UNITED STATES AIR FORCE

FLYING Safety

MAGAZINE

December 2000

Are You FM Immune?

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Photo Illustration by Dan Harman

UNITED STATES AIR FORCE
FLYING Safety
MAGAZINE

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FSM notams

TAKING A STAND FOR SAFETY

Courtesy ASRS *Callback* #243, Sep 99
NASA's Aviation Safety Reporting System

Some of the most difficult judgment calls in aviation occur on the ground, before a flight. Pressured by schedule, passengers, and other considerations, pilots may be tempted to suspend the good judgment they have gained from experience and training to undertake questionable or unsafe flights. We hear from several pilots who explain to ASRS why they regretted not taking a stand for safety. From a new-hire corporate First Officer:

The Captain (who was) also Chief Pilot...would not put on more fuel at my request. We were both aware of the forecast conditions at our destination, and were both also aware that these conditions required additional fuel to be added to remain within legal IFR reserve fuel minimums. However, the Captain was still unwilling to purchase the fuel. I am new with this company and was afraid to make waves with my boss as he has a poor record with pilot personnel. I should have made a stand and deplaned the aircraft, but did not. We landed with about 35 minutes of fuel at our destination after shooting an ILS to 500 ft and one and one-quarter mile visibility...

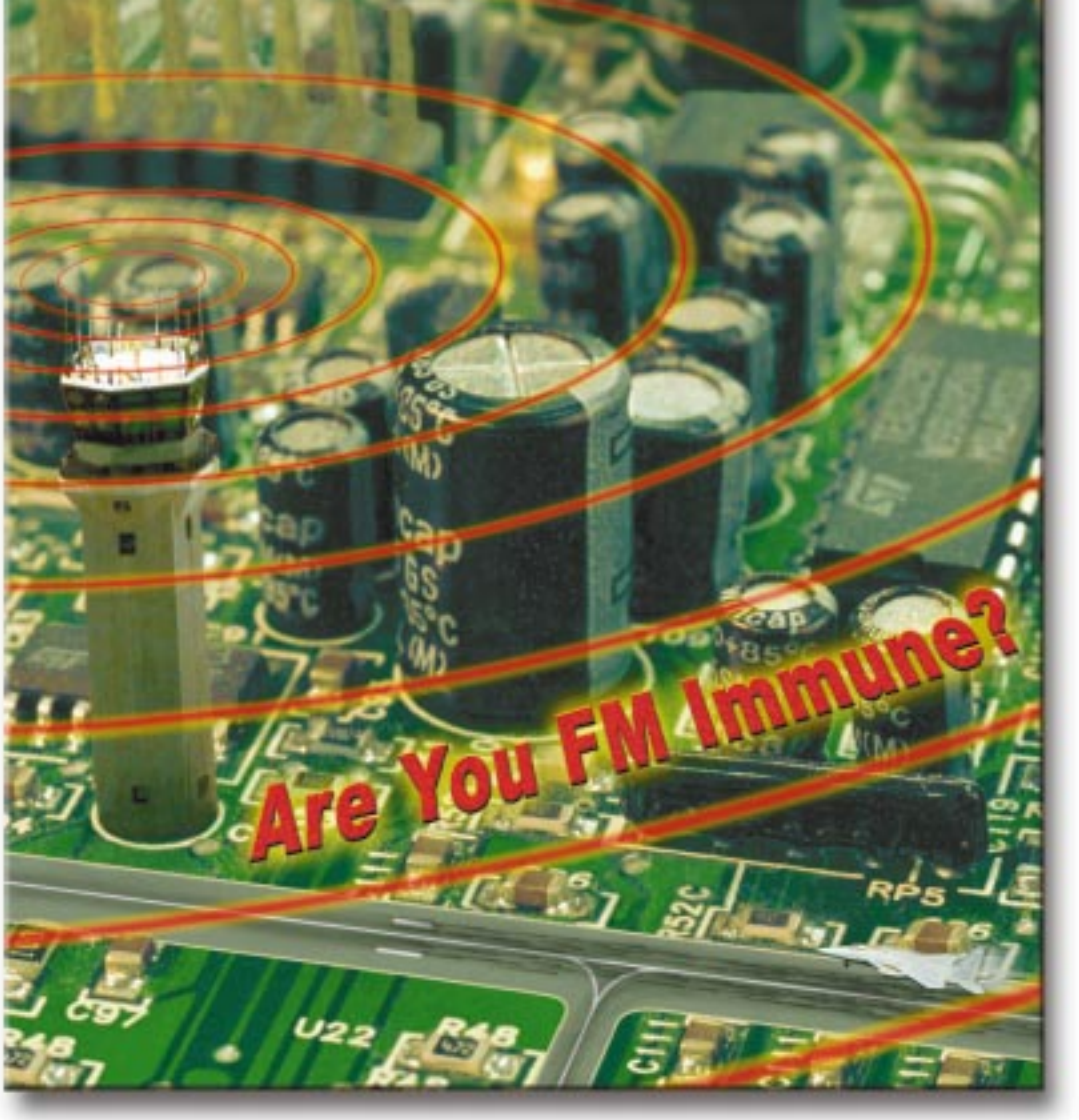
I made contact with his superiors and informed (them) of the event. They assured me that would stand behind me in all situations of this nature...and also informed me that this will not happen again...I have learned that I should and will take whatever actions (are) necessary to avoid putting my certificate...the passengers' safety or the aircraft in jeopardy.

NO SNOOZE IS GOOD NEWS

Courtesy ASRS *Callback* #242, Aug 99
NASA's Aviation Safety Reporting System

At FL200, I was notified by my Flight Attendant that there was a loud knocking noise (coming) from the forward baggage bin. After checking with our departure station, we discovered a baggage handler was missing. We returned to the station to find a scared but otherwise O.K. baggage handler. Cause: Sleeping in the baggage bin before loading. Corrective action: Don't do it.

In addition to our reporter's firm admonition, we add another: Ground crews should conduct a visual inspection of cargo bin interiors before closing and securing doors.



Aircrews in aircraft equipped with "non-immune" receivers are unlikely to know the information displayed by their flight instruments is inaccurate.

CAPT MIKE WOOD
60 OG/OGT
TRAVIS AFB CA

"It was late in the evening when we arrived at our destination. Although the weather was good, it was so black outside that we couldn't see the mountains which we knew were there, based on our preflight review of the airfield. While we were on the approach, I kept thinking about how thankful I was for the ILS that was helping me to stay clear of all those sharp rocks!"

How many of you have been in this situation or one similar to it? If you haven't yet, I'm willing to bet that you will if you stay in the flying game much longer. Now, ask yourself one question: What if that ILS course was bad and you didn't know it? If that thought bothers you as much as it does me, read on and learn all you can about FM Immunity.

The term "FM Immunity" refers to a problem where commercial FM radio communications combine to create a negative effect on the VOR and ILS receivers in our aircraft, causing them to display inaccurate information. The real difficulty with FM Immunity is that aircrews in aircraft equipped with "non-immune" receivers are unlikely to know the information displayed by their flight instruments is inaccurate. As you might suspect, this has serious implications for aviation safety!

A Little Background

This story starts back in 1979, when the attendees of the World Radio Conference decided the commercial FM broadcast bandwidth in Europe, Africa, the Middle East and Russia needed to be expanded in order to accommodate the increased demand for FM frequencies. Well, you just can't create new frequencies, so some existing frequencies had to be re-categorized to accomplish this. This is where our troubles began.

Prior to the conference, the commercial FM radio spectrum stretched from 80.0

megahertz (MHz) to 100.0 MHz. The commercial spectrum was followed by an 8.0 MHz bandwidth that was "protected," meaning that nobody could transmit on it. Following this protected spectrum were the bandwidths used for Localizer transmissions (108.1 MHz to 111.9 MHz) and VOR transmissions (112.0 MHz to 117.9 MHz). Figure 1 shows what this distribution looked like.

As you can see, the only range of untapped frequencies was the 8.0 MHz protected spectrum. This spectrum was designed to prevent interference with the Localizer and VOR frequencies, but the conference attendees felt that this "Guard" band should be eliminated to allow for new commercial stations. Therefore, after the 1979 conference, the upper end of the commercial FM radio spectrum was moved to 107.9 MHz, as shown in Figure 2. Eliminating the Guard band produces a negative effect on signals in the ILS/VOR part of the spectrum. In simplified terms, here is what happens—two FM signals in the commercial part of the spectrum can combine to create a third signal in the ILS/VOR part of the spectrum. This third signal may potentially operate on or near the ILS/VOR frequency you were depending upon for IFR navigation, which interferes with safe use of the ILS/VOR for navigation. With the elimination of the Guard band and the increase in the number of commercial FM frequencies, the opportunities for potential interference will increase.

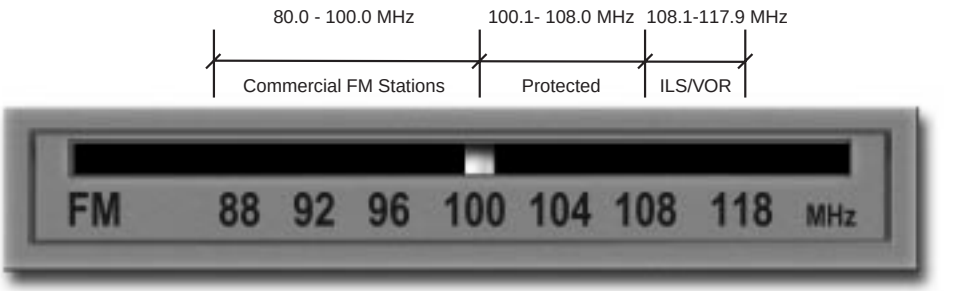


Figure 1

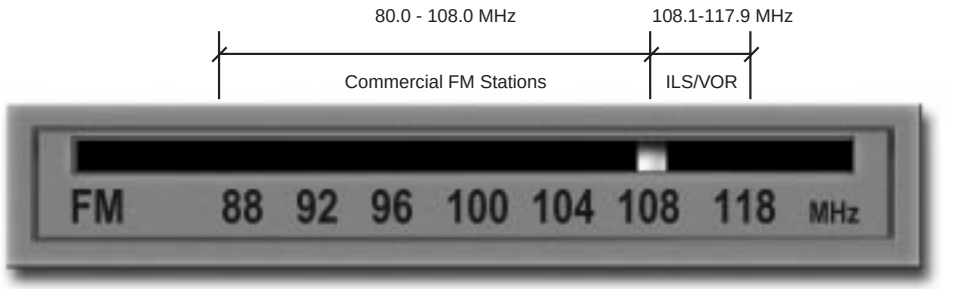


Figure 2

In the early to mid-1980's, the International Civil Aviation Organization (ICAO) got into the act and met with representatives of the world's commercial broadcasting industry. ICAO decided that existing aircraft receivers needed to be modified or replaced with new receivers that are "immune" to this FM radio and television broadcast interference, and published new standards for ILS/VOR receivers in 1985. A target implementation date of 1 Jan 98 was established by ICAO for compliance.

Many aircraft operators identified concerns about the 1998 cutoff. One concern was that the development and acquisition of "Multi-Mode Receivers" (MMRs—which offer the capability to add GPS or MLS in addition to "Immune" VOR and ILS) was not proceeding as quickly as the industry had anticipated. Other operators expressed budgetary concerns. As a result of these developments, in 1994 ICAO Europe established an implementation deadline of 1 Jan 01 to accommodate operators desiring to equip aircraft with MMRs.

Changes in the European broadcast industry added more complexity to the FM Immunity issue in the 1980's. New broadcasting regulations allowed commercial broadcasters to increase the power output of their stations, which increased the potential for FM interference. As a result, ICAO encouraged aviation authorities to work with broadcasting authorities on delaying changes until after the 1 Jan 01 deadline,

continued on next page

Here is what happens—two FM signals in the commercial part of the spectrum can combine to create a third signal in the ILS/VOR part of the spectrum.

and approved procedures to support limited broadcast changes during the 1 Jan 98 to 1 Jan 01 transition period to protect air navigation.

Most European nations have delayed broadcast changes (power increases, transmitting on new frequencies, relocation of antennas, etc.) until after 1 Jan 01. Nations which permitted broadcast changes analyzed the potential effects of those changes and either modified the request or published a NOTAM restricting operations at affected airfields. Unfortunately for us, the European nations are unable/unwilling to further delay broadcast changes beyond 1 Jan 01 due to commitments to the broadcast industry.

It's possible for nations to continue analyzing the impacts of FM broadcast changes on non-immune ILS/VOR receivers. However, after 1 Jan 01, many nations may drop the requirement for commercial broadcasters to notify aviation authorities about broadcast changes and obtain approval for them. As a result, aviation authorities would assume total liability for their analyses if they chose this path, and they are hesitant to do this. The result is that European nations have rejected continued analyses as a regional approach.

If you're not suitably equipped, then you may not be allowed to operate in most European nations' FIRs/UIRs without host-nation aviation authority approval.

The current regional policy is to discontinue provisions for the operation of non-FM-immune aircraft, effective 1 Jan 01, due to navigation safety, ATC workload and potential liability issues. Furthermore, ICAO Europe has recommended that nations should publish the following text in their aeronautical publications:

After 1 Jan 01, only aircraft with Nav equipment compliant with the applicable interference immunity performance requirements for ILS localizer and VOR receiving systems will be allowed to operate in (FIRs/UIRs).

Some nations have published the ICAO text in their aeronautical publications (including Portugal, the Russian Federation, and Germany). Thirty-six European region nations have provided formal notification to ICAO Europe that carriage of FM-protected receivers is mandatory effective 1 Jan 01. Germany has even placed the requirement for FM-immune receivers in public air law.

Where We Are Now

Unfortunately, many of the aircraft in the U.S. military inventory aren't going to make the 2001 cutoff. While the services are all working very hard to modify their aircraft to make them "immune" prior to the deadline, it's probable that a large percentage of aircraft will remain unmodified when the new year is ushered in.

So, what will be the impact on U.S. military operations if we haven't modified our aircraft before 2001? In short, if you're not suitably equipped, then you may not be allowed to operate in most European nations' FIRs/UIRs without host-nation aviation authority approval. Even when approvals are provided (and there is no guarantee of this), restrictions may be imposed, especially on terminal area flight operations.

Various organizations (including the DoD FLIP Working Group, Air Force Flight Standards Agency, USAFE Staff and the Air Staff, EUCOM and US Defense Air Attaches) are actively engaging ICAO Europe, the military staffs of other nations and the NATO Staff to clarify how non-FM-immune state (i.e., military) aircraft will be handled after 1 Jan 01. In particular, the USAF is seeking exceptions to the regional policy of excluding non-FM-immune aircraft from European airspace. [Proposals for en route access to the airspace are based on the use of other navigation equipment, such as BRNAV (Basic Area Navigation) and TACAN, in lieu of VOR receivers.] Finally, the US is requesting NATO, ICAO Europe and member nations to continue analysis of terminal area procedures at selected airfields after 1 Jan 01, and to publish NOTAMs when potential interference is assessed.

The success of these efforts cannot be guaranteed at this point and will likely be limited. While many European nations are attempting to address how they will accommodate non-FM-immune military aircraft, it is possible that at least some nations will refuse entry to non-equipped state aircraft. Even if nations agree to en route access, VOR/ILS terminal area operations with non-FM-immune-equipped aircraft will be prohibited unless nations implement procedures to safely accommodate non-equipped military aircraft and publish the appropriate exceptions. Unfortunately, it's very hard to predict what accommodations will be provided by each nation come the first of the year—there are too many players and variables involved. What we do know is that if nothing changes between now and then, we will effectively be barred from operating non-equipped aircraft in most of the ICAO European Region after 1 Jan 01.

The Real Problem for Aircrews

Why such a heavy-handed restriction? Why is everybody so concerned about this issue?

The root of the problem is that our current receivers don't know when they are receiving the third signal that results from the mixing of two other signals. The third signal can de-sensitize the CDI needle such that your indicated displacement from centerline may be less than your actual displacement (i.e., CDI shows one dot off when you may actually be two or more dots off centerline).

Some of you may be asking, "But what about the 'OFF' flag? Won't that tell us about the bad signal?" No, it may not. The "OFF" flag in our VOR/ILS receivers was designed to tell us when we are not receiving a signal of sufficient strength. The problem is, in an environment where the Localizer signal is corrupted, the signal probably won't trip the "OFF" flag—you'll be receiving a strong signal, but the signal will be giving you bad information. The course information displayed by the CDI will be inaccurate and you may never get an indication of it.

Prior to 1 Jan 01, the ICAO nations that make up the European Region are acting to identify sources of commercial-based FM interference. Most nations are using analyses to locate problem areas—that is, they take the locations and signal strengths of known commercial FM stations and dump them into a computer model that identifies possible areas of interference. When the nations discover areas where commercial interference is occurring, they are working with the civil broadcast authorities to come up with solutions to eliminate the problem. They also report the locations of interference to aircrews via NOTAM and FLIP publications.

The problem is that some nations are more diligent and thorough than others. In some nations, the reporting process hasn't worked smoothly either, so the aeronautical publications lack definitive information on the status of FM conflicts and fixes in those nations. Additionally, information on illegal, "pirate-based" interference (which cannot be determined via analyses) isn't reflected in the aeronautical publications.

The situation will get worse when 1 Jan 01 rolls around, because after that date most of the ICAO nations of this region had planned to assume that anyone using their airspace would be equipped with FM-immune receivers. Accordingly, all but a few nations intended to cease analysis and reporting efforts for non-FM-immune aircraft after 1 Jan 01. In addition, many nations that have been delaying changes to FM broadcasting procedures within their borders (such as transmitter power increases, new antennas, expanded frequency ranges, etc.) will lift the restrictions after 1 Jan 01, under the assumption that all aircraft will have been suitably modified. This will obviously make the FM Immunity problem even more complex.

We are trying to persuade nations to support en route access to civil routings for non-immune military aircraft with BRNAV and TACAN capability and continued access for TACAN-only-equipped aircraft to VORTAC and TACAN routings as Operational Air Traffic (OAT). Additionally, efforts are underway within ICAO and NATO to convince nations to continue analyses for selected military and civil airfields. However, host nation cooperation is not guaranteed.

What You Can Do About It

OK. So that's the doom and gloom. What are you supposed to do about it as aircrews? Here's a list of suggestions:

1. Know if your aircraft has been modified.

I happen to fly the KC-10. To date (early October—Ed.), only 20 of our 59 KC-10s are equipped with FM-immune receivers. I can't say what the status is for your airframe, but I encourage you to find out and actively track it. Each operating unit should document FM-immunity-equipage status in the aircraft maintenance log so crews will know whether or not their aircraft is FM- immune-equipped.

2. Actively monitor FCIFs, FLIP and NOTAMs.

FLIP and NOTAMs are the first place you should look for FM Immunity information. A lack of NOTAMs and specific national information in FLIP does not mean you can operate without restriction—be sure you consult the regional section in FLIP, too. By the time this article is published, Chapter 3A of AP/2 should have an entry about FM Immunity which outlines overall regional restrictions/prohibitions and directs you to consult individual nations' entries in Chapter 3B of AP/2 for specific country rules, regulations and procedures that address non-FM-immune operations (both en route and terminal). If there are no entries for the individual nation, the FLIP regional prohibitions/restrictions will apply. FLIP should also provide the latest guidance on regional and national flight plan filing and ATC voice notification procedures.

continued on next page

"But what about the 'OFF' flag? Won't that tell us about the bad signal?" No, it may not.

The DoD FLIP Working Group will publish the latest information provided by nations in AP/2, but that information may be incomplete or lacking detail, depending on what the individual nations provide. They may only publish that FM-immune equipment, or compliance with ICAO standards, is *mandatory* for entry into their airspace. Of course, there are no assurances that nations will publish any exceptions for state aircraft.

3. Use only navigation systems/NAVAIDS that are approved for en route navigation in the airspace in which you are operating.

AF/XO policy states, "Aircrews will not file IFR to, or fly an ILS or VOR approach/departure at, a destination requiring FM-immune receivers unless FM-immune VHF receivers are installed and operational. USAF crews will follow host nation requirements/direction." In short, this means unless you are equipped with FM-immune receivers or alternate navigation systems/NAVAIDS that are authorized by a host nation, don't fly in their airspace! Host nations may publish regional and national exceptions to permit operations in the UIRs/FIRs without FM-immune VORs if aircraft are equipped with BRNAV, TACAN or NDBs, which are all unaffected by FM interference.

4. Use navigation systems/NAVAIDS that are approved for terminal area navigation in the airspace in which you are operating.

Per the previously stated AF/XO policy, you should not fly STARs, SIDs, or approaches using non-immune VOR or ILS equipment unless the FLIP or NOTAMs identify exceptions for your destination/alternate airfields. Some nations may not publish exceptions for military aircraft in their national NOTAMs, so you will need to reference our FLIP (both regional and national sections) and US NOTAMs to determine if any exceptions are permitted. For non-immune aircraft, PAR will be the primary precision approach method and TACAN/ASR will be the primary non-precision approach methods.

5. Look for abnormal indications.

When permitted to use non-FM-immune equipment by a European host nation (and additionally in other regions of the world) look for abnormal indications. We've already said that the "OFF" flag probably won't pop up, but it's possible that other signs may show up on non-immune receivers. Look for things such as a CDI needle that is unresponsive or a CDI needle that is centered when you obviously aren't on course—these are definite indications that your CDI has been "de-sensitized" by the FM interference. Of course, there's no guarantee that anything will look out of the ordinary (which, after all, is the problem) but keep a sharp eye out anyway.

6. Tune, Identify and MONITOR!

Some pilots have reported hearing music or voices on the Localizer frequency while they have been identifying and monitoring the frequency. This may be an indication of interference. It should be noted that we are talking about FM interference and your ILS receiver detects AM modulation. There is no guarantee that you will hear music or audible tones (like warbling or static).

7. Consider fuel planning.

If you are unable to make an approach at your primary field, you can't divert to a field with a Radar or TACAN approach if you don't have the fuel to get there. This means you may have to increase your fuel reserves to allow that option.

Similarly, if you are planning to fly a radar-based approach at an airfield to avoid potential FM interference, you will require an alternate (remember, AFI 11-102, Volume 3, *General Flight Rules*, requires an alternate when radar is required to fly the approach) and therefore, you may have to increase your fuel reserves. (Note: Specific aircraft procedures/directives may be even more restrictive.) Consider also that the higher weather minima required for many TACAN approaches, coupled with the traditionally poor weather in the European theater, may increase the likelihood for a divert if TACAN is the only available approach—again, plan your fuel accordingly.

Last, keep in mind that your en route fuel burn may be higher than planned if you are re-routed by ATC. This kind of re-route is quite possible if you are operating with non-immune equipment under a published host-nation exception for en route navigation.

Oh Yeah, Another Thing

Let's not forget that this whole discussion can apply to other parts of the world as well. The Middle East and Africa are areas where there is a potential for FM Immunity problems. All the discussion tends to focus on Europe because this is where a majority of airports, VORs and Localizers are located, where commercial broadcast changes are being implemented, and where nations have mandated ICAO FM Immunity standards. However, you could experience similar difficulties on a Localizer somewhere else, even though FM-immune equipage is not mandatory for that region.

Summary

We have many folks working very hard to clarify the intentions of the European nations with respect to the operations of non-equipped state aircraft in the European FIR/UIRs where FM-immune equipment is required after 1 Jan 01. The point is that you need to keep your ear to the ground and stay on top of the most current guidance issued by your service, command and DoD FLIP, because there are bound to be many changes in how you operate after 1 Jan 01.

Think about your aircraft's equipment and the choices you need to make to ensure the safety of your crew, passengers and aircraft. Watch the NOTAMs and FLIP changes like a hawk, and be ever-mindful of the potential for FM-based interference to affect your VOR and Localizer-based equipment, regardless of whether or not you are flying a known "problem area."

Fly safe!

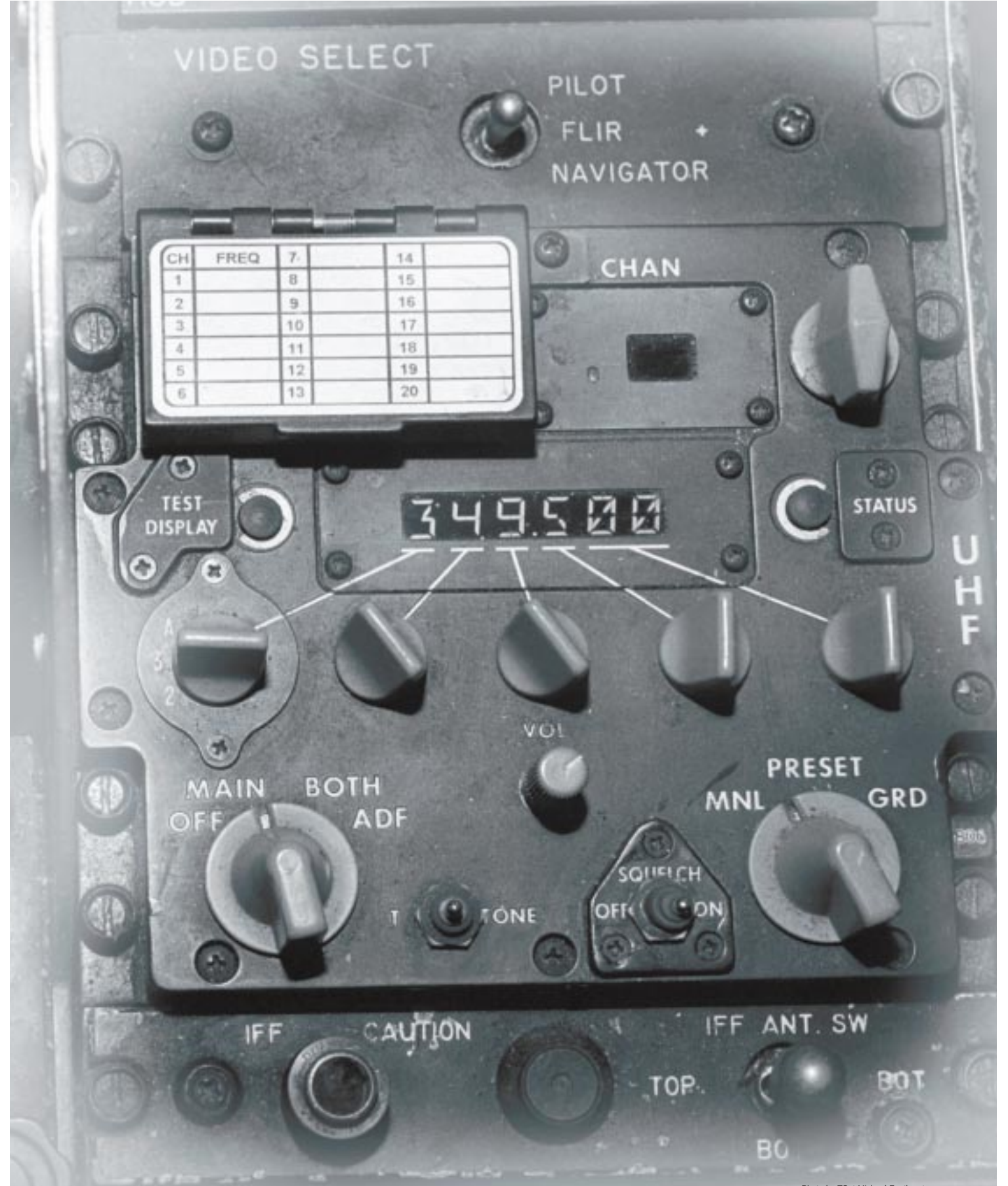


Photo by TSgt Michael Featherston

AIR FORCE SAFETY CENTER 2001

Photo by SrA Greg Davis

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Photo by SrA Greg Davis

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Photo by SSgt Jeffrey Allen

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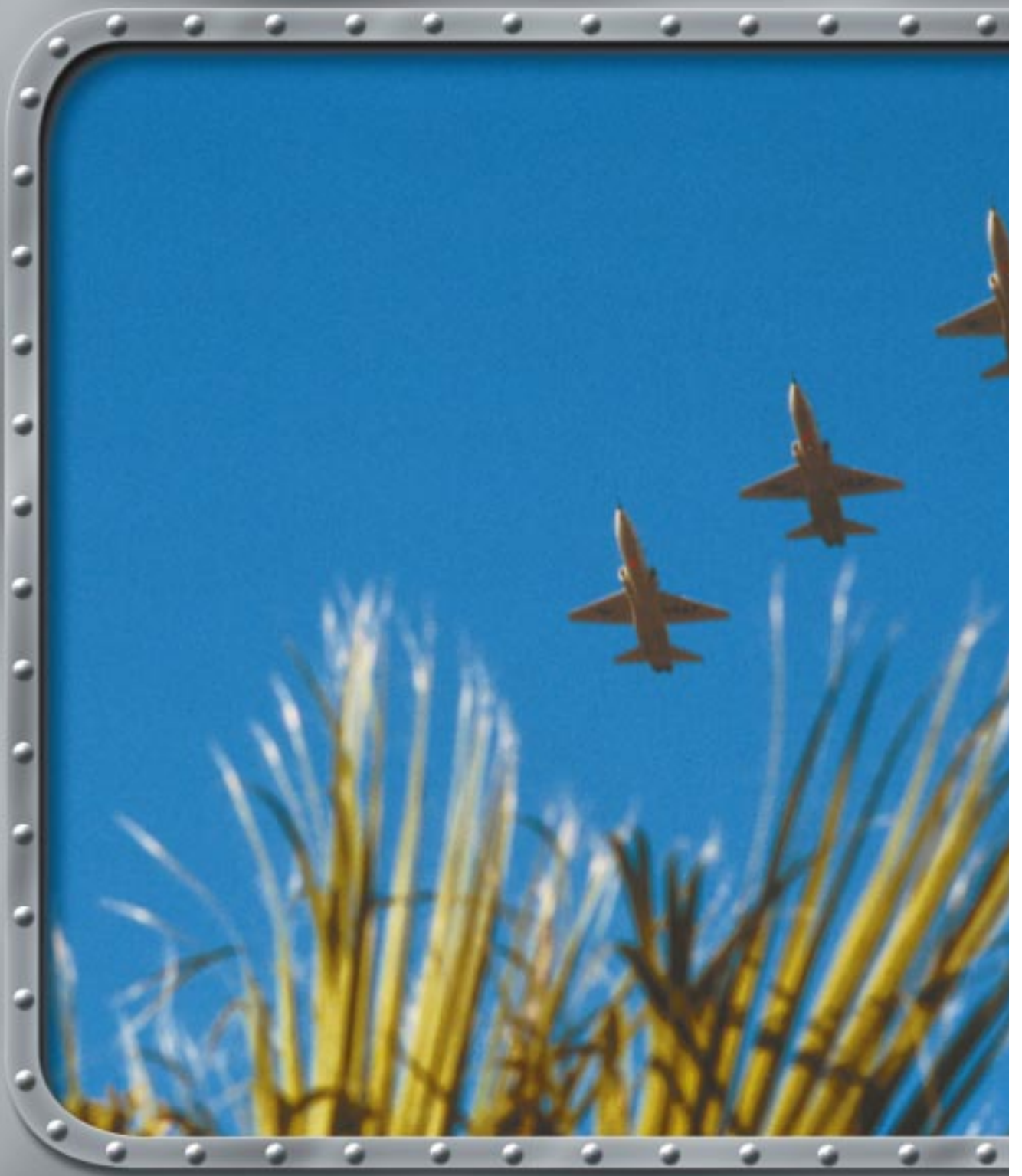

2001

FLYING Safety

USAF Photo

AIR FORCE SAFETY CENTER 2001

Photo by SSgt Jeffrey Allen

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AIR FORCE SAFETY CENTER 2001

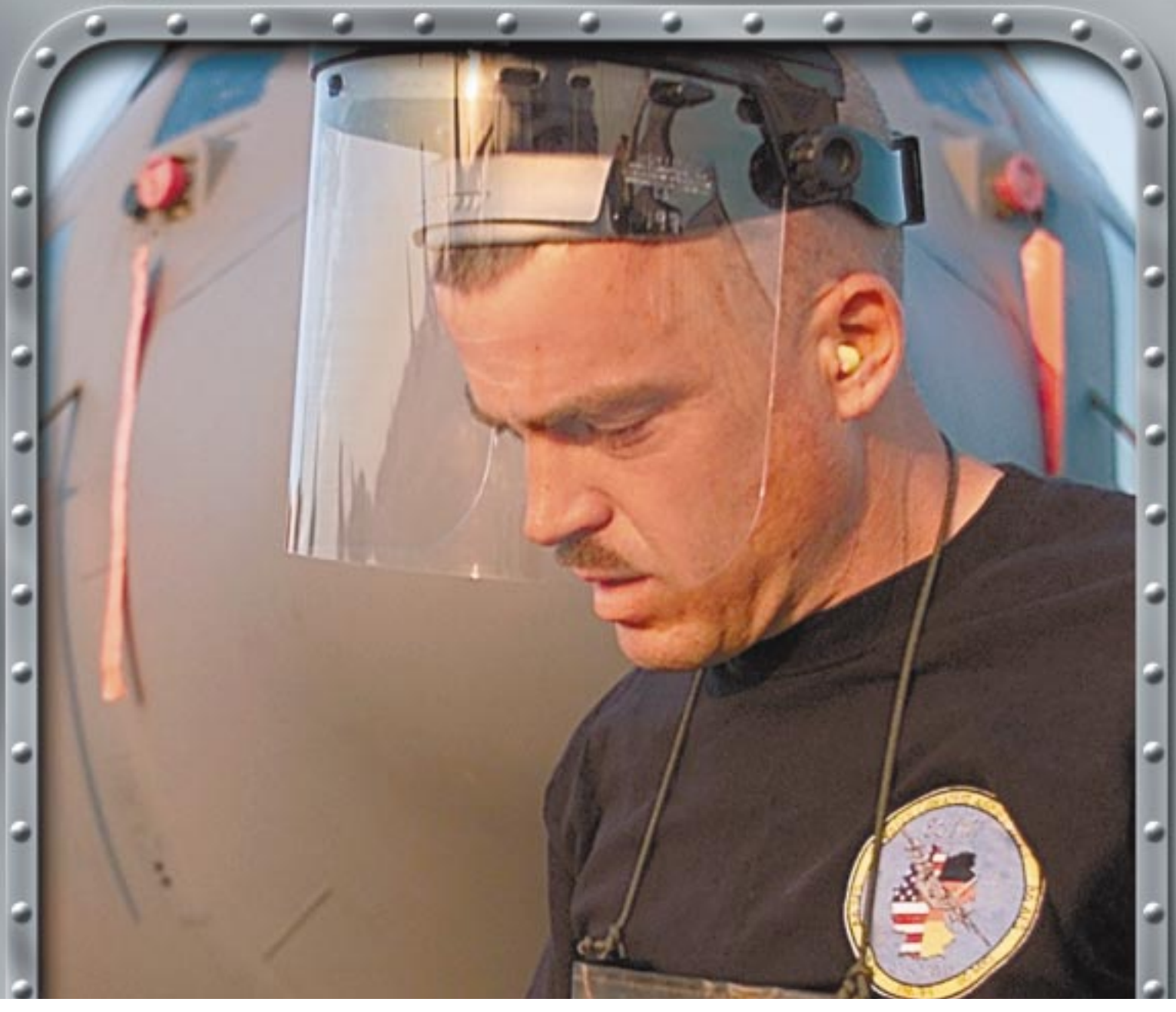

Photo by SSgt Jeffrey Allen

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In FY00, Near Midair Collisions rose to represent 57 percent of the Reportable Incidents.

FY00 HAZARDOUS AIR TRAFFIC REPORT (HATR) SUMMARY

MSGT JAMES K. ELLIOTT
HQ AFSC/SEFF

This article provides insight on the HATRs filed for FY00 by breaking them down in three different ways: by type of Reportable Incident, including trends; by Location; and by MAJCOM.

FY00 Reportable Incidents and Trends

There were 126 HATRs filed during the period 1 Oct 99 - 30 Sep 00. This is a decrease of five from the previous year.

Once again, Near Midair Collisions (NMAC) accounted for the majority of Reportable Incidents. NMACs accounted for 53 percent of the Reportable Incidents in FY98, but only 48 percent for FY99. In FY00, NMACs rose to represent 57 percent of the Reportable Incidents. The majority of them were between USAF aircraft and civilian general aviation aircraft not using correct "See and Avoid" procedures. Base safety offices and air traffic controllers must keep the civilian flying organization knowledgeable of their local hazards and flying missions through their Midair Collision Avoidance (MACA) Program. Air traffic system user education is one of the keys to decreasing the number of NMACs.

The second largest category was "Ground Incidents," which increased from 15 percent in FY99 to 19 percent in FY00. The majority of these runway incursions were between USAF vehicles and USAF aircraft. There is an assortment of causes, mostly vehicle operators not adhering to, or understanding, ATC instructions around the runway environment. Units must continue to be aggressive and thorough in their flightline driving training programs, especially with contractors, who typically have very little experience operating around taxiways and runways.

There were no significant changes in the other Reportable Incidents categories to quantify any trends.

FY00 HATRs by Location

"Domestic" HATRs increased from 69 percent in FY99 to 80 percent in FY00. This is due to a significant decrease in combat-related HATRs resulting from the air war in the Balkans in 1999. The "Domestic" category accounted for 86 percent of the HATRs in FY98.

FY00 HATRs by MAJCOM

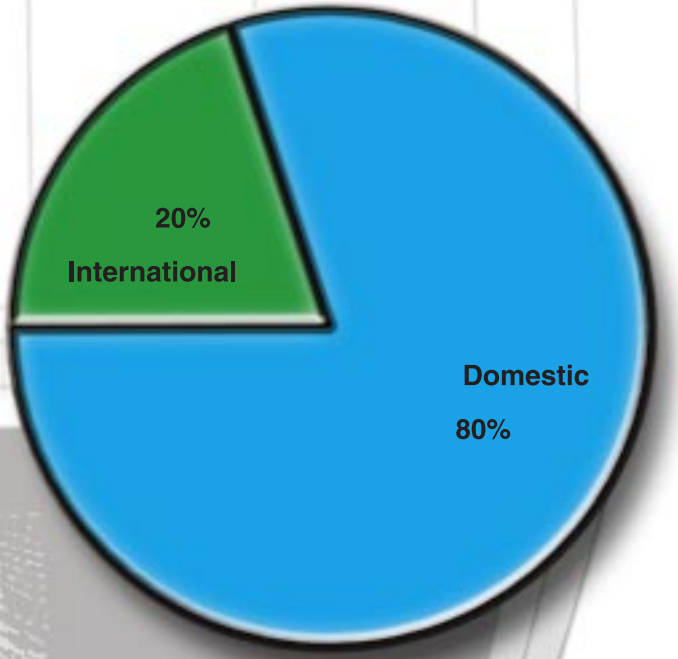
There were no significant changes or trends noted in HATRs when looking at them by MAJCOM.

In Conclusion

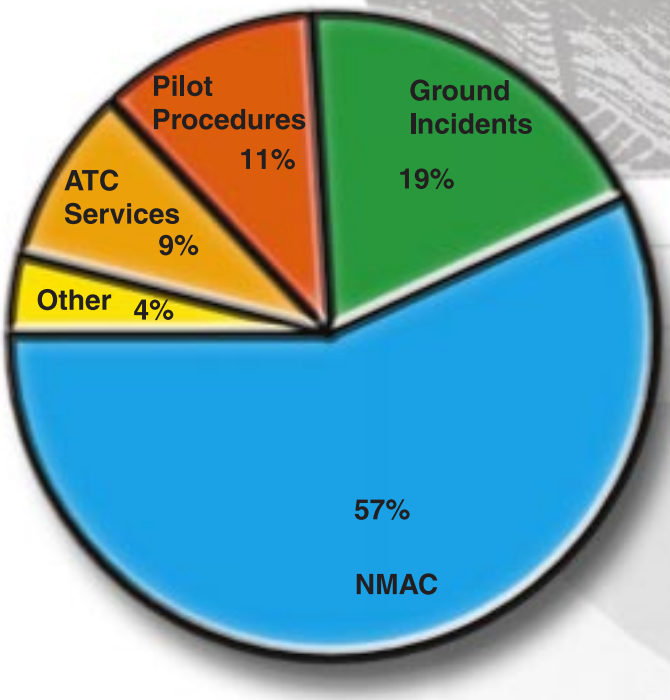
We continue our efforts to publicize the HATR Program and improve its utility as one more tool available to you for mishap prevention. We encourage you to continue submitting those HATRs, along with comments and suggestions, to:

HQ AFSC/SEFF
9700 "G" Avenue, SE
Kirtland AFB, NM 87117-5670

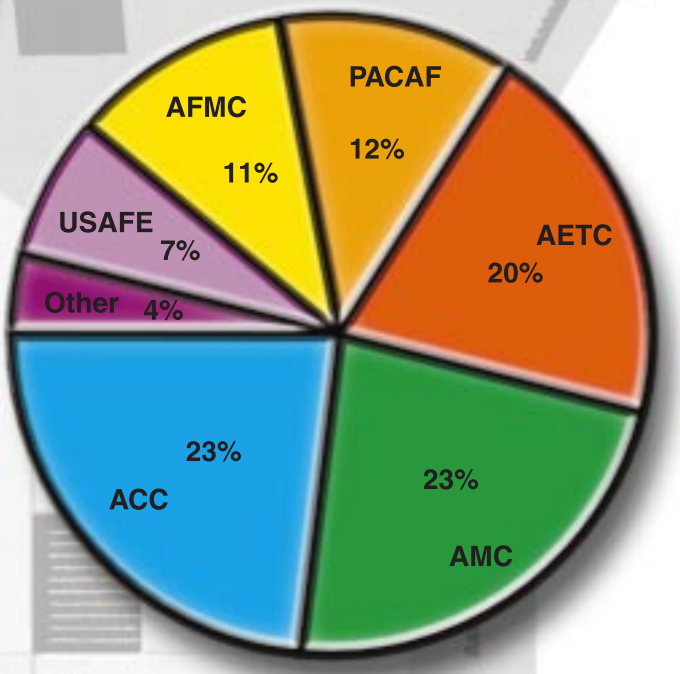
You can reach me at DSN 263-2034; or by e-mail, elliottj@kafb.saia.af.mil.



FY00 HATRs by Location



FY00 Reportable Incidents



FY00 HATRs by MAJCOM

Editor's Note: The following accounts are from actual mishaps. They have been screened to prevent the release of privileged information.

Wake-Up Call

The mishap aircraft (MA), an F-15E, was number four of a four-ship on a daylight interdiction training mission. The flight was uneventful until landing.

Tower cleared the four-ship to land Runway 05 and reported surface winds as 270/4. They flew a tactical overhead pattern sequenced to provide a minimum of 3000 ft spacing on final, in accordance with MCI 11-F-15, Vol 3, para 3.24.2 (now covered in AFI 11-2F-15, Vol 3, *F-15 Operations Procedures*, para 3.23.2).

The mishap pilot (MP) rolled out on final with the required 3000 ft spacing behind number three and unexpectedly encountered wake turbulence 300 ft from the threshold. He fought to counter moderate-to-severe rolling tendencies and an excessive sink rate, hit afterburner and initiated a go-around. The MP likely fought a little to catch his breath, then executed a closed pattern and returned for a pleasantly dull landing and taxi back to the chocks. Interestingly, it was learned later that even though numbers two and three had landed safely, they had also encountered wake turbulence.

Four kt winds quartering from the tail doesn't sound like much but, in this case, it was blowing from a direction that set up conditions for the landing aircraft's wake turbulence to be blown along the length of the runway. Result? A close encounter with what could have turned into a really nasty crash.

Postflight inspection of the MA revealed a six inch-diameter semi-circular hole in the trailing edge of the right horizontal stab, with an additional six inches of delamination along the trailing edge proceeding inboard from the hole. Subsequent check of the runway environment revealed one of the lights mounted on the 20-inch tall terminating bar light fixture, located 200 ft from the threshold, had been struck. That's *20 inches high* and *200 feet from the threshold*.

Luckily for all, this potential Class A/destroyed aircraft mishap ended up as a Class C mishap.

Any lessons to learn from this? You bet! When conditions exist that increase the potential for wake turbulence, stay alert. And if you encounter wake turbulence? Tell others. Don't keep it to yourself.

"Handle" Your Emergencies With Care

The Nighthawk was flying a single-ship, night, surface attack tactics (SAT) sortie. It consisted of simulated attacks off-range and was to be capped with a BDU-33 attack on a tactical range.

Then, about forty minutes into the mission, the Master Caution illuminated and the mishap pilot (MP) noted that his Utility A hydraulic system had failed. He made a "Knock it off" call, declared an emergency and turned back toward home station.

He contacted the SOF, advised him of the situation and his intent to accomplish an ILS approach and landing. While in the turn to intercept final, RAPCON queried the MP whether or not he had his gear down, to which he received the response, "Not yet."

Special notes here for those who haven't flown the F-117. Point One: Just like the B-52 and F-4, this jet uses a

drag chute to cut down landing roll. Point Two: With a Utility A hydraulic system failure, the landing gear is lowered using an emergency gear release handle. Point Three: The emergency gear release T-handle and drag chute T-handle are both oriented vertically and located on the left side of the main instrument panel. Point Four: Although the emergency gear release T-handle is striped black and yellow, and is outboard and below the gray drag chute T-handle, the initiation of both handles feels very much the same. Point Five: During initial qual (IQ) simulator training, inadvertent drag chute deployment—particularly during periods of high task saturation, as occurs in multiple emergency procedures scenarios—is a fairly common student mistake. Differentiating between the chute and emergency gear release handles is emphasized heavily during IQ training. Conversely, during simulator continuation training, training scenarios are less structured, with emphasis placed more on tactics and instrument events than on emergency procedures. As a result, it's conceivable that post-IQ pilots would rarely perform a simulated or actual emergency gear extension during the remainder of his Nighthawk tour. Now, back to our story...

The MP eventually did pull the emergency gear release handle, got an all three gear down-and-locked, and made an otherwise uneventful, no drag chute landing... 'Nuff said?

What A Pain In The...Sinus Cavity, Part Two

We wrote in these pages last month of a Tweet student pilot who flew with a cold and very nearly had his sinus cavities blown out. Here's another Tweet physiological event that, through no fault of the mishap student pilot (MSP), could also have resulted in blown sinus cavities.

The mission was a dual contact syllabus sortie. During rapid descent from 14,000 ft to 4000 ft, the MSP experienced a sudden onset of excruciating pain over the right frontal sinus and upper right teeth. The pain was severe enough to cause some disorientation. The IP took control of the T-37 and initiated a climb to decrease pressure on the MSP's sinuses. It worked. The IP declared an emergency and coordinated for a gradual descent and straight-in approach for landing, where they were met by the flight surgeon (FS). During the ambulance ride to the clinic, the FS treated the MSP with oxymetazoline nasal spray that helped relieve most of the residual sinus pressure.

A thorough medical evaluation found the MSP to be in good health with nothing to indicate he was at higher-than-average risk for a sinus block—no nasal congestion, shortness of breath, itchy eyes, sneezing, ear problems or joint pain. All the same, the sinus block he had experienced wasn't just in his head. The FS allowed him to return to flight six days after the mishap and prescribed "for emergency use only" medication the MSP could carry with him during future flights in case the problem recurred.

So, this student pilot and his IP did nothing wrong and everything right. Good job! What then, you may ask, can be learned here? Never fly with a cold or sinus congestion. And never self-medicate. If you fly—or you're ever tempted to fly—with your own self-prescribed meds, then you may be masking a more serious condition that places you (and others) at risk. Don't do it. Diagnosing and treating aviator maladies is why flight surgeons get the big bucks, so trust 'em!

"When I Says 'Whoa,' I Means 'Whoa!!!'"

The F-16D mishap aircraft (MA) was number five in an eight-ship, large force employment, formal syllabus training, air-to-ground SAT (surface attack tactics) mission.

The MA was configured with two inert MK-84s, two wing tanks and a captive AIM-9, and was to be flight lead for the second four-ship cell. At scheduled taxi time, only three aircraft in the first four-ship cell were ready. The fourth ship was delayed in the chocks while maintenance worked a problem, so the MA flight lead elected to go ahead and taxi his four-ship to the arming area. Soon after the second four-shipper taxied out, the maintenance-delayed F-16 was repaired and also commenced taxi. The MA flight lead pulled his cell off to the side of the taxiway to allow number four to join the first cell.

Once number four had cleared, the MA flight lead and his cell resumed taxi to the arming area. And that's when it happened... Number six radioed he saw fluid dripping from the MA's left main landing gear area. The MA slowed to a near-crawl—estimated to be about 1-2 mph—but didn't stop. Which was especially not good since the MA had also lost nose wheel steering authority and was veering ever-so-slowly, but inexorably, to the right edge of the taxiway. Finally, the soft, grassy soil around the taxiway did what the MA's brakes were unable to do—*stop* the aircraft.

The left main stayed on the taxiway, the nose and right main dug into the soil and the Falcon came to rest at a 20 degree list, where the crew safely executed an emergency ground egress. Shutting down the engine before leaving the prepared surface undoubtedly prevented FOD damage. Kudos for outstanding presence of mind!

Sometimes things break "just because." The philosopher Murphy propounded that when things do break, they tend to do so at the worst possible time. Luckily for this crew, the brake failure occurred during low-speed taxi instead of on landing roll at a field with no barrier. Your next emergency could be right around the corner: How prepared are *you*?

Editor's Note: The following accounts are from actual mishaps. They have been screened to prevent the release of privileged information.

Close Encounter

In the bygone days of MAC (Military Airlift Command), Hercules, Starlifter and Galaxy aircraft were the principal occupants of military airlift support squadron (now air mobility support squadron—AMSS) parking spots. That all started changing in 1992 when Air Mobility Command stood up and en route units had to figure the beddown, care and feeding of KC-135 and KC-10 aircraft into their plans. Things continue to change and evolve as evidenced by the ever-increasing numbers of C-17 Globemaster IIIs making appearances on AMSS and home station ramps.

With all that in mind, it's likely that you, or someone before you, has made suitable provisions at your station for the parking, care and feeding of "X" number of all the various types of weapon systems AMC now owns. But... When was the last time you took a good, hard look at your parking plan? We ask because...

At a couple hours to midnight, three maintainers were detailed to block in a C-17. Marshalling went smoothly and the aircraft shut down with the parking spots off both wings unoccupied. What the head marshaller didn't know was that the dashed taxi line leading to the spot the C-17 parked in was actually designated for use as a "conditional" parking spot. That is, additional parking spots had been "conditionally" established adjacent to "regular" parking spots—those designated with solid taxi lines—to allow parking multiple C-17s side-by-side with adequate wingtip clearance.

A few hours later, a different team was detailed to park a C-141 Starlifter adjacent to, and on the left side of, the Globemaster. The marshaller and wingtip clearance person—let's call them "near-mishap person 1" (NMP1) and "near-mishap person 2" (NMP2), respectively—directed the C-141 to make a right turn for parking in an established parking spot. Remember what we said earlier about that C-17 being parked in a "conditional" parking spot, adjacent to "regular" parking spots?

As luck would have it, mild precipitation that had accumulated during landing covered the C-141's side windows, so crew vision to the sides was mildly obscured. As the Starlifter made its right turn into parking, NMP2 gave no indication to NMP1 that the taxi operation needed to be halted. Once chocked, it was discovered that the Starlifter's right wingtip overlapped the Globemaster's left wingtip by six inches, with the Starlifter's wingtip thirty inches below the Globemaster's.

Having said all that, when's the last time you took a hard look at availability and suitability of parking spots at your location? If necessary, is there a local OI to spell out "regular" and "contingency" aircraft parking plans? Finally, have the troops been trained so they know about the OI and understand the parking plans?

Crippled Globemaster III

The heavyweight (540,000 lbs) C-17 was back-taxiing on the runway in preparation for takeoff. It had begun a slow, shallow, 180 degree turn when the left wheel on the NLG failed.

Teardown inspection revealed the outboard bearing was similar in appearance to the required bearing, but was, nonetheless, not the correct bearing. Subsequent

investigation focused on how an incorrect bearing could have gotten into the wheel.

Per the mishap report, applicable T.O.s contain several precautionary steps to prevent such an occurrence. Sadly, there were several (missed) opportunities to detect the mismatched wheel bearing prior to the mishap.

- Wheel & Tire Section uses the guidance in T.O. 4W3-4-1002, Task 7-34, for C-17 nose wheel assembly. Step 8 contains a "Warning" which states in part, "Bearings must be checked for correct part numbers prior to installation...Failure to comply may cause injury to personnel or damage to equipment."
- Step 8 in the same T.O. also requires two IPIs: One IPI is to verify the inner bearing is the correct part number; the other IPI is to verify the outer bearing is the correct part number.
- Flightline maintainer guidance for R&R'ing a C-17 nose wheel is contained in T.O. 1C-17A-32JG-40-1. Prior to installing the tire/wheel assembly, there's a "Note" which reads, "NLG wheel bearings shall be checked for correct bearing part numbers prior to NLG wheel installation." These are also IPI items.
- Two days after the faulty wheel was installed, it had to be removed FOM for other maintenance on the nose gear. Per the -32JG-40-1, before reinstalling the wheels, the "Note" to verify correct NLG wheel bearings and document the IPIs still applied.

The NLG wheel failure also caused enough damage to the NLG axle that it required replacement. Total mishap cost was more than $30,000, but it could have been much higher. Surely, Providence intervened when this mishap occurred at slow speed taxi. All kinds of ugly scenarios come to mind when considering what could easily have happened if the NLG wheel had failed on this 270-ton behemoth during takeoff roll at 100 kts. Or landing rollout at 100 kts, when it weighed only a few tons less.

Incorrect bearing installation and wheel failure was also a problem in the F-16 community for a while. NLG wheel bearings are only a little smaller than MLG wheel bearings, but they still fit nicely in the MLG wheel outer bearing position. However, awareness of the problem, along with emphasis on tech data procedures and additional supervisory controls, have all but eliminated these types of mishaps.

If the near-catastrophic mishap with this C-17 doesn't give you cold chills, then there's something wrong. Your actions—following tech data to the letter yourself, and ensuring those who work for you and with you also follow tech data—are the difference between an aircraft that's safe for flight, and one that's got a ticking time-bomb on board.

Hairy Hop In A Hercules

No sooner had the C-130 taken off than the flight crew declared an emergency for aileron control problems and circled the field for an immediate landing. It was tense going for a few minutes, but the approach, landing and taxi to parking were uneventful.

A look-back at previous repair actions revealed that the day before the flight, maintainers had R&R'd a leaking aileron boost pack. Removing a C-130 aileron boost pack is pretty straightforward, and entails (steps greatly simplified here): removing the cable clamps and associated bolts, washers and self-locking nuts in order to disconnect the aileron control cables; removing the booster quadrant; disconnecting hydraulic lines; and removing the boost pack. Installation is pretty much a matter of doing the same steps in reverse, and reinstalling and reconnecting everything. In accordance with tech data, the system was checked for leaks, binding and overall proper operation, with no defects noted.

Now, we aren't pointing fingers and saying these maintainers did anything wrong. But the investigation into this flight control problem did turn up some things worth sharing with all maintainers.

T.O. 1C-130H-2-27JG-10-1, C-130 *Flight Controls, Aileron Control System*, makes no reference as to whether or not one has to replace the self-locking nuts that secure the cable clamps that hold the aileron control cables in place on the booster quadrant. But as a practical matter, maintainers at the mishap base did replace the self-locking nuts if they went on too easily. However, there has been a recent change to T.O. 1C-130H-2-27JG-00-1, *C-130 Flight Controls, General Maintenance*, in the section titled "Removal and Installation of Flight Control Bolts and Nuts." It states, in part, that "...new self-locking nuts shall be used..." Also, T.O. 1-1A-8, *Aircraft and Missile Repair Structural Hardware*, contains a "Caution" on self-locking nuts in paragraph 5-29 that states, in part, "New self-locking nuts shall be used each time components are installed in critical areas throughout the aerospace vehicle." (Note: That same "Caution" in the "general" series T.O 1-1A-8 also goes on to state where self-locking nuts shall *not* be used, and the following paragraph, 5-30, further qualifies usage of self-locking nuts. When in doubt, always refer to the system-specific tech data.) Granted, the 1-1A-8 term "critical areas" is open to some interpretation. But in most people's books, flight controls definitely fall into the "critical areas" category.

A one-time inspection of aileron control quadrant cable clamps on 30 C-130s at the mishap aircraft's home station found discrepancies in six aircraft. Mishaps waiting to happen...

Do you ever find yourself in situations where you aren't sure whether or not it's okay to re-use aircraft hardware? If so, then do the smart thing—and the right thing—by taking the extra couple of minutes necessary to consult tech data or get guidance from your supervisor or Quality Assurance. ✈

USAF Class A Mishaps

Final FY00 Flight Mishap Totals (Oct 99 - Sep 00)

21 Class A Mishaps
7 Fatalities
14 Aircraft Destroyed

03 Oct	♣	While conducting a SAR mission, a UH-1N went down.
17 Nov	♣	Two F-16Cs flying an NVG upgrade sortie collided during a VID intercept. One F-16 was destroyed; the other F-16 recovered safely.
22 Nov		An OA-10A departed the departure end of the runway.
06 Dec	✶	An RQ-4A Global Hawk UAV was extensively damaged while taxiing after landing.
10 Dec		A C-130E touched down short of the active runway, then diverted to another airfield and belly-landed. Three personnel were fatally injured.
15 Dec		An HH-60G rolled over at an LZ following a hard landing.
20 Jan	♣	An A-10 crashed on RTB. The pilot was fatally injured.
16 Feb	♣	An F-16CG on a routine training mission experienced an engine malfunction.
16 Feb	♣	An F-16DG on an NVG upgrade sortie experienced an engine malfunction.
28 Feb	✶	A maintainer sustained fatal injuries after falling from the lower crew entry ladder on a C-5.
19 Mar	♣	An F-16C crashed while performing at an airshow. The pilot was fatally injured.
31 May	✶	An F-15E was damaged after a high-speed abort.
01 Jun (Added)		The No. 2 engine on a KC-10 sustained FOD damage during takeoff roll.
16 Jun	♣	An F-16C on a routine training mission had an engine malfunction.
21 Jun	♣	A F-16CG egressing off-target sustained a bird strike that destroyed the canopy and injured the pilot.
02 Aug		An MH-53M's tail rotor contacted the ground during a tactical NVG approach.
03 Aug	♣	An F-15C crashed during a Green Flag sortie.
03 Aug	♣✶	An unmanned QF-4G crashed 10 minutes after takeoff.
08 Aug	♣	Two F-16s experienced a mid-air collision. An F-16CG was destroyed; the F-16CJ recovered safely.
11 Aug	✶	An F-15E was damaged during a ground maintenance run.
28 Aug	♣	An F-16C crashed during RTB. The pilot was fatally injured.
29 Aug		An E-8C suffered damage from an overheated radar waveguide.
31 Aug	♣	An F-16C on a training flight crashed and was destroyed.
31 Aug	♣	A T-6A crashed and was destroyed while flying an instrument approach.
06 Sep	♣	A T-37B crashed one mile from the runway. The pilot was fatally injured.
12 Sep		An F-15E departed the runway on touchdown.
14 Sep	♣✶	An RQ-1L UAV crashed 45 minutes after takeoff.

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FY01 Flight Mishaps (Oct 00)	FY00 Flight Mishaps (Oct 99)
1 Class A Mishap	1 Class A Mishap
0 Fatalities	0 Fatalities
1 Aircraft Destroyed	1 Aircraft Destroyed

04 Oct ♣✶ An RQ-1 Predator UAV crashed while on a routine test mission.

12 Oct ♣ An F-16C crashed during a routine training mission.

23 Oct ♣✶ An RQ-1 Predator UAV went into an uncommanded descent.

- A Class A mishap is defined as one where there is loss of life, injury resulting in permanent total disability, destruction of an AF aircraft, and/or property damage/loss exceeding $1 million.
- These Class A mishap descriptions have been sanitized to protect privilege.
- Unless otherwise stated, all crewmembers successfully ejected/egressed from their aircraft.
- "♣" denotes a destroyed aircraft.
- "✶" denotes a Class A mishap that is of the "non-rate producer" variety. Per AFI 91-204 criteria, only those mishaps categorized as "Flight Mishaps" are used in determining overall Flight Mishap Rates. Non-rate producers include the Class A "Flight-Related," "Flight-Unmanned Vehicle," and "Ground" mishaps that are shown here for information purposes.
- Flight, ground, and weapons safety statistics are updated daily and may be viewed at the following web address by ".gov" and ".mil" users: http://www-afsc.saia.af.mil/AFSC/RDBMS/Flight/stats/index.html
- **Current as of 29 Oct 00.**

FY00 SAFETY WRAP-UP: A MESSAGE FROM GENERAL MICHAEL E. RYAN CHIEF OF STAFF, USAF

Congratulations on achieving the safest flying year in AF history.

This tremendous achievement, while flying in demanding worldwide operations, is truly a team effort and a testament to the professionalism, dedication and talents of all our airmen. Records set this year include lowest number of Class A's ($1M in damage, aircraft destruction or death—22) (since revised downward to 21. Editor.), aircraft destroyed (14), total aviation fatalities (7), and pilot fatalities (3). We did an outstanding job focusing on our previous logistics problems and reduced our logistics mishaps from 20 in FY99 to a maximum of 7 this year pending board completions. Kudos to all who worked this issue.

Now, we need to shift our focus to the human factor element. While we set records in the air, our ground mishaps continue at a level that is higher than any of us would like. On duty, we lost six airmen (2nd lowest ever) and 51 others off duty. Over two-thirds of these lives were lost in vehicle mishaps with excessive speed, inattentive driving, and lack of seat belt usage as the primary causes. Unfortunately, we lost another nine lives in water-related mishaps.

Overall, trends are very good; however, we must always strive to minimize the loss of lives and resources—zero is the goal! Taking risk management practices to the individual level, both on and off duty, is a must if we are to preserve our combat capability while accomplishing the Air Force mission.

Thanks for a great year—let's make FY01 even safer!

THE Well Done AWARD

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

SSGT MICHAEL D. GRAMSCH
SSGT JOHN M. TETREAULT
37th Airlift Squadron
Ramstein AB Germany

On 9 August 1999, SSgt Tetreault and SSgt Gramsch were loadmasters on the crew of "Herky 12," a C-130E, during a personnel airdrop. At the drop altitude of 2,590 feet MSL, jumpers began to exit the aircraft. After 30 seconds the "red light" command was given and jumping ceased.

As the aircraft was climbing past 4,000 feet, SSgt Tetreault, at the left paratroop door, discovered and reported a towed trooper. The parachutist was tangled by his parachute and static line and hanging outside, beneath the belly of the aircraft. SSgt Gramsch immediately closed the right paratroop door and moved into position to help retrieve the jumper.

As the pilot broke out of the formation and the copilot lowered the landing gear and set 100% flaps, SSgt Tetreault and SSgt Gramsch immediately began applying procedures for retrieving the towed parachutist. They tried the Towed Parachutist Retrieval System (TPRS), but it was unable to reach the hung trooper. They then attempted to use a 5000-pound tie-down strap to retrieve the trooper (an alternate published procedure). This was also unsuccessful. Out of approved book answers, and with the pilot's approval, they improvised a solution.

SSgt Tetreault leaned outside of the airplane to try and grab the jumper. The trooper realized someone was trying to retrieve him and raised a leg for SSgt Tetreault to grab. SSgt Tetreault took the leg and passed it to SSgt Gramsch, and they worked together with the Army safeties to pull the trooper into the airplane.

The professionalism, technical skill, teamwork, and quick thinking by SSgt Tetreault and SSgt Gramsch, along with the entire crew of "Herky 12," saved the life of one of America's finest young Army combat paratroopers.