who drive straddling the center line can get around a few curves, but sooner or later, they're going to meet a Kenworth coming the other way. That's not just predictable, it's inevitable. ■

* A catapult launch which is powerful enough to start the launch, but doesn't have the sustained power to get the aircraft to flying speed. You can't stop on the deck, and you can't fly when you get to the edge.

DEFENSE MAPPING AGENCY

CONTRIBUTIONS TO FLIGHT SAFETY

MAJ JIM CRAMP
DMA(ATCF)
Fairfax, Virginia

When aviators think of the Defense Mapping Agency (DMA), usually two products come to mind — aeronautical charts and Flight Information Publications (FLIP). While these two products are certainly "cornerstone" contributions to flight safety, they only scratch the surface of the many roles fulfilled by DMA.

Other major contributions, but by no means an exhaustive list, include vertical obstruction and aeronautical data, World Geodetic System 1984 implementation, Navstar Global Positioning System support, magnetic and gravity data, and a host of other DMA products to aid U.S. forces in completing their worldwide mission taskings.

The aeronautical navigation and planning charts produced by DMA are the Global Navigation Chart series (GNC, 1:5M scale), the Jet Navigation Chart series (JNC, 1:2M scale), the Operational Navigation Chart series (ONC, 1:1M scale), the Tactical Pilotage Chart series (TPC, 1:500K scale), and the Joint Operations Graphic-Air series (JOG-A, 1:250K scale).

In addition to topographic and cultural features, all series except the JOG-A portray special-use airspace and NAVAID information. Because of dense topographic and cultural detail, the JOG-A series excludes portrayal of special-use airspace to reduce chart clutter but does include NAVAID information. All series from ONC through JOG-A depict flight hazards such as towers and power lines and other vertical obstruction information.

Updates to special-use airspace information are published by DMA in the FLIP AP1A, AP2A, AP3A, and AP4A documents. DMA publishes monthly updates to vertical obstruction information and other flight safety-related items in the Chart Update Manual (CHUM) and its supplements. Vertical obstruction information over CONUS is obtained by DMA from the National Oceanic and Atmospheric Administration (NOAA). DMA, in conjunction with international coproducers, obtains data for the rest of the world.

DMA publishes the full suite of FLIP products as the DoD executive agent for the program. The format and content of FLIP are developed by DMA in conjunction with the military services, NOAA, FAA, and ICAO.

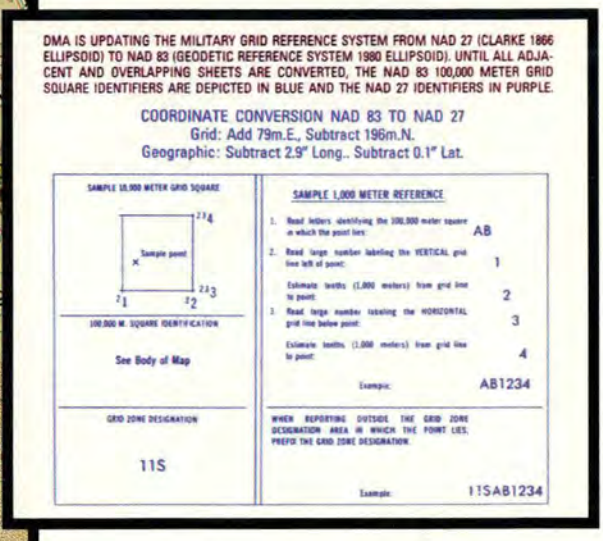
The entire FLIP series and revision and new production of aeronautical charts are produced on the World Geodetic System 1984 (WGS 84) global datum. The WGS 84 datum, developed by scientists at DMA, provides a highly accurate worldwide geographic coordinate reference system. *The importance of datum information is an often overlooked and sometimes misunderstood aspect affecting flight safety.* *(See "What's a Datum," page 9.)*

Over 300 local datums exist worldwide. DMA began full implementation of WGS 84 in 1989 as the standard reference coordinate system adopted by DoD. Prior to 1989, DMA used 19 datums in regional chart production. Despite the volume of production resources available to DMA, only a fraction of the total chart inventory is able to undergo revision in any single year. Therefore, many charts still exist in DMA's inventory which are referenced to non-WGS 84 datums.

The highest priority charts identified by the military services and commands generally are revised at least every 3 years. Some lower priority charts in DMA's inventory can be 10 or more years old. Given the time span involved in production of the total chart inventory, datum information in the chart margin sometimes varies (and often is immediately cut off by mission planners!). As a recent initiative to bolster flight safety, DMA is adding horizontal and vertical datum information for aeronautical charts in the CHUM. This change is expected to appear in late fall 1995.

One aspect associated with WGS 84 of particular relevance to flight safety is its impact on the Military Grid Reference System (MGRS).

The Joint Operations Graphic-Air series chart, 1:250,000 scale, excludes the portrayal of special-use airspace in order to reduce chart clutter. The JOG-A does include, however, navigational aid and vertical obstruction information.



DMA IS UPDATING THE MILITARY GRID REFERENCE SYSTEM FROM NAD 27 (CLARKE 1866 ELLIPSOID) TO NAD 83 (GEODETIC REFERENCE SYSTEM 1980 ELLIPSOID). UNTIL ALL ADJACENT AND OVERLAPPING SHEETS ARE CONVERTED, THE NAD 83 100,000 METER GRID SQUARE IDENTIFIERS ARE DEPICTED IN BLUE AND THE NAD 27 IDENTIFIERS IN PURPLE.

COORDINATE CONVERSION NAD 83 TO NAD 27
Grid: Add 79m.E., Subtract 196m.N.
Geographic: Subtract 2.9" Long.. Subtract 0.1" Lat.

SAMPLE 10,000 METER GRID SQUARE

Sample point

100,000 M. SQUARE IDENTIFICATION

See Body of Map

GRID ZONE DESIGNATION

11S

SAMPLE 1,000 METER REFERENCE

1. Read letters identifying the 100,000 meter square in which the point lies: AB
2. Read large number labeling the VERTICAL grid line left of point: 1
   Estimate tenths (1,000 meters) from grid line to point: 2
3. Read large number labeling the HORIZONTAL grid line below point: 3
   Estimate tenths (1,000 meters) from grid line to point: 4

Example: AB1234

WHEN REPORTING OUTSIDE THE GRID ZONE DESIGNATION AREA IN WHICH THE POINT LIES, PREFIX THE GRID ZONE DESIGNATION.

Example: 11SAB1234

Most DMA charts include marginal information to assist the user in transforming coordinates between multiple datums.

When some local datums are shifted to WGS 84, the two-letter identifier scheme for the MGRS 100,000-meter square changes. For example, in North America, the two-letter identifiers changed with the second character shifting by 12.

MGRS coordinates must be converted to the right datum for the weapon system in use. For example, during a live-fire exercise in spring 1992 at Twenty Nine Palms, a Marine ground element passed MGRS coordinates to a Harrier jet for close air support. Upon inserting the MGRS coordinates into the navigation system, the pilot received flight guidance to a point some 600 nm away. Realizing an obvious error and unable to resolve it, the pilot discontinued support to the CAS request. Post-mission analysis revealed that the ground element passed MGRS coordinates based upon WGS 84 datum, yet the Harrier navigation system was referenced to North American Datum 1927. The two-letter identifiers for the MGRS 100,000 meter squares' shift between

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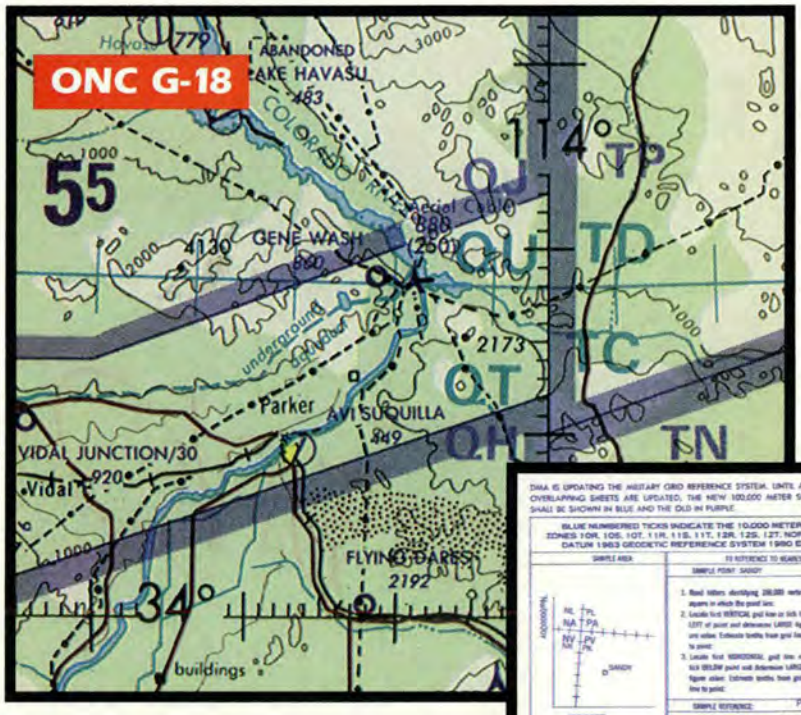


The smaller scale Operational Navigation Chart (1:1,000,000 scale) depicts special-use airspace in addition to navigational aid and vertical obstruction information.

DMA IS UPDATING THE MILITARY GRID REFERENCE SYSTEM. UNTIL ALL ADJACENT AND OVERLAPPING SHEETS ARE UPDATED, THE NEW 100,000 METER SQUARE IDENTIFIERS SHALL BE SHOWN IN BLUE AND THE OLD IN PURPLE.

BLUE NUMBERED TICKS INDICATE THE 10,000 METER UTM GRID ZONES 10K, 10L, 10T, 11R, 11S, 11T, 12R, 12S, 12T. NORTH AMERICAN DATUM 1983 GEODETIC REFERENCE SYSTEM 1980 ELLIPSOID

SAMPLE AREA

TO REFERENCE TO NEAREST 1,000 METERS

SAMPLE POINT: SANDY

SAMPLE REFERENCE: PK2663 PV2663

11SPK2663 11SPV2663

COMPLETE GRID VALUES ARE SHOWN TO DETERMINE FULL COORDINATES, REMAINING VALUES IN BORDER AREA REPLACE OMISSION OF LAST FOUR DIGITS

ENTIRE PRIMARY GRID FALLS WITHIN THE GEODETIC REFERENCE SYSTEM 1980 ELLIPSOID.

ENTIRE SECONDARY GRID FALLS WITHIN THE CLARKE 1866 ELLIPSOID.

these two datums caused the discrepancy.

To compensate, charts compiled upon the WGS 84 datum include both the new and old MGRS 100,000-meter square two-letter identifiers, if changed. This ensures a common reference system is available between WGS 84 and older non-WGS 84 charts. This dual scheme facilitates a vital link for MGRS operations when using adjacent charts of the same series (i.e., two JOG-A charts next to one another), or overlapping charts of differing series (i.e., one JOG-A and one ONC covering the same area) produced on different datums.

Failure to understand the datum in use can result in serious navigation errors or potential safety hazards to air-ground operations. During DESERT STORM, an Army special operations team was dropped behind Iraqi lines 1 mile from the intended position. The error began when the drop zone coordinates were determined from a map using a non-WGS 84 datum. The helicopter performing the insertion flew to that same set of coordinates using GPS, which transmits position in WGS 84, as its reference navigation system. **It should be noted that 11 different datums were in use within the DESERT STORM theater of operations.**

Desert Storm B-52s flying out of the United Kingdom used coordinates provided for INS ground alignment referenced to the European Datum 1950. Analysis of navigation system performance from early missions detected the error.

How far could you be off if you don't convert between datums? Over North America, the position shift in coordinates between WGS 84 and the North American Datum 1927, the old regional datum used in chart production, averages about 125 meters. Over Korea, the position shift between WGS 84 and the Tokyo datum, the regional datum used in chart production, averages about 750 meters.

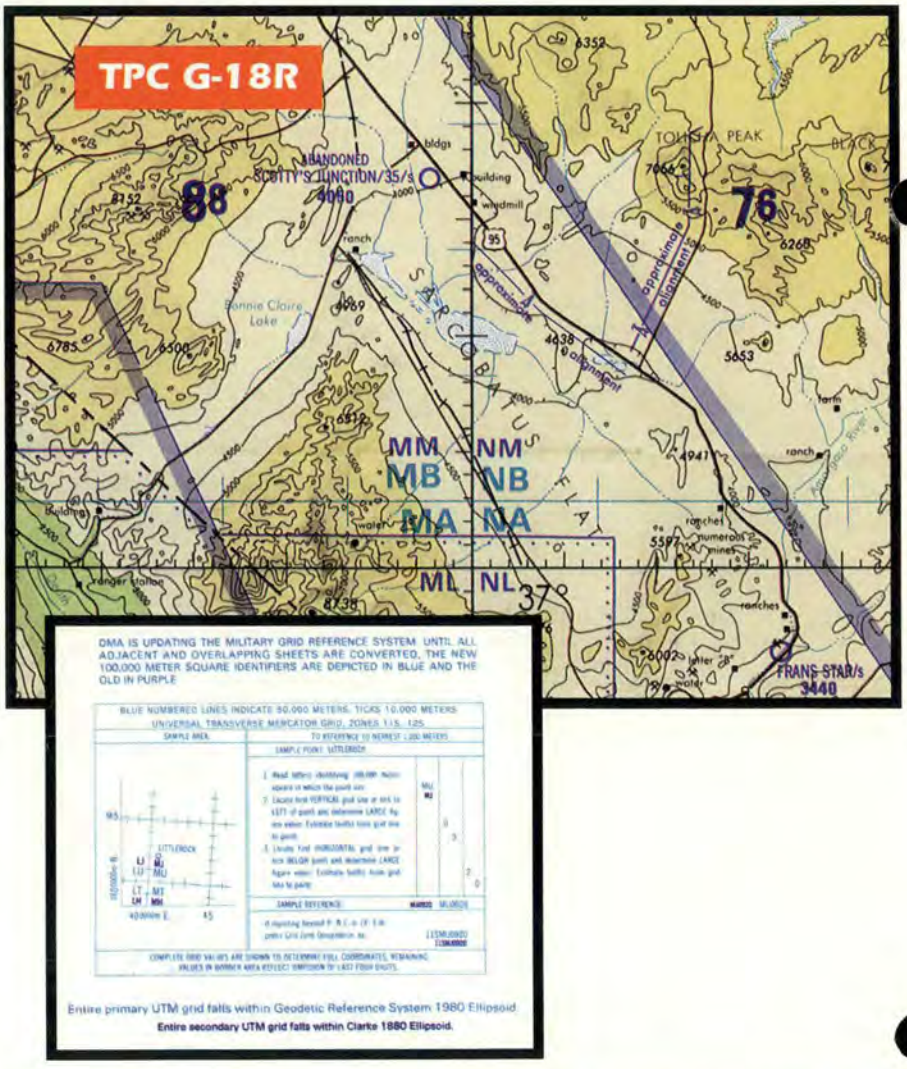
Coordinate shifts of these magnitudes may go unnoticed in flight operations involving only high-altitude cross-country navigation. However, flight operations involving precision navigation or air-ground operations may prove hazardous if waypoint/target coordinates and navigation systems are not referenced to the same datum.

Datum discrepancies and datum issues are best resolved during mission planning to ensure flight safety. This principle is particularly relevant when units are not collocated during planning for exercises or operations. (See sidebar on next page.)

For aid resolving datum issues during mission planning, DMA produces a software program called MADTRAN (Mapping and Datum Transformation). MADTRAN is actually a component of another DMA product, the Mapping, Charting, and Geodesy (MC&G) Utility Software Environment, or MUSE, software tool kit. MUSE, a CD-ROM product, is a collection of executable computer programs and source code automating common MC&G functions. MUSE programs can be used as "stand alone" applications, or the source code may be used by programmers while compiling related applications.

The MADTRAN program, along with a companion MUSE program, can transform and display coordinates and delta-change information between WGS 84 and a local datum or between two local datums. Over 260 different datums are contained within MADTRAN and are selectable from menu windows. The menu window also identifies the predominant country or countries in which each local datum may be employed in native mapping.

DMA also contributes to successful

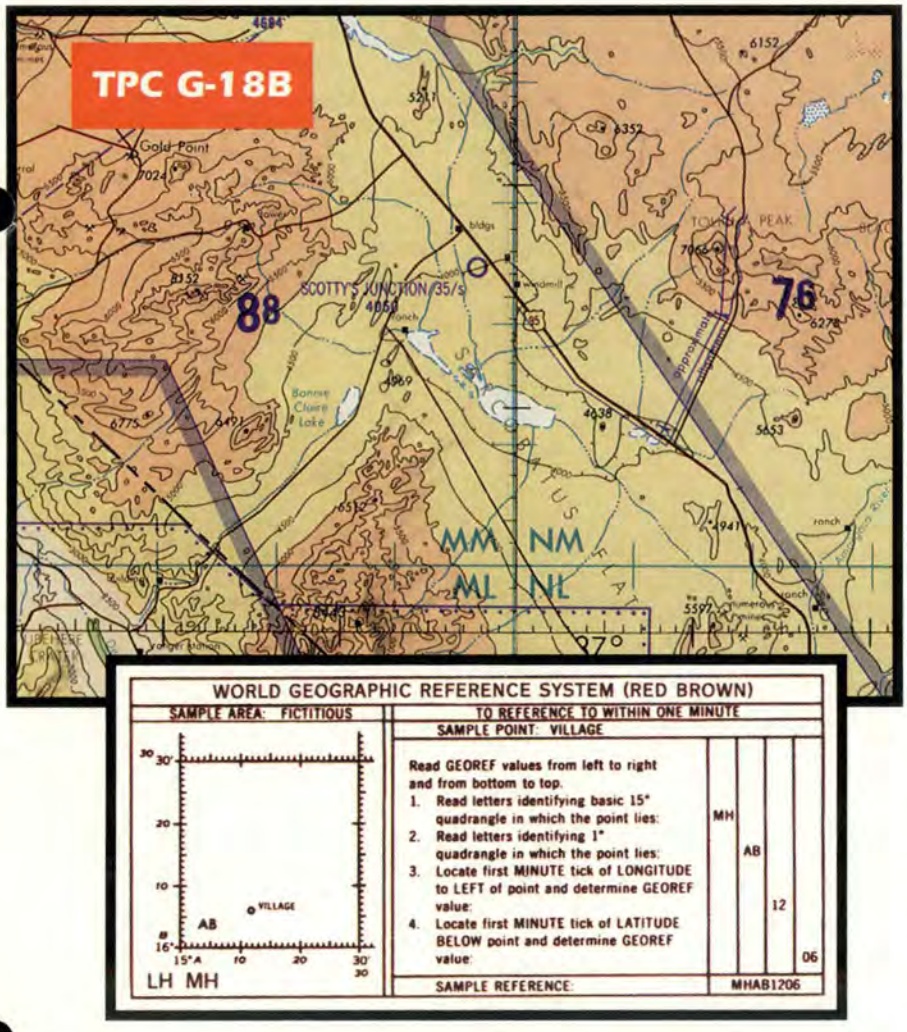


This Tactical Pilotage Chart is produced on WGS 84 and depicts the new MGRS as the primary grid reference system. The old MGRS, based upon NAD 27 is also depicted as the secondary grid. The presence of primary and secondary grids allow interoperability with either WGS 84- or NAD 27-based charts overlapping, or adjacent to, this area.

management of the Navstar Global Positioning System (GPS). DMA maintains six GPS satellite tracking stations around the globe. These stations collect GPS satellite tracking data to improve satellite ephemeris data and time signals for high-precision geodetic survey requirements performed by DMA. The data DMA generates is shared with USSPACECOM and is used in monitoring and correcting GPS signals.

Additionally, since GPS transmits position information referenced to WGS 84, ongoing issues with WGS 84 and DMA's continuing development of a more refined global datum model impact the GPS program. Most GPS receivers can display position in one of several selectable datums or even in a user-defined datum. Therefore, DMA's work refining datum transformation algorithms and datum definition parameters plays a critical role in flight safety.

When flying, have you ever used an INS or other navigation computer? Of course! In support of navigation systems, DMA has oversight of the World Magnetic Model (WMM) and maintains the DoD library of worldwide gravity data. The WMM is used to correct compass headings. The gravity data is used to generate gravity models. Both geomagnetic and gravity models are widely used in the aeronautical systems development community. Some of the most advanced INS systems rely heavily on DMA gravity data. ■



This Tactical Pilotage Chart is produced on NAD 27 and uses the old Military Grid Reference System. This chart is incompatible with any other chart, or system, which is not based on NAD 27.

OKAY, WHAT'S A *DATUM*, AND WHY SHOULD WE CARE?

Simply put, a datum is the mathematical model of the Earth we use to calculate the coordinates on any map, chart, or survey system. *All* coordinates reference some particular set of numbers for the size and shape of the Earth.

The problem for warfighters is that many countries use *their own datum* when they make their maps and surveys — what we call **local datums**. Other nations' maps often use coordinates computed assuming the Earth is a *completely different size and shape* from what the Department of Defense uses, but we have to be ready to fight around the world!

U.S. forces now use a datum called **World Geodetic System 1984**, or just **WGS 84**. The Defense Mapping Agency (DMA) produces all of its *new* maps with this system. Unfortunately, they reprint a lot of maps from products made by allied countries using local datums. Some old maps were made on several different local datums, sometimes WGS 72 (maps using this datum were often printed "World Geodetic System" with no year identification). So the old maps that were reproduced, and the foreign ones that were reprinted, might use those *other* datums.

Why Should You Care?

The coordinates for a point on the Earth's surface in one datum *will not match* the coordinates from another datum *for that same point*! Sometimes, the difference can be huge. For example, near the margins of two adjoining maps of Korea, the same set of buildings can be identified. One of the maps is based on WGS 72, however, the other uses the Tokyo Datum. If you plot Universal Transverse Mercator (UTM) or Military Grid Reference System (MGRS) coordinates for the buildings on each map, you will get *two different answers*, in this case *different by 729 meters*! The Grid Zone Identifiers for MGRS change with different datums to alert you to be careful, but few people outside DMA

continued on next page

DMA's Mapping, Charting, and Geodesy Utility Software Environment is a CD-ROM of executable computer programs automating common MC&G functions

know this. If you don't understand datums, you'll have a tough time figuring out why your artillery support tells you your grid coordinates are 1,000 Km from theirs. Worse yet, maybe you're both using different datums that just happen to use the same grid designators — *you won't realize you have incompatible coordinates*!

"Won't the Navstar Global Positioning System (GPS) Fix This?"

Maybe. GPS receivers usually give you the option to read your coordinates in several datums, including WGS 84. One new unit now coming into use, the Precise Lightweight GPS Receiver or "PLGR," allows you to use 51 predefined datums and two "user datums." The datums already programmed in are some of the ones you're most likely to see now on maps. If U.S. forces go to a place where the maps are on some datum that the PLGR doesn't have, your command will get the figures for you to put in as the User Datum. Consult your GPS manuals to find out how to switch datums. But be careful. GPS coordinates are almost always more accurate than the ones you read off a map. The specification for the 1:50,000 Topo Line Map says objects are plotted on the sheet to within 50 meters of their true position. And you could add 50 more meters error just in reading the point. *That's why maps should never be used for very precise targeting!*

The bottom line is this: *In the past, we didn't worry much about datums because our weapons usually didn't need highly accurate positions. But nowadays, precise coordinates are vital for mission success. Ignoring the fine print in the margin for a map could get you killed!*

Find out what datum is on your map. Set your GPS receiver to read in that datum. Pass the datum along with the grid numbers when transmitting your coordinates.

Where Can You Get More Info?

■ Every higher headquarters staff has a Mapping, Charting, and Geodesy (MC&G) officer. He or she can help you find out which datums are in use in your AOR and help you make sure you're using the right one. The unit that orders your maps should be able to tell you the MC&G officer's number. If you can't find it, call one of the numbers below for help.

■ DMA has action officers who work with military customers to ensure the war fighters receive the maps and charts where U.S. forces may be deployed. They work in the DMA Operations Group Customer Support Division located in the DMA headquarters building outside Washington DC, DSN 235-8600 or commercial (703) 275-8600. Simply tell them your area of interest. These action officers communicate regularly with the Command MC&G officer and can help direct you to the best source to answer your questions.

■ The Defense Mapping School (DMS) will provide you with plenty of assistance. Mobile training teams can come to your location anywhere in the world at DMA expense to get you on the right track. Call DMS at DSN 655-3206 or (703) 805-3206 commercial.

■ DMA publishes software called MADTRAN which can convert coordinates from latitude/longitude to UTM or MGRS and the reverse. It can also transform coordinates between WGS 84 and over a hundred other datums. MADTRAN will work on any IBM PC-compatible computer with a 5 1/2" floppy drive. It comes with instructions right on the disk and is easy to use. MADTRAN 4.0 is the current version, and you can order it wherever you get your Defense Mapping Agency products. The stock number is MADTRANIBMPC.

■ DMA distributes a poster explaining how to check the coordinates used for precise targeting. The DMA stock number is DIAXXCOORDGRAPH. ■

How Can You Check Your Datum?

All of the maps and charts DMA distributes will have the datum printed somewhere in the margin like this:

ELLIPSOID.....WORLD GEODETIC SYSTEM 1984
GRID.....1,000 METER UTM ZONE 51
PROJECTION.....TRANSVERSE MERCATOR
VERTICAL DATUM.....MEAN SEA LEVEL
HORIZONTAL DATUM.....WORLD GEODETIC SYSTEM 1984
HYDROGRAPHIC DATUM.....APPROXIMATE LEVEL OF
.....LOWEST LOW WATER
PRINTED BY.....DMAHTC 4-94
COORDINATE CONVERSION WGS 84 TO TOKYO
Grid: Add 156m.E.; Subtract 712m.N.
Geographic: Add 7.0" Long.;
Subtract 8.8" Lat.

Notice there is a "Horizontal Datum" for location and a "Vertical Datum" for elevation. Almost all maps and charts use mean sea level for elevation, but they might use any of over a hundred different horizontal position datums. Sometimes, a map will have more than one grid on it. *Normally, each grid is for a different datum!*

YES, TOTO, THAT'S ICE ON THE WING

CAPT DAVID A. DAVIES
Offutt AFB, Nebraska

■ There is no such thing as a little ice! *There is no such thing as a little ice!* **There is no such thing as a little ice!** If you quietly say these words and click your heels together while awaiting takeoff this winter, you will find yourself safely back in "Kansas" at the end of your winter adventure. This, and remembering that the only yellow brick road to safe flying this winter is to *get your aircraft clean, and keep it clean.*

As the Scarecrow would be so happy to tell you, this *clean aircraft concept* is just another way to stay out of trouble. Remember Federal Aviation Regulation 121.629, which governs commercial air carriers, specifically prohibits takeoff when snow, ice, or frost is adhering to the wings, control surfaces, engine inlets, or other critical surfaces of the aircraft.

FAA Advisory Circular (AC) 120-58, *Large Aircraft Ground Deicing*, states, "Test data indicates that ice, snow, or frost formations having a thickness and surface roughness similar to medium or coarse sandpaper on the leading edge and upper surface of a wing can reduce wing lift by as much as 30 percent and increase drag by 40 percent." With a contaminated wing, the stall progression may begin at the wingtips and move inward. When this occurs, aileron authority is lost early in the stall, just when it is needed most. Also, the stalled area tends to be aft of the C.G., causing a pitchup tendency, which only exacerbates the stall.

With this in mind, if you do not want an unpleasant encounter with the Wicked Witch this winter, you really have only two choices when confronted with a takeoff decision under adverse winter conditions. The first option is to simply taxi back and call it a day. The second, Glenda approved, is to apply the principles of the *clean aircraft concept* and get your aircraft deiced and anti-iced before takeoff.

Deicing removes any frozen contaminants from the aircraft's surface, and anti-icing prevents the subsequent accumulation of ice, snow, or frost on an aircraft for a given period of time. This time, known as the holdover period, begins at the start of anti-icing application and ends when the anti-icing fluid loses its effectiveness.

AC 120-58 contains holdover time tables published by the International Standards Organization and Society of Automotive Engineers which take into account temperature and general weather conditions. The times, though, are only guidelines as more than 30 factors have been identified which can reduce anti-icing fluid effectiveness.

There are two types of deicing/anti-icing fluids commercially available today: Type I and Type II. While Type II fluids are superior, at an Air Force base you will probably be able to get only a Type I fluid. From the holdover table, it is easily seen that if it is snowing, the maximum holdover time for a Type I fluid is only 15 minutes. Even the Tin Man isn't that fast with his oil can!

Regardless of the type of fluid used, it is extremely critical that a thorough pretakeoff check be accomplished. If portions of the aircraft are not visible from the cockpit or cabin, request assistance. The surfaces treated with anti-icing fluids should appear glossy, smooth, and wet. If they aren't, the fluid is becoming diluted, and another application may be warranted. **NEVER, NEVER ASSUME** that a light dusting of snow on top of the wings will blow off during takeoff. The decrease in temperature of the airflow over the upper surface of the wings during takeoff could easily freeze the contamination, with disastrous results.

Ultimately, the decision to take off under adverse winter conditions remains the responsibility of the aircraft commander. However, safely launching an aircraft is a team effort. Each and every member of the team, both ground and flight crews, need to work together to *get the aircraft clean, and keep it clean.* ■

SLIP-SLIDIN´

CMSGT DON A. BENNETT
Technical Editor

Unbeknownst to the injured 3-level mechanic, his unit's team of maintenance supervisors and managers established the foundation for his mishap 3 years earlier. Over time, they had allowed an unsafe work environment to develop where mishaps were inevitable. Hopefully, this trainee's mishap will be the last!

By simply procuring some badly needed 15/16-inch sockets, an unsafe condition was finally resolved — but it took 3 years! And throughout those years, the mishap shop mechanics had literally been **"slip-slidin´ along,"** making do with oversized sockets or other inappropriate tools.

In fact, there was a time or two when one of the mishap participants had tried to keep the oversized socket from slipping off a nut during torque-wrenching activities by stuffing a piece of rag in the socket!

Of course, it was only *after* the mishap permanent, decisive actions were finally taken, and then it took only a short time to obtain the correct sockets. Funny how that works, isn't it? *Someone has to get hurt before prompt action is finally taken to correct an unsafe condition.*

Read on for more about this relatively minor mishap and how it quite possibly stopped an even more destructive *flight* mishap from occurring. Although it might be considered minor in terms of cost and injury, the mishap amply reveals this unit *lacked* a working environment conducive to safe, quality maintenance. This mishap was far from being a freak accident — that's for sure!

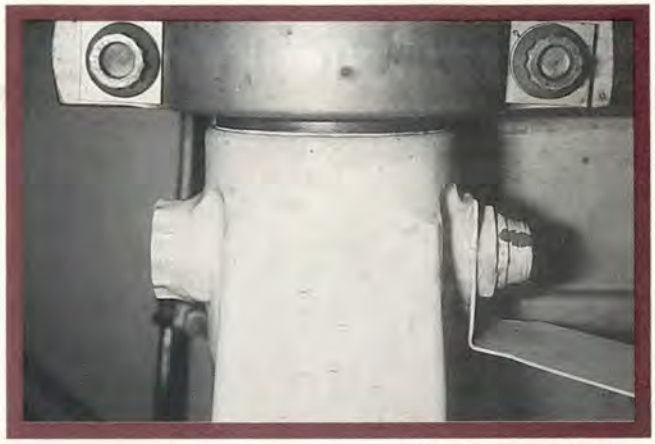
Three mechanics, two 7-levels and a 3-level, were tasked with installing an aircraft's nose landing gear strut. Between the two 7-levels, they had a combined total of 14 years of experience on nose strut installations and an incredible 24 combined years experience in general tool usage! Obviously, these two *seasoned* mechanics should have been quite capable of performing this "heavy maintenance" tasking.

On the other hand, the inexperienced, young 3-level maintainer had only 5 months experience under his belt in general tool usage and just 3 months on nose strut installations.

At the time of the mishap, all three individuals were actively involved in torquing the trunnion bolts. The 3-level was resisting the torque at the head of one trunnion bolt with a crow's foot attached to a breaker bar. One of the 7-levels was on the torque wrench (with the oversized socket), and the other was underneath, assisting in keeping the torque wrench in place, plus keeping an eye on the torque gauge. Then, before they reached the desired 350 foot-pounds, the crow's foot attachment spread open a little and slipped on the bolt's head, resulting in the lost-day injury to the younger mechanic.

For those who've been there, you will recall that torquing *anything* to 350 foot-pounds can sure make you earn your lunch. Sometimes there's a lot of grunting, pulling, or yarding on that torque wrench to get your 350. And, of course, you can envision the "shock" factor if your wrench were to suddenly slip a notch or two, especial-

By simply procuring some badly needed 15/16-inch sockets, an unsafe condition was finally resolved — but it took 3 years!



USAF Photos by MSgt Perry Heimer

ALONG

ly when you and your cohorts are all hunkered down and really putting "the muscle" to that old wrench. The moment will surely wake you up, don't you agree?

Unfortunately, ladies and gentlemen, the insult to injury doesn't end here. While it's questionable to use a crow's foot attachment vice the proper-size socket to apply (or resist) the needed torque, the mechanics had many *step-down* attachments employed, too! It would probably take a rocket scientist to figure out the actual applied torque value. Certainly you could lose some torquing effectiveness with each step-down attachment used, couldn't you?

Remember, the task was to install the nose gear strut. Now, recall some of the "landing gear mishaps" the Air Force has suffered in recent years, mishaps like the main landing gear trucks falling off, gear "UP" landings, cocked or in transit gears, severe nose-gear shimmies, main or nose tires falling off, and so on. You should now be grasping my point about how this incident could have prevented a serious flight mishap later. Of course, the particulars of this incident might be different than the flight-related mishaps mentioned above, but its end result might possibly have developed into the same — another aircraft landing with an unsafe gear.

While some of the past landing-gear mishaps were due to materiel failures, others were attributed to mechanics performing unsafe and/ or unauthorized maintenance. Such was the case here: improper tools and torquing procedures, inadequate task supervision, lack of a **fail-safe** tool management program, lack of an effective quality assurance program or local supervisory followup procedures, lack of effective worker-supervisor-management communication channels, and probably other infractions of a sound, quality maintenance operation.

It can also be said with certainty the two senior mishap mechanics had been "slip-slidin' along" for 3 years and were even training unsafe practices to the next generation of aircraft mechanics. Scary, isn't it? **I wonder how many other unit aircraft nose landing gears have been worked on and might have some installed hardware with questionable torque values?**

In the safety business, we try to determine the *exact* factors influencing our flight and ground mishaps and assist the MAJCOMs, depots, other DoD agencies, and the aviation industry in looking for **hard-core** solutions to prevent future recurrences. We must avoid a tendency to **address only the symptoms *and not* the true causes of mishaps.**

Well, this mishap unit was no exception. They had correctly identified the mechanics' poor judgment in this mishap, but was the mechanics' judgment *really* the true reason? Arguably, the two senior mechanics should have known better. However, if they both felt comfortable enough to continue an unsafe maintenance practice for 3 whole years, couldn't we reasonably assume their shop's and unit's lackadaisical working conditions and atmosphere were major factors leading up to the mishap? And who, pray tell, is responsible for establishing and

continued on next page

The rationale for my agitation is this: If something (for instance, safety, training, quality assurance, or FOD/tool control programs) isn't important enough to be responsibly emphasized and reinforced by the bosses, then it probably won't be important to the workers either.

maintaining *any* working environment that promises only safe, quality maintenance will be conducted? Immediate supervisors, functional managers, and leaders — in that order!!

The rationale for my agitation is this: If something (for instance, safety, training, quality assurance, or FOD/tool control programs) isn't important enough to be responsibly emphasized and reinforced by the bosses, then it probably won't be important to the workers either. If bosses aren't constantly alert for shop or unit complacency or program weaknesses through periodic, accurate followups, then it's safe to assume each progressively lower level of supervisors and workers probably won't either. Finally, if those same bosses don't feel it's important to adhere to the highest standards of performance and conduct, then neither will the folks under them. It's a simple proposition — each level up and down an organizational chain will keep each other on their toes in conducting their duties and responsibilities through the daily application of unquestionable personal integrity and accountability.

Remember, one key factor in **everybody's** followups and feedbacks must be honesty in two-way communication. Tell the bosses or subordinates **what they *have* to hear, not what they *want* to hear**! Neither one can convey or fix what's broke if they're led to believe everything's fine. There's absolutely no room for "lip service" in the military, much less in the critical business of flight operations. Nobody wants to be the bearer of bad news (operational), but then nobody wants to break the news of the death of someone's loved one, either.

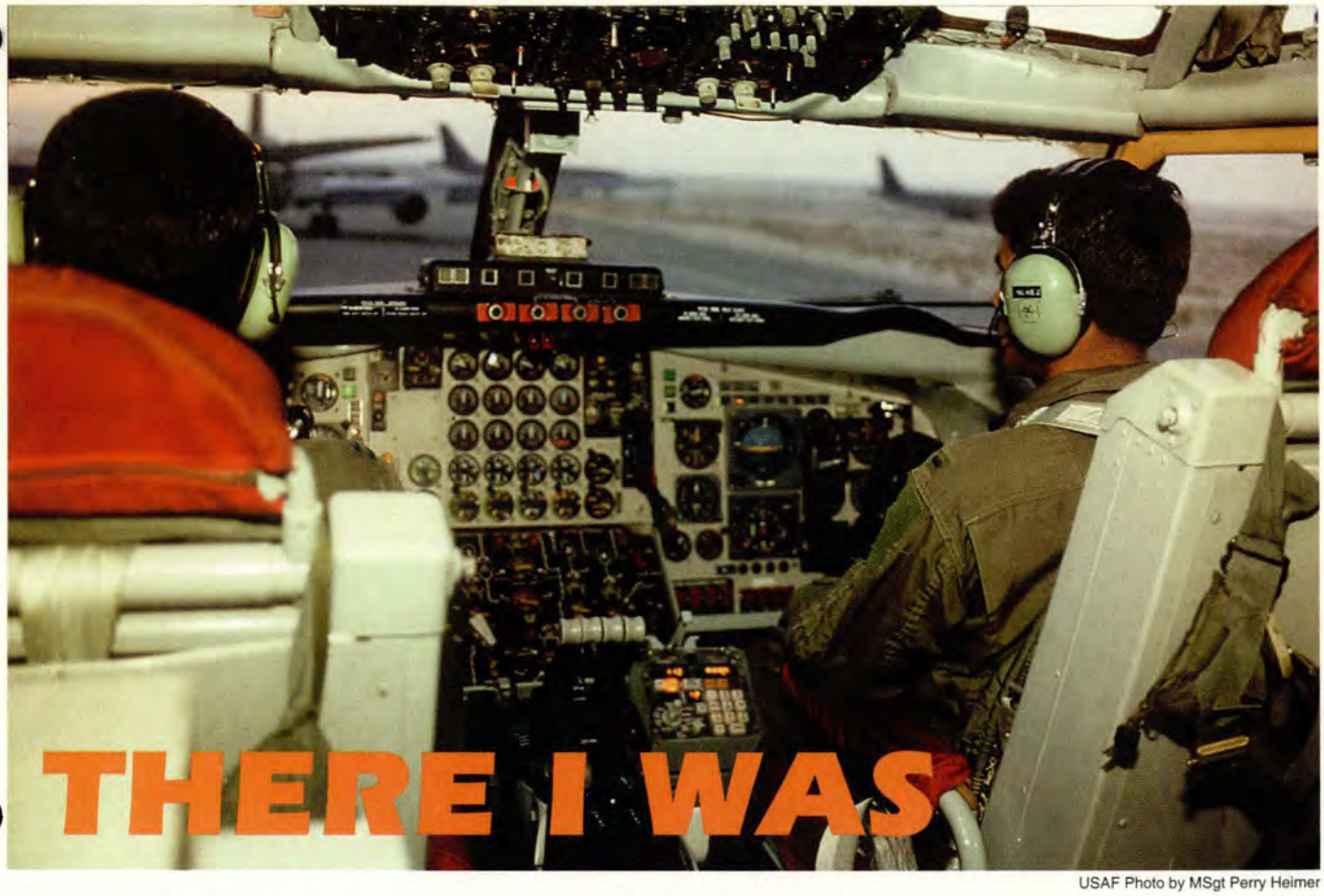
As we all know, **truly effective communication happens only when a message is effectively conveyed *and then* effectively received.** The most eloquent, understandable speech in the world is for naught if the receivers don't **effectively listen** to the spoken words — period!

As in this mishap, some of the mishap shop mechanics had tried to convey to others the old required 15/16th socket (apparently the one and only one) was shattered and a replacement was needed. It was determined the unit management was never aware the shop needed the 15/16th sockets. Consequently, due to these obvious miscommunications within the shop or unit, the sockets were never procured. Either the critical need for a replacement was never properly emphasized to those *up* the chain, or was properly conveyed, but the requirement fell on deaf ears, and no action was taken. Regardless of the circumstances, I firmly believe the unit's communication was a contributing player in the mishap's development. And again, who is responsible for establishing and maintaining clear, effective communication channels within *any* organization?

Do you think it's conceivable this unit's corps of supervisors and leaders will comprehend the disturbing signals radiating from this minor Class C ground mishap and correlate them to the unit's potential for greater category mishaps involving death and destruction? Do you think they might have stopped and taken a good, hard look at their questionable organizational production climate?

Based on my experience talking with the folks out in the field, including a few at MAJCOM and Numbered Air Force levels, a lot of people at the action officer/NCO and/or "boss" levels don't pay as close attention to the details or heed the distress signals of minor ground and flight mishaps as they should. So, naturally, these folks never fully realize they could be setting themselves up for a future Class A ground or flight mishap until it's too late. Unfortunately, they also have to face **the enlightenment** during the course of a formal accident and/or safety investigation.

What better or safer way to see if you really have a safe, quality-oriented unit than taking an analytical look at your unit's minor mishaps? We should all know the little hiccups in life — constantly overlooked and ignored —will eventually come back to haunt us in the form of a Class A mishap. So in order to avoid your own disaster, just plan, implement, direct, control, communicate, and follow up like you've been trained and educated. Don't be like this mishap unit and take 3 years to wake up, just **"slip-slidin' along"**! ■



THERE I WAS

USAF Photo by MSgt Perry Heimer

■ My first ride as an aircraft commander just happened to be a two-ship formation cell out of a busy civilian international airport. This airport is used to handling lots of traffic, ranging from L1011s and 747s to Cessna 150s. They also have a Guard KC-135 unit, and they *were* used to handling 12-second MITOs (minimum-interval takeoffs).

This particular day was very busy, and the air traffic controllers were doing an excellent job of handling the takeoff and landing sequencing. Our two-ship was waiting at the approach end for a hole to open up in the sequence so we could meet the refueling control time. We no longer did 12-second MITOs and were expecting spacing for a 30-second cell departure.

A small hole appeared to be opening up. As lead, our plane was cleared "on to hold" as a commercial passenger jet completed their landing roll. As I glanced down the approach end, I saw a 757 on about a 4-mile final. I thought, "This is going to be close," as I lined up on the runway. The No. 2 aircraft in our formation was even more concerned. I started to apply power for a static rolling takeoff in the KC-135E. Tower then cleared us for takeoff.

Engine Nos. 1, 2, and 3 came up to 1.2 EPR right away. Engine No. 4 was approaching 1.2, but it was lagging. I remembered how close the 757 was getting, so I released brakes while pushing the throttles up to 1.87. The next thing I knew, I was looking at the terminal building instead of straight down the runway. Nos. 1, 2, and 3 were at TRT, and No. 4 was lagging at less than TRT. I instinctively used nose wheel steering to correct back to centerline to no avail and a lot of chatter.

The runway lights on the right side of the airplane looked like tree trunks and were getting bigger. This was all happening in slow motion. I was thinking, "I'm going to go off the side of the runway! What can I do to stop this from happening?"

Throttles idle. The nose wheel chatter stopped. Tower asked if we would be able to take off. I told the copilot to answer "Yes" as I gingerly applied power and did a rolling takeoff. Our No. 2 tanker watched this comedy of events from the sideline as they never did take the active runway with the 757 so close on final. The 757 landed right after we took off, and our No. 2 aircraft took off 3 minutes later and joined us en route.

The 757 was happy not to have gone around and wasted gas and company profits. However, I learned a more valuable lesson that flight. *Communicate*. Don't let someone rush you into making dumb decisions. Tell tower what kind of takeoff spacing you need. Don't be afraid to make someone go around.

After I did the second takeoff, our data was no longer accurate, and I assumed the problem with the No. 4 engine was just a slow spool-up. That happened to be the case this time. I'm grateful for a supportive crew who stood by me. I am even more grateful for a dry runway and a clear VFR day.

Fly safe! ■

PREVENTING TOMORROW

A year ago, I offered readers of *Flying Safety* some thoughts on the Air Force's ongoing efforts to prevent mishaps ("Common Sense and Safety," January 1995). At the time I wrote that article, the Air Force was off to its best start ever — only three Class A flight mishaps in the first quarter of FY95, only one of which resulted in loss of life.

While we anticipated a new safety record, the rest of the fiscal year didn't live up to the promise of its first 3 months. By year's end, we suffered 32 mishaps, including our first loss of an AWACS, a C-21 crash, a midair collision, and an inadvertent release of a weapon into an observation post. A total of 47 Air Force people lost their lives to aircraft mishaps during the year.

Still, we need to keep last year's record in perspective. FY95 was our third best ever in terms of mishap rate (1.44 per 100,000 flying hours), and fewer aircraft (29) were destroyed in FY95 than in any year in Air Force history. Also, the F-16 fleet had one of its best years ever, reducing the number of losses by almost 50 percent compared to FY94, resulting in a mishap rate better than that of the fighter community as a whole.

So, with FY95's mixed results behind us, let's look to what's ahead. I'd like to briefly update and expand on a few of the themes I raised in last year's article, then offer a few thoughts on where I see the Air Force and its safety program today:

"There are no new accidents." While every mishap is different, there have been no new fundamental causes. We continue to face natural factors such as bird strikes and adverse weather as part of the inherent risks in our business. Engine and other mechanical problems also take their toll, as do human factors such as spatial disorientation and G-induced loss of consciousness.

"We have to work on human factors mishaps." Fortunately, we did fairly well this past year in terms of numbers of Class A mishaps. Unfortunately, human error remains a significant contributor to accidents. Often, we think of human factors problems as the sole domain of aircrew members. Several incidents this past year serve as reminders that the performance and technical competence of both our operators and maintainers are critical to mission success and safety.

"High OPTEMPO will continue." We've worked hard to reduce the OPTEMPO across the board, but we will continue to receive heavy taskings for the foreseeable future. That is the nature of our business. We'll continue to work hard to balance the taskings throughout the force and ensure we fund adequate spares, updated equipment, and training opportunities to keep our force ready. I expect everyone to have the courage to speak up with a "knock-it-off" call when the pace of operational taskings begins to create unsafe conditions. You, the folks on the line, are the best ones to know when things start to get out of hand.

"Needed: a fresh look at safety." To ensure our overall safety program was above reproach, this past June we chartered a Blue Ribbon Safety Panel to review aviation safety within the Air Force. To ensure objectivity, I asked Vice Admiral Engen, a retired naval aviator and former administrator of the Federal Aviation Administration, to chair this panel. He was joined by former Secretary of the Air Force Hans Mark; retired Air Force General Robert Oaks, former CINCUSAFE and more recently employed by USAir to work safety issues; and Brigadier General Joel Hall, former commander of the Air Force Safety Center. I asked Admiral Engen and the other panel members to examine Air Force safety organizations and procedures without restriction. The panel's charter empowered it to look at all safety documents and to talk with any

W'S MISHAPS

Air force personnel relevant to the panel's mission.

The panel completed its study at the end of August, concluding that "the organizational structure of the Air Force Safety effort — both in the prevention and in the investigation of mishaps — is appropriate for a military organization. Combat efficiency must have a first priority for the Air Force and this means that the responsibility for flight safety must be lodged in the military command structure." In short, our institutional safety program is in good shape. The Blue Ribbon Panel report was illuminating in other areas as well. Its recommendations covered a broad range of issues, all aimed at making our safety process even better and our operations safer:

- Privileged information must be protected.
- Air Force Safety would be more responsive to the needs of the field if the Chief of Safety and his field operating agency worked under the same roof.
- The Air Force's Cockpit/Crew Resource Management (CRM) program needs to be given more Air Staff attention.
- Safety board presidents and members need better and more readily available training to do their jobs more effectively.
- Safety board reports and their subsequent review and followup need more visibility to the Air Force flying community.
- MAJCOM CCs, not lower-echelon commanders, should convene all investigations of losses experienced within their commands.
- We need to better understand the real effects of high OPTEMPO and reduced manning.
- Class B, C, and HAP mishaps need closer scrutiny to deliver on their full prevention value; a less serious mishap is often just a single decision or a lucky break away from being a disaster.

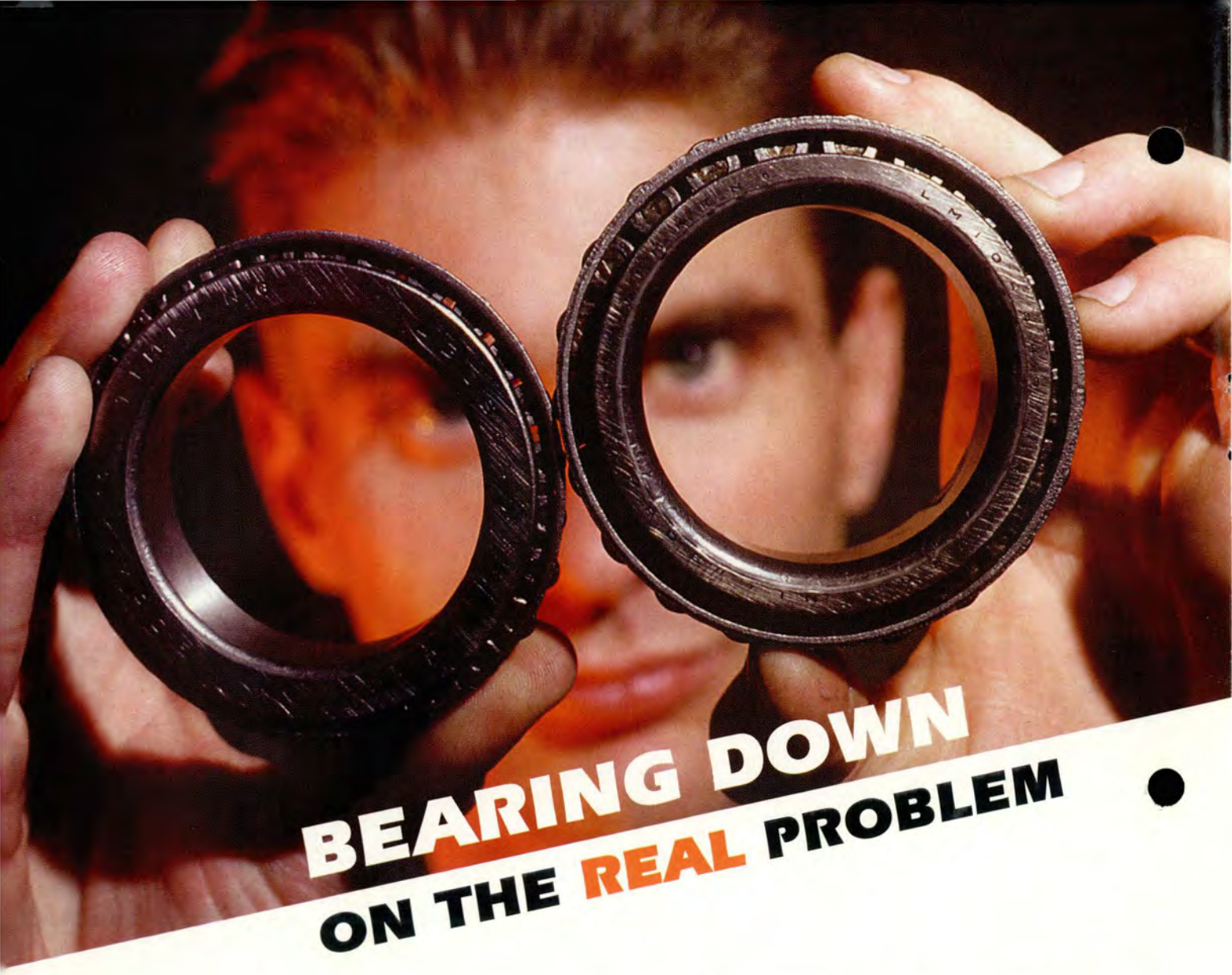
I've been getting many briefings and seeing a lot of action over the past few months on many

GENERAL RONALD R. FOGLEMAN
Chief of Staff, USAF

of the Panel's recommendations, and there's progress on every front. For example, by the time you read this, the Chief of Safety will be in place at Kirtland AFB in Albuquerque, New Mexico. He and his immediate staff are joining his current field operating agency — the Air Force Safety Agency — to form a new organization known as the "Air Force Safety Center," providing one-stop safety policy and program guidance. The other recommendations are getting equally fast, high-level attention.

I'd like to close with a few thoughts about risk. The need to make our operations safer and smarter has never been greater, but as an Air Force, we're obliged to step up to the missions we're given. If those missions involve inherent risks, fine. Risk goes with the territory. The key is to ensure that, from the planner to the crew chief to the airplane driver, everyone involved knows what the risk is, who it affects, and what we can do to minimize it.

As we look ahead into the New Year, I ask all of you to identify potential risks and aggressively try to minimize their impact on our ongoing operations. It's up to every member of the Total Force to do his or her part to make our mishap prevention program a success. I will continue to work hard to ensure that Air Force leadership at all levels is responsive to your inputs and feedback. Together we can make the upcoming year a record year for safety. ■



BEARING DOWN ON THE REAL PROBLEM

To allow almost identical hardware and parts to be commingled during routine repair or servicing activities on two separate component end-items is absolutely beyond comprehension. It's a sure-fire way to invite trouble — trouble that can lead to the death of others.

CMSGT DON A. BENNETT
Technical Editor

The impetus for this article is based on *two* identical F-16 incidents from the same unit, occurring about a week apart. Both involved total destruction of a main landing gear wheel assembly because **a *nose* wheel bearing** had been installed in each of the ***main*** **wheel assemblies.**

For this F-16 unit, the month of June required them to switch to wet-weather flying criteria, which requires all tires with tread depths beyond tolerances be replaced. The wheel and tire shop's average rebuild production rate of 40 wheel and tire assemblies per month was significantly increased during the transition to wet-weather operations. The additional workload for the wheel and tire shop lasted about 10 days.

The wheel and tire assemblies in question were taken to the wheel and tire shop for disassembly. Bearings were cleaned, inspected, and repacked, and a new tire was installed on the wheel assembly.

It was determined during the cleaning process the nose *and* main wheel bearings were "mixed" by shop personnel. However, the mixed bearings were supposed to be separated when they were repacked with grease.

Extreme care has to be exercised at this point because of the close similarities of the two bearings. The inner bearings for both the nose and the main wheels are the same diameter, but the nose wheel's outer bearing diameter is about 1/8th inch smaller than the main's. In fact, a nose wheel bearing will fit quite nicely in a main wheel's outer bearing holder, and the main wheel can be completely reassembled with the *wrong* bearing installed.

Because of the potential for inadvertently using the wrong bearing, TO 4A4-77-2 calls for a ***visual/physical*** *part number identification to verify the correct bearings are being installed.* This tech data also refers maintainers to the illustrated parts breakdown, TO 4A4-77-4, for actual part number identifications. TO 4A4-77-2 even warns of the possibility of the *main wheel's* inner and outer bearings being interchanged during assembly, but it doesn't specifically address the fact the *nose* wheel bearing will also fit in the main's outer bearing holder. **Remember: This warning is in the *back shop's* "tear down and build up tech data."**

Six days before this incident, an experienced 5-level mechanic had changed the mishap wheel and tire assembly on a unit aircraft's main gear in order to meet the wet-weather tire tread depth requirements. Besides the 5-level, it was necessary that a 7-level perform an in-progress inspection (IPI) to complete the task.

TO 1F-16CJ-2-32JG-40-1 requires the **installation** mechanic to verify correct wheel bearing part numbers *before* the wheel and tire assembly is installed. For whatever reason, the installation mechanic **never** performed this last-chance critical check. (This "before" installation verification **isn't** part of the IPI inspector's duties; however, the unit has initiated the appropriate action to have the IPI inspector included in this critical preinstallation check.)

It was determined during the cleaning process the nose *and* main wheel bearings were "mixed" by shop personnel. However, the mixed bearings were supposed to be separated when they were repacked with grease

Anyway, both mechanics (back shop and flightline) failed to comply with their respective tech data and verify main wheel bearing part numbers.

Also, the wheel and tire shop boss contributed by **not** properly controlling the disassembly and cleaning of *both* the nose and main wheel bearings so as to keep them from becoming mixed — especially when the back shop tech data stresses the importance of the bearings' similarities and warns against installing the wrong bearings.

It shouldn't surprise anybody this unit had two mishaps resulting from the sloppy handling of the wheel bearings. Indeed, big problems can result from abnormal upsurges in our folks' workload, when we, as supervisors, forget to be on the watch for "cutting corners" or maintenance malpractices.

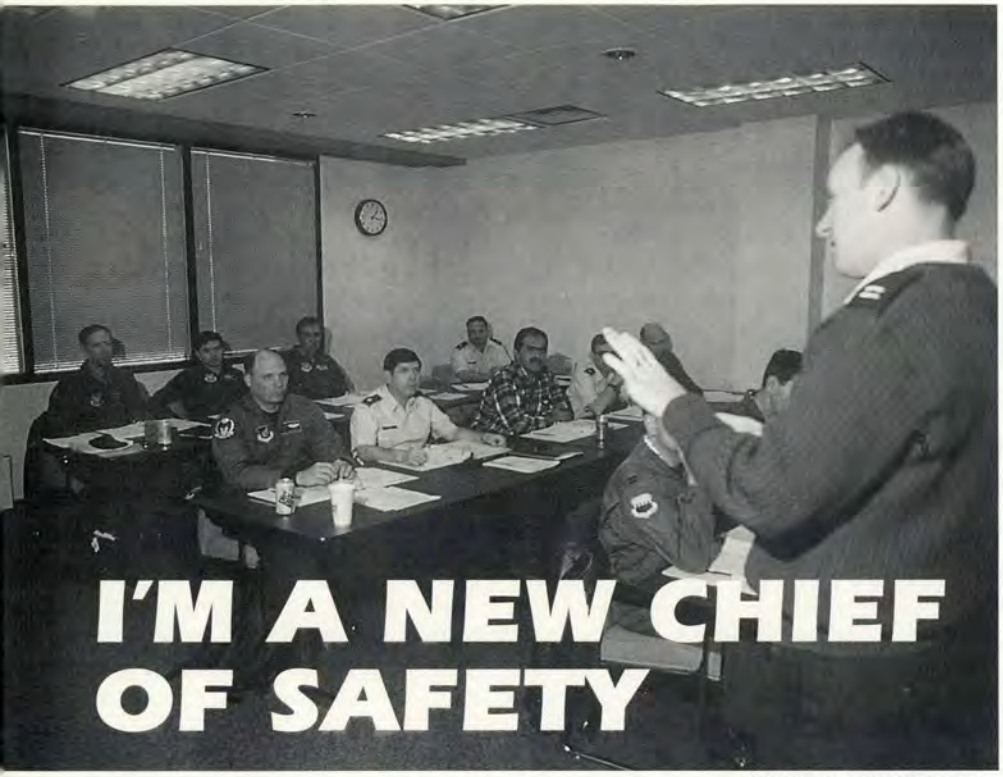
If you maintenance supervisors and managers (e.g., from multiaircraft, composite wings, or units with different F-16 block jets) want to check your organization for this potentially lethal condition, please don't start with supply or at the hardware bins. Save yourselves some time and go straight to the shop bosses. If they are running their wheel and tire shops like they're trained, they should know the answers to your questions.

Just start off by asking simple questions like **"Do you have look-alike hardware or parts for different aircraft or equipment inventories?"** and **"If you do, what precautions are being taken to prevent their mixing?"** Of course, if you get immediate, precise answers with clear-cut examples of look-alike items and the positive steps taken to prevent commingling, you, no doubt, have a "real shop boss" minding the store. This kind of courtesy visit is probably all that's needed for the vast majority of all the shops Air Force-wide.

USAF Photos by MSgt Perry Heimer

The inner bearings for both the nose and the main wheels are the same diameter, but the nose wheel's outer bearing diameter is about 1/8th inch smaller than the main's.

But if they give you that blank stare smirk resembling those on post office wanted posters, you really need to dig deeper. You might also want to review their job qualifications. You could have some excellent examples of the Peter Principle in action! And, if you do discover serious breaches of maintenance discipline, then it's now *your* responsibility to **"bear down on the *real* problem"!** ■



I'M A NEW CHIEF OF SAFETY

USAF Photo by MSgt Perry Heimer

What Do I Do Now?

LT COL KIRK D. F. MILLER
22 ARW/SE
McConnell AFB, Kansas

■ The purpose of this article is to address the concerns you have, as a rookie chief of safety (COS), new to the position, and lacking experience in the safety culture. Hopefully, what I've learned during the past 2 years will benefit others in the challenges ahead. I will focus on selected areas I feel are critical to success while you are gaining your own vital experience.

The keys to success are your people and your leadership. In the safety culture, your people are the safety-trained experts, and you are the trained leader. You provide the leadership as their facilitator, manager, motivator, and provider of their needs to perform their mission effectively. You must trust them and temper their expertise with good judgment and common sense, and *always ask the right questions.* But don't try to become the safety expert — you weren't trained for that.

A First Priority and an Example

One of the first things you should do as a new COS is become well acquainted with your people — know what they do and how they fit into a working safety system. Make sure they are properly trained. You can't expect people to perform well if they don't know how.

Let the experts teach you the system — not the details. For example, during my first week as chief of safety, I was given a 30-day notification of a Department of Defense Explosive Safety Board (DDESB) inspection. In a crisis situation, you'll get smart quickly about quantity distance clear zones. I asked the right questions and discovered, to my horror, we had 57 violations of AFM 91-201 safety regulations which needed to be fixed *yesterday.* We worked 35 days straight to put the wing in compliance.

The problem? In the year they had been on the job, my people were never formally trained. The two explosive safety technicians had experience as flightline weapon loaders and as production managers. But they didn't have a clue as to what to look for in terms of safety compliance. My first act was to find experts from NAF, newly trained safety technicians, and gain the expertise. We survived the DDESB inspection, but it took the direct and immediate support of the wing commander to get it done. And this leads to my next point.

Support From Your Boss

The emphasis your wing commander places on safety is a key factor. *The success of your safety program depends on how much your boss supports you.* The wing commander sets the temperament for safety priorities and directly influences the rest of wing leadership involvement. Safety is an attitude which emanates from, and is reflected through, you and wing leadership.

In preparation for the DDESB inspection mentioned earlier, I took the wing commander on a tour of all the noted discrepancies. He requested, by cellular phone, the support group commander meet him at the nonnuclear munitions storage area. The igloos' lightning protection system had deteriorated. Work orders, on the books for 5 years, had been ignored. The wing commander directed a completely new system be put in place in less than 1 week — and it was done.

It' a Cooperative Effort

Safety success depends on cooperation. Since safety permeates every organization on base, your participation and involvement with each group are critical. Be tactful, courteous, and empathetic, but stand your ground. Your integrity and your judgment must not be swayed by popular vote or rank.

For example: For training purposes, circling approaches were being accomplished at low altitude, directly conflicting with a nearby civilian airfield. The operations group didn't want to sacrifice training despite the fact uncontrolled civilian VFR arrivals/departures were head-on and at near co-altitude with our aircraft.

When disputed issues arise, voice your concerns and put them in writ-

ing. Give your wing commander an operational risk assessment. Chances are, as in my case, decisions won't go to wing commander level since putting problems in writing requires commitments and answers everyone must live with. In this situation, the decision was made, before reaching the wing commander, to prohibit training circling approaches toward the civilian field. Documentation and commitment are key factors in bringing about safety reasoning.

Ground Safety, Too

In the ground safety arena, one of your main and closest customers is civil engineering (CE). CE is usually in charge of most construction, which often creates hazards — hazards you must help control. CE is also the main source to fix the hazards you discover. How well you interact with them may determine how quickly you eliminate your RAC* 1s, 2s, and 3s. Arrange a meeting with both the operation support group commander and CE commanders to establish the rapport you'll need to get your job done and accomplished quickly.

CE and the fire department are your key customers for lockout/tagout programs. These programs are very often the most neglected in ground safety. To run the program right, you need extensive knowledge of every facility on base. Beware of new construction, upgrades, renovations, and "do it yourselfers." They can ruin a good in-place program.

Contractors doing construction on base are always a problem. Get to know them. Know habitual violation patterns, and be persistent in demanding corrections. You'll need to report violations, not only to contractors, but also to the base contracting office. If you don't get satisfaction, your next recourse is to call OSHA. Monetary fines tend to get contractors' attention and compliance.

The Importance of Planning Ahead

Okay, it's 0300 Saturday morning, and you get that dreaded call from command post. You have an in-flight emergency (IFE) inbound with aircraft damage. Don't panic, but do have a plan. Collect all the information, assess the situation, notify required people to respond, and get to the flightline as soon as possible. Tell command post you'll need the aircraft impounded when the IFE is terminated. Have them recall the base photographer or use your own camera, depending on the situation. Probably tox tests will need to be taken, and the on-call flight surgeon will have to respond. Aircraft specialists must also be called in for damage cost assessments. Command post will be required to do either a "homeline" or "beeline" message. You are the source of information for their report and the wing commander's signature for release.

Once you have the crew and other witnesses, get their statements as soon as possible. Brief them on safety privilege before you start, and make sure they understand it. If you have a tape recorder, record your questions and their answers. Notify the wing commander, NAF, and MAJCOM as soon as you have all the known, accurate facts. Otherwise, it can be, and has been, embarrassing.

Keep your objectivity — you want only facts. Keep the command post message as simple and direct as possible. Never insinuate, place blame, or find cause. Remember, you have an extensive investigation ahead of you.

Depending on the type of mishap, an interim safety board may be required to convene. Before you make that call, your recommendation to do so should be made to the wing commander. If he concurs, brief the NAF. If you're well prepared, you'll have an updated list of trained individuals you can use as interim board members. You can begin the recall to your designated location to start the investigation.

Once the on-scene commander releases the crash site, security police will secure the area and set up an entry control point. One of the first things you'll need is an authorization letter allowing access to the site, signed by the wing commander, listing safety board members,.

Preserve evidence on-site as soon as possible. Brief your team not to accidentally destroy evidence by wandering around or moving pieces. Take a video camera, and scan the entire site in detail. Necessary still shots can be taken later.

Be prepared for shock if you've never seen a mangled or burned body. The initial crash response and medical personnel will first help those living, but the deceased won't be removed until later. In my experience, it could take up to 3 days to recover all body parts. Mortuary affairs will set up a recovery location to preserve the remains.

Go through the equipment in your mishap response kit. Does it have all the items required to do your job?

Are your vehicles well maintained so you can get where you need to go? Hopefully, you have made prior letters of agreement with the transportation squadron commander so four-wheeled vehicles will be available for mishaps happening in obscure areas.

A laptop computer is essential. You've got to be mobile. Make sure you have all required safety forms with you at all times.

Mobile radios with secure voice and spare batteries are a must, but be careful what you say. There are scanners out there. Every reporter has one, and some, I'm told, can pick up even secure voice transmissions. Don't jeopardize the investigation, and don't talk to reporters. That's Public Affairs' job!

Be aware of the weather. Rain, snow, and ice can very quickly destroy critical evidence. Sometimes the camera will be the only means to preserve evidence.

I've experienced two Class A mishap investigations, and I've found you usually have more help than you need. Therefore, you must properly control your help. Keep the investigation command center off limits to everyone but board members. Keep the board president focused on priorities. Never assume people remember the details of that 3-day safety course they had 6 years ago. You, too, must keep focused. You have only 8 hours before your first message (preliminary report) is due. Again, keep it factual, direct, and objective. All board members

continued on next page

*Risk assessment codes

should be aware there isn't a shift change to relieve them. It's been my experience you'll work the first 22 hours straight before you can get a little sleep. *The key is to be prepared, know in detail your O-plan for mishap response, and know your priorities.*

Teamwork, Training, and Decision Making

Teamwork is a key factor in a good safety office. Yes, all your people are specialty trained, but they can be used for other purposes. You will always be short of manpower, so all three disciplines (explosives, ground, and flight) must help each other or you'll fail. It's your job to integrate the disciplines, keep them informed of the issues for each discipline, and delegate help where it's needed. A sort of "on-the-job" cross-training will pay great dividends when one discipline is task-saturated.

Your squadron unit safety representative (USR) and flight safety officer must have the best training your people can provide. If at all possible, hand-pick these squadron representatives. If their commanders do the selecting, stress they must choose the representative very carefully. It should be someone who has continuity and, above all, a proactive safety attitude.

It's my experience not everyone will be motivated to do their safety job. In one case, I personally requested one USR be replaced because he didn't believe in safety. Don't be afraid to take appropriate action. Commanders will usually support you.

You must realize your decisions will not always make you the most popular person on base. Many times you'll be the bearer of bad news which will cost lots of money and a lot of work to fix. You may find someone's perception is that safety means evaluation and scrutiny, and perhaps they believe their main purpose is to harass people and organizations.

For example: It was payday, 30 minutes before the commissary was to open. The night before, there was significant water damage, breaking a ceiling beam. The commissary had to remain closed in case the rest of the structure dominoed.

Another example happened at the small-arms firing range. For years, the overhead baffles didn't stop projectiles in accordance with regulations. We had to order the range closed. It cost $1.5 million to build a new one, and readiness for mobility was greatly impacted — but it was safe.

When the commissary cold storage area had condensation, we closed the facility just hours before the ceiling collapsed. The cost was $120,000 for a temporary storage facility, but it was safe.

When it was discovered the golf course maintenance facility was in an explosive quantity distance clear zone, we shut the facility down. This situation had been tolerated for years. Others had covered it up as an acceptable risk. Remember, other people depend on your integrity to keep them safe.

Annual and spot inspections are great for finding and correcting potential mishaps, but there are other ways to be proactive. One way is to master the art of trust. If commanders, supervisors, and most important, their subordinate people, know you're approachable, know you don't constitute a threat, and believe you are there for them, they will inform you of problems impacting safety. Think about it. Who better knows the hazards and dangers they face day to day in their work environments than those who work with the problems/hazards? The point here is get to know the people. Ask how it's going. You'll be surprised what you can learn and correct before problems result in mishaps.

The Unexpected and the Bizarre

Situation: A maintenance facility had a refrigerator in which an airman stored Freon in an unmarked ice water container. You got it! Another airman drank some of the Freon.

Situation: A KC-135 engine was lost because of a night bird strike with a goose! Geese don't fly at night, do they? Well, this one did!

Situation: A DUI on base — the driver hit a telephone pole, and the security police found a grenade under the car seat. EOD spent 2 hours trying to remove a dummy grenade from the wreckage.

Situation: An airman had an auto accident at 10 a.m. At 11 a.m., the same individual ran a forklift through a storage building. Don't forget tox testing. I personally went to his squadron commander and recommended he order one be taken.

Situation: An airman saw a fully loaded semi being backed up to a dock. He put himself between the truck and the dock while motioning the truck driver to keep backing. The airman was crushed, but he lived, fortunately.

The Bottom Line

So what's the bottom line? The points I've tried to make can be summed up in this laundry list of key result areas for a new chief of safety:

Leadership
Teamwork
Training
Planning
Readiness
Integrity
Involvement
Attitude
Communication
Cooperation
Proactive awareness
Trust
Participation

I hope this will give you a starting point to integrate effectively into the safety culture. I haven't even addressed many other areas, such as safety advertising, spot inspections, OSHA, awards programs, HQ inspections, messages, strategic plans, and key yearly events. But Rome wasn't built in a day either.

Hopefully, you'll inherit an outstanding program on which you can ride until you get your feet wet. Being a chief of safety is a challenging job with great rewards, a tremendous amount of responsibility, and lots of authority to handle the accountability. Best of luck! ■

FINAL

Reflections on a Final Flight

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■ I read with interest, several years ago, about an "old" aviator who had flown the last of an MDS to the "boneyard" near Tucson, Arizona. While reading about the event, I thought, "What a glorious trip that must have been." I pondered the distinction of being among those who take a marvel of aeronautical, mechanical, and electrical engineering to its final place in a history filled with years of service to this great nation. What an honor it must be.

That was long ago. I hadn't thought about that article in the base newspaper for years — that is, until last week. It was then I remembered and realized I'd considered all those things in the naivete of my youth.

You see, last week I participated in the funeral procession of the last five AC-130A Gunships. The procession departed Duke Field, Florida, on Thursday, 28 September 1995. One Gunship proceeded to Davis-Monthan AFB, Arizona, one to Warner Robins AFB, Georgia, one to Dobbins AFB, Georgia, one to Wright-Patterson AFB, Ohio, and one to Eglin AFB, Florida. I drew the trip to the Air Force Museum at Wright-Patterson AFB.

When we landed Thursday afternoon, there were a couple dozen cameras of various types held by people standing along the "closed" Wright Field (DWF) runway. We turned onto the last taxiway, shut down the engines, took a final look at our stations, and stepped off the aircraft for the last time. Taking a final look, we handed over the forms to Air Force Museum personnel. For me, the event marked the conclusion of 19 1/2 years flying an aviation legend. For the aircraft commander, Lt Col Larry Muench, the landing was not only his last sortie after 20 years flying AC-130A Gunships, but was also his last sortie as an Air Force pilot.

I left the flightline in 1975 and moved to the world of Special Operations. I first flew AC-130A Gunships as an aerial gunner from 1976 until 1979, then as a navigator from 1979 until 1995. I'm here to tell you, one can't fly the same 10 tail numbers in the same organization for 20 years without developing an intense loyalty for the unit, the people, and the aircraft.

In retrospect, taking the last of an MDS to its final place of rest, even when it's the Air Force Museum, is a sad event. AC-130, tail number 54-1630, will stand proudly in the same hangar with ex-Presidential aircraft. There, thousands of people will view her in awe for years to come. But her engines will never again emit the sound of freedom, her guns will never again spew the fire of military power, and the Ghost Riders who knew her very soul will fly her only in fading memories longing to be real.

Perhaps it's a little like putting your wife of many years in the finest available retirement home. You know she will receive the best of care, but both of you will miss your times together, and it will never be the same again.

This time, I'm the "old" guy who took the last of an MDS to rest. Down the road, it will be your turn. While you can, enjoy your years with that marvel of modern engineering, the one you wear with pride as you streak through the skies defending our country. In just a few years, like the AC-130A Gunship, the life of your aircraft will be over. You see, her life is even shorter than yours. Treat her well, fly her with care, and she will give you all she has for all the days of her life. ■

We salute Lt Col Larry Muench, ghost rider, pilot, and friend. The landing was not only his last sortie after 20 years flying AC-130A Gunships, but was also his last sortie as an Air Force pilot.
The Members of Azrael's Final Crew

A FIGHTER PILOT'S PERSPECTIVE

MAJ ANDY PARRISH
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USAF Photo by SrA Steve Thurow

Last year, I reached the milestone of 2,000 hours of fighter flying time. Since then, I have been running over in my mind just what I have to show for my 12 years and almost 3,700 hours of Air Force flying. What important lessons or skills have I learned? Some of my friends would say "not much," but I'll proceed anyway. None of these thoughts are original — most date back to the Wright brothers. Maybe some young pup will benefit from the review. Maybe we all can.

Experience

A couple of years ago, someone asked me what was my greatest weakness as an officer and fighter pilot. I didn't know what to say, so I said I was still a young fighter pilot in terms of experience. If asked the same question today, I think I'd give the same answer. Many of my peers have a greater breadth of fighter experience to include having flown in combat or in several different fighter types. Most have more fighter time than I, if that's a measure.

However, those who believe they've seen and done it all are headed for a fall. Experience doesn't mean anything when the youngest pilot in the squadron capitalizes on your BFM (basic fighter maneuvers) mistakes or takes your money on the bombing range. Experience aids in judgment, but you can never assume your performance will automatically be up to par just because you've been there before.

Leadership

I have had the good fortune to work for the finest operations officers and squadron commanders in the Air Force. They all had different styles and personalities, but they all led by example. They were the best flight leads, the best instructors, and worked hard to stay that way. They were in the books (I could tell by the questions in the brief), led the most challenging missions, did the thankless jobs, and handled the responsibilities of their jobs without complaint. If I ever become a commander or operations officer, I won't want for lack of role models. The challenge for all of us is to take the elements of their leadership that inspired us and incorporate them into our own style.

Maturity

We all have crazy-young-lieutenant stories about ourselves or others back in the good old days. However, there comes a time when the new nugget is expected to mature a little. Around the squadron, maturity and hard work are what distinguish the more professional people. Away from the squadron, young lieutenants are free to be a little footloose, but there are bounds. Remember, all your actions reflect on your professionalism, whether at work or away. Professionalism is always in style, but if you need to be the center of attention, then go back to grade school.

Airmanship

It is one of the strengths of our modern Air Force that we develop good airmanship skills in our young airmen. An important part of airmanship is attention to detail. Attention to detail is alive and well in aviation — just read the accident reports for the last 10 years or more.

As a young pup, a reputation for attention to detail is one of the best compliments you can aspire to. You will be the person the commander wants to do the job. We all make errors every time we fly, but it's the missed detail or misprioritization that can kill. Stress attention to detail on the ground and in the air to develop it in yourself. The Academy tried to teach it to me through a myriad of menial tasks — room organization, uniform, marching, etc. I don't know if they succeeded, but I do know it is a prerequisite to be a good aviator. The best tacticians I know all have it.

Training

In my old fighter squadron, a young lieutenant walked into scheduling where his flight commander (one of the best instructors I've known) was building the schedule for the next day. "Shucks," he said, "just a BFM sortie. I was hoping for a 4v4 dissimilar mission with F-18s."

The young lieutenant was nearly consumed by the ensuing verbal explosion from the crusty flight commander. I'll abbreviate, but basically he said that the lieutenant couldn't find a certain bodily orifice with both hands, let alone find the turn circle, and that once he was proficient at BFM inside, on, and outside the turn circle, he could press on to dissimilar air combat training.

The strength of our Air Force is the training we give and receive. The finest fighter pilots I have flown with have several traits we should all take to heart.

First, they all stress the basics. The basics keep you alive and are a must for everything else. The best BFMers are also the best intercept tacticians and the best bombers. They are always in the books. Most have a reading list they continually cycle through to include aircraft and weapons manuals, regulations, and threat manuals. The 3-1 employment manuals are outstanding. They were written by the best and have improved with every edition. If you don't know the salient chapters inside and out, *you are not doing your job.*

Lastly, the best tacticians are their own worst critics. They don't let deviations go unnoticed (attention to detail) or uncorrected. How do you think they got so good? They weren't born great instructors — they practiced and critiqued every mission. They took notes on what they did right and wrong. We all need to do the same every day.

Free Advice

Here are a few things I wish I'd done.

First, keep good notes as you progress through upgrades, whether it be flight lead, instructor, or mission commander. You will get rusty, and these notes can help prevent making the same mistakes again.

Second, figure out how you can be better 6 months from now. That may include studying practicing certain flying skills, or just working on your mission briefing/debriefing skills.

Third, find the "best" in your squadron, and get everything you can out of them. I wish I could go back and have just a couple of hours to learn from some of the great people I admire from my old fighter squadrons.

Fourth, spend a few hours riding around with your squadron's expediter or production superintendent. If you keep your eyes open, you'll learn a lot. I count many of these NCOs among my leadership role models.

Last, if you have something to say, then say it in a professional and convincing manner. Otherwise, it pays bigger dividends to just listen and learn. Most of us would be better off if we heeded this advice.

If this came across as a confession, then forgive me. What really prompted this article are my feelings about the many people I've seen lost over the last 12 years in Air Force aviation. Young guys are amazed when I say I've lost more friends than I can count on my fingers and toes. Some were good friends — most were just acquaintances. Only one was lost in combat.

Unless you are working to be better, you are losing ground. I'm convinced strong basic fighter skills and attention to detail are what count. So what do we all have to show for our time and years? We have our service to our country to show for it and be proud of, and we have the memories of those fine aviators who gave all in their service.

To them this is in tribute. ■

NVGs AND IMC

CAPT BRET CRENWELGE
HQ AFFSA/XOPF

I know. I can already hear what you're saying. "It's the Flight Standards Agency coming to regulate our operations. Run!!" Well, this article is not about regulating your procedures. It's about common sense — and some cold, hard facts that could very well save your life. Watch out! If you're not careful, you might learn something!

The use of night vision goggles (NVG) has provided the United States Air Force with the ability to conduct extensive operations at night. NVGs have significantly increased our combat capability by allowing pilots to fly at high speed and/or low altitude during night conditions. As technology has improved NVG quality, the Air Force has increased the number of aircraft that use them. Recently, AFFSA was asked to develop standardized night vision device guidance for incorporation into AFI 11-217 (AFM 51-37). The most frequently asked question we heard while compiling this guidance was "Can I use my NVGs in IMC?"

The legal and short answer is "No," but don't toss this article aside saying, "My goggles work just fine in IMC, thank you." Read on. Instead of just learning the answer to this question, it's important to understand why it's the correct answer. To best explain, I need to start with a little background information, then cover weather and how it degrades the illumination required for NVG operations. Finally, I'll show how NVGs perform in the weather and how to avoid IMC conditions.

The human eye and NVGs are sensitive to different ranges of the electromagnetic spectrum, just as a radio receiver can be selectively tuned to a specific frequency within a broad spectrum. The eye is most sensitive to the visible spectrum which gives us the perception of color. At night, a substantially higher degree of light exists outside the limits of visible light in the near infrared (IR) region. It is in this near IR region that NVGs are most sensitive.

With that understanding of the nighttime operating environment, let's turn our attention to weather and focus on how it degrades the illumination for night flight. Any condition of the atmosphere that absorbs, scatters, or refracts the illumination, either before or after it strikes the terrain, will effectively reduce the usable light available for NVG operations. The exact amount of reduction is difficult to predict because a common factor cannot be applied to each condition of cloud or fog coverage. To explain the issue in simpler terms, consider clouds to be one of two types — thick or thin.

Since NVGs are primarily sensitive to near IR energy, and near IR energy is poorly reflected by moisture, a contrast exists between a thick cloud that is not reflecting near IR energy and an object or substance that is reflecting near IR energy. It is this contrast that is perceived by the NVG and results in the cloud being "seen." Thin, wispy clouds have more space between particles, allowing a larger percentage of the near IR wavelengths to pass through without being scattered. If more IR light is passing through the thin clouds, no contrast will exist between them and their surrounding environment. Therefore, thin, wispy clouds, which may be seen with the naked eye, are invisible when viewed through the NVG. This potential invisibility is possible given three conditions:

(1) The clouds are thin and wispy (or at least so on the edges of the cloud prior to becoming dense),

(2) The clouds are low level and set in against the terrain rather than being silhouetted against the night sky, and

(3) Ambient light illumination is either very high (causing the intensifier tubes to gain down) or very low (causing NVG graininess).

The invisibility of thin clouds which progress to thicker clouds hiding terrain features can create a severe hazard for NVG operations. In that regard, a common question occurs: "If the cloud is 'invisible,' why can't a pilot see the terrain behind it?"

The answer is complex but similar to the conditions encountered while driving a car in a rainstorm. Although there is still some visibility, it is degraded, and objects in the distance may not even be visible. The big difference between this analogy and what occurs with NVGs is that the reduction in visibility is not as obvious with NVGs. First, the cloud reduces visual and near IR illumination and luminance, which, in turn, reduces scene contrast and texture. This produces a false perception of distance, resulting in the pilot either not seeing the terrain or thinking it is much farther away than it actually is. Also, the cloud may get progressively thicker, allowing the pilot to progress into the cloud without initially perceiving it or the terrain behind it. If a cloud is detected, the perception may be that it is off at a distance.

Go back and reread the last few sentences. Do you understand the importance of those words? If you fly into clouds you don't detect, one of two things can occur. If you are lucky, and if the cloud consistency stays the same or dissipates, and if your NVGs are still intensifying the available energy, you might escape unscathed. That's a lot of ifs, but it's the best possible scenario in this situation.

On the other hand, if you fly into an undetected cloud and it gets progressively thicker, there is reduced energy for your NVGs to intensify, and the potential for a mishap has increased significantly. You now have no outside references for terrain avoidance or situational awareness, and you are setting yourself up for an unusual attitude. Oh, yeah, don't forget the clouds could be obscuring terrain. I don't know about you, but that's a situation I'd like to avoid.

Well, now that you know how NVGs perform (or don't perform) in IMC, I hope it is readily apparent why NVGs should not be used in these conditions. Recognition in the cockpit of the reduction in ambient illumination is sometimes very difficult. The changes are often very subtle reductions in contrast that are not easily perceived when viewed through NVGs. Aircrews should keep in mind that the image intensifier tubes have a feature called automatic gain control which, in effect, hides these subtle changes by attempting to provide a constant image in spite of changing luminance conditions. If cues are perceivable, you'll have to be looking for them to catch their significance.

How do I avoid IMC while utilizing NVGs if clouds are invisible? Good question. You have already accomplished the first step towards avoiding inadvertent IMC with NVGs — knowledge. Knowing that the conditions exist and training to avoid them are paramount. Next, use the following cues from the NVGs themselves to warn you of impending IMC:

(1) A halo may be perceived around a source of illumination. The halo effect tends to increase when atmospheric obscurants are present.

(2) A gradual reduction in light levels, visual acuity, or terrain contrast.

(3) Partial obscuration of the moon and stars.

(4) An increase in NVG "snow" when atmospheric obscurants are present and the ambient light is low.

Aircraft-specific procedures for inadvertent IMC should be addressed by your MAJCOM regulations but, hopefully, by reading this article and being aware of your surroundings you won't have to use them. Fly safe! ■

Now for something a little different. In this month's quiz, we're going to let you try to get to an out-of-the-way location, much like many of you will soon be doing on the way to Bosnia and surrounding areas supporting the new Peace Treaty.

To set the scene, you have just been notified by command post that you have been tasked to fly a mercy mission transiting several cities in Eastern Europe and Western Asia. This will be your squadron's first trip into the region, and no one on the crew has had the luxury of visiting the area. You are the aircraft commander and need to get the planning done prior to crew rest. Your journey begins now.

1 After getting the frag for the trip, and not really wanting to go to any of these places, how are you going to find out about the diplomatic requirements for the areas and what it will take to get there?

a. DoD Flight Information Publications for the region.

b. Foreign Clearance Guide.

c. AMC TACC.

d. Call the embassies for the countries you are going to transit.

2 Now that you have the diplomatic clearances requested, where are you going to find the flight routings and approach plates for Baku, Azerbijan?

a. Europe, North Africa, and Middle East (ENAME) FLIP.

b. Jeppesen.

c. Eastern Europe and Asia (EEA) FLIP.

d. Either B or C.

3 Your next destination is Split, Croatia, and you found enroute charts that will get you to the airport, but the DoD FLIP had no approach plates for the airfield. Now what?

a. Call the command post to get Jeppesen approaches for the airfield.

b. Call the American Embassy to get host nation approaches.

c. Call AF Flight Standards/XOIA

continued on next page

to get approaches for the airfield.

d. A or C above.

4 Your unit has now been tasked as primary carrier into Split, and you want to get the approaches into DoD FLIP products to save the Air Force the money of establishing a Jeppesen account. How can you go about doing it?

a. Let AFFSA/XOIA know you have a need for the approaches and let them do the work.

b. Let your MAJCOM know you have a need for the approaches. They'll have the approaches put in.

c. Make copies of the Jeppesen approaches you got the first time you went in, and establish a library for each different airport.

d. "Borrow" a copy of the local approach plate the first time in, and make copies for everyone who flies into the country.

5 At the end of the mission, you have successfully negotiated the international maze of flight publications and have a handful of Jeppesen approaches. What can you do with them?

a. Use them in the squadron to start your international destinations library.

b. Shred them. They were probably classified, and you should have them covered throughout the mission.

c. Destroy them. The trash can is fine.

d. Turn them in to the command post. Someone else will get to use them.

ANSWERS

1. **b.** The Foreign Clearance Guide in base operations has all your personal and aircraft clearance requirements. Don't forget to check the classified portion as well. Base ops or the command post will have a copy.

2. **d.** DoD FLIP began publishing charts and approaches for Eastern Europe and Asia in 1993. If the destinations are not covered in any DoD procedure, AFI 11-206 authorizes the use of MAJCOM-approved alternatives. Jeppesen is one of these.

3. **d.** At AMC bases, there should be an account established with Jeppesen, and the squadron or command post can issue or make "Trip Tics" of the necessary approaches and charts you need. If your base doesn't have an account (only AMC bases are authorized these accounts), contact AFFSA/XOIA to get copies of the necessary approach plates and charts and any other flight-planning information you will need.

4. **b.** If your unit has a continuing mission into a destination not covered under current DoD FLIP products, your MAJCOM FLIP/TERPS office can get procedures published into DoD FLIP products through DMAAC.

5. **c.** Jeppesen approaches are copyrighted and authorized for one-time use only. They also change on an irregular basis, so a library of approaches may be outdated without your knowledge.

Congratulations! You have taken the first steps into international aviation. If you have any questions on Flight Information Publications, call AFFSA/XOIA at DSN 858-2103. They have all the latest and greatest information and will be glad to help. Also, here is a quick recap of the flight-planning information presented here if you want to add it to your "Brain Book."

International and Domestic Flight Planning

1. Check the DoD FLIP and National Ocean Services (civil) publications (civil publications cover Alaska, Pacific, and stateside US), both Enroute and Terminal. If not there...

2. For AMC units with Jeppesen accounts, check Jeppesen Enroute and Terminal publications.

3. AMC units without Jeppesen accounts call HQ AMC TACC/XOCZF, DSN 576-3940/3426 for Jeppesen information.

4. Non-AMC units request a Jeppesen "Trip Tic" (for one-time use and discard) through AFFSA/XOIA, DSN 858-2103.

5. Any unit going to use a destination on a continuing basis, call your MAJCOM to request the information be published in DoD FLIP. ■

Flying Safety

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POSTAL INFORMATION — *Flying Safety* (ISSN 0279-9308) is published monthly by HQ AFSC/PA, 9700 "G" Avenue, S.E., Kirtland AFB NM 87117-5670. Second-Class postage paid at Albuquerque NM, and additional mailing offices. **POSTMASTER:** Send address changes to *Flying Safety*., 9700 "G" Avenue, S.E., Kirtland AFB NM 87117-5670.

THE FSO'S CORNER

PERFORMANCE / MISHAP INDICATORS

MAJ JOHN C. JENSEN
Chief of Safety, Montana ANG

■ My approach to evaluating safety is not simply looking at a mishap rate but, rather, examining what causes our mishap rate. Safety is an attitude, not a number on a mishap chart. I think our efforts should be directed at fostering a unit attitude whereby a person who, when placed in a totally unsupervised situation, will do the right thing. They do this, and a little more, because this is the defined, accepted, and encouraged standard of conduct.

The following are areas and questions I feel, when answered, will assess our mishap prevention efforts. How are we really preventing our next mishap? Some of these questions have simple answers, while others need to be viewed as a continuum and answered as such.

MISHAP TRENDS: Is the current low rate a result of proactive measures or reactive actions?

UNIT CULTURE

- Individual versus unit effort?
  - Does the leadership actually foster a safe unit culture as a whole, or are the mishap results a product of uncoordinated individual efforts?
  - Are a clear set of standards and expectations established?
  - Are these standards enforced with a culture of accountability?
  - If not, why not?
- Does the senior leadership hold people accountable?
  - If not, who is expected to enforce accountability?
  - If delegated or peer accountability is utilized, is the authority given to these levels to enforce accountability?
- Does the unit reward extra effort and professional conduct?
  - Is superior performance indirectly denounced by refusing to publicly hold nonperformers accountable?
- Is there honest and timely feedback, both positive and negative?

ATTITUDE

- Does the leadership promote a solid professional attitude?
  - Are job expectations defined?
  - Are open displays of undesirable attitude dealt with or just ignored until that person can be retired out?
  - When a problem is dealt with, is it a band-aid fix or do we really look at and correct the root cause?
- Is morale high or low?
  - If low, can you identify why?
  - Are steps being taken to improve morale?

TRAINING

- Quantity vs quality?
- Do programs define what level of performance is to be achieved?
  - Are they planned and drawn up to support the desired level of training?
  - Are participants objectively analyzed and assessed against the stated standard of performance?
  - Do program graduates exhibit the standard of performance, or are they merely the recipients of "X" amount of training hours and resources?
- Deployments
- Are our people actually proficient or just current?
  - Are proficiency and skill levels in new personnel defined and monitored?
  - Is there a method to monitor their performance levels?
  - If not, why not? And is this being corrected?

Apply the above answers to determine where you lie between the following questions.

Is our culture one that defines, encourages performance, fosters going the extra mile, publicly rewards those top performers, and most importantly, identifies and corrects those who fail to make the grade?

OR

Is our culture one that speaks of high standards, but in reality allows people to do substandard work, to push the rules, and on occasion break them?

You should know if your good safety record is a result of proactive measures or reactive actions. Are you flying high overhead or walking in the mine field? ■

Major
Patrick J. Hathaway,
Aircraft Commander

Major
Marc D. Isabelle,
Pilot

Major
Stephen T. Scott,
Instructor Aircraft Commander

Technical Sergeant
Stephen B. Fitzgerald,
Flight Engineer

Technical Sergeant
Richard L. Visco,
Flight Engineer
(no photograph)

514th Air Mobility Wing
McGuire AFB, New Jersey

■ With a ceiling of 600 feet, visibility of 1 mile, and rain-showers throughout the area, the crew of a C-141B Starlifter prepared to depart on a local training mission. Instructor Pilot Maj Tracy Scott was in command and occupied the right seat while Maj Pat Hathaway flew from the left seat and Maj Marc Isabelle performed safety observer duties from the jumpseat. TSgt Rich Visco ran the Flight Engineer panel assisted by TSgt Steve Fitzgerald as Scanner. TSgt Visco called the Lineup Checklist complete, and Maj Hathaway initiated a left seat takeoff.

Three thousand feet down the runway, the 230,000-pound aircraft reached "Go" speed, and Maj Hathaway began to rotate towards the takeoff attitude. No sooner had the main landing gear left the runway surface when the aircraft struck a large flock of geese. The ensuing impact at 150 miles per hour and barely 10 feet above the runway destroyed the No. 2 engine, extensively damaged the No. 1 engine, and crushed a portion of the left wing leading edge. Additional but less severe damage was sustained on and around the left main landing gear. The devastated No. 2 engine immediately compressor stalled and rolled back towards idle power, but the No. 1 engine, having experienced less severe damage, recovered from its compressor stall and continued to produce usable thrust.

Within seconds, the tower controller alerted the crew that smoke and flames were trailing the No. 2 engine. F[illegible] suring first that the crippled aircraft was under cont[illegible] and capable of continued flight, Maj Scott directed Maj Hathaway to begin an immediate climb to a safe altitude, declared an in-flight emergency, and initiated the engine failure emergency checklist. While TSgt Visco attended to

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the checklist procedures, TSgt Fitzgerald immediately proceeded aft to assess the damage firsthand. Looking through the cargo compartment windows, TSgt Fitzgerald's view was hampered by extremely poor in-flight visibility, but he was able to determine the No. 2 engine was physically intact. Inside, however, he found clear evidence of major problems with one of the aircraft's three hydraulic systems. With cockpit indications confirming the complete failure of that hydraulic system, Maj Scott elected to configure the aircraft for an immediate emergency approach and landing.

As Maj Hathaway turned into the radar pattern, Maj Isabelle established radio contact with command and control advising them of the situation and went aft to begin his role as an essential liaison between the cockpit and the cargo compartment. With the flaps in the approach position, Maj Scott lowered the landing gear lever. Much to the crew's concern, there was absolutely no movement of the main or nose landing gear. Just as they began to react to the prospect of an additional malfunction, Maj Isabelle, standing on the ladder to the flightdeck, relayed from TSgt Fitzgerald that the gear had begun to move and slowly sequence through the extension cycle. As the gear approached the safe down and locked position, Maj Scott and TSgt Visco noted multiple annunciations of catastrophic failure in a second hydraulic system. At this point, barely 5 minutes after taking the runway, one engine was completely destroyed and two others partially disabled while two of three hydraulic systems were rendered useless. Further use of the flaps, spoilers, landing gear, and brakes was impossible. Realizing that in its present condition the aircraft could be landed but not stopped, and needing time to more completely evaluate the status of the aircraft and the implications of the major systems failures, Maj Scott directed Maj Hathaway to enter a holding pattern on final. Once established in holding, Maj Scott drew upon the considerable aircraft systems knowledge of each of the crewmembers as well as operations, maintenance, and standardization experts on the ground. TSgt Visco suggested it might be possible to electrically isolate the backup accumulators for one of the two hydraulic systems, and TSgt Fitzgerald felt he and Maj Isabelle could refill the reservoir and hand pump the system up to normal pressure.

Within minutes, their combined actions successfully restored the system and provided power for limited use of the brakes on landing roll, albeit without antiskid protection. The system continued to show evidence of a slow leak, but through continual use of the handpump, TSgt Fitzgerald and Maj Isabelle were able to sustain normal pressure until short final when they were directed to strap into their seats.

With the system restored and after thoroughly reviewing all possible options, Maj Scott outlined a plan of action for each crewmember, advised Air Traffic Control of his intentions, and initiated a precision instrument approach. The aircraft broke out of the weather at approximately 400 feet above the ground, and Maj Scott took over visually and touched down smoothly. Initially, the thrust reversers would not extend, which further compounded the problem of deceleration on a wet runway with no spoilers and only partial flaps. Furthermore, without antiskid wheel protection, seven of the eight main landing gear tires and wheel assemblies failed during braking. Despite these additional complications, Maj Scott brought the aircraft to a safe stop on the runway centerline and initiated an uneventful ground evacuation.

Maj Scott's crew handled one of the most serious compound emergencies in the history of C-141 operations with impeccable judgment, outstanding situational awareness, thorough aircraft systems knowledge, and superior aircrew coordination. They directly prevented the loss of a valuable crew and airlifter.

WELL DONE! ■

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Hurry?