UNITED STATES AIR FORCE
FSM
DEC 2004
FLYING SAFETY MAGAZINE

# Flying Blind

FSM
FLYING SAFETY MAGAZINE

AIR FORCE RECURRING PUBLICATION 91-1

contents







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U.S. AIR FORCE

*Flying Safety Magazine* on line: http://afsafety.af.mil/magazine/htdocs/fsmfirst.htm

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SAFETY SAGE

## SMOKE AND FUMES

In almost every airframe, the number of smoke and fumes in the cockpit/cabin events are increasing. While in some airframes there are trends—and you will see these addressed in the Jan-Feb *Flying Safety* End-of-Year Mishap Review issue—every Airman who climbs into/onto one of our aircraft needs to be aware of and ready for a smoke and fumes event. When was the last time this was addressed during a preflight brief or a training day? How often have you reviewed the procedures with your students, if you are in a training wing? Smoke and fumes are almost always a Class E event, but can lead to a more serious condition really quick, especially if you are in a single-seat airframe. Just a reminder to all the aircrew that a small event like smoke and fumes can turn into an ugly fire or ejection if not treated quickly and properly. Be ready and be prepared.

Error:

The article "Aircrew Fatigue: Combating the Problem" (November *Flying Safety*), stated that modafinil has been approved for F-15C WSOs, but there are, in fact, no WSOs in the F-15C. The aircraft identified should have been the F-15E.





**DEPARTMENT OF THE AIR FORCE — THE CHIEF OF SAFETY, USAF**

**PURPOSE** — ***Flying Safety*** is published monthly to promote aircraft mishap prevention. Facts, testimony, and conclusions of aircraft mishaps printed herein may not be construed as incriminating under Article 31 of the Uniform Code of Military Justice. The contents of this magazine are not directive and should not be construed as instructions, technical orders, or directives unless so stated. SUBSCRIPTIONS — For sale by the Superintendent of Documents, PO Box 371954, Pittsburgh PA 15250-7954. REPRINTS — Air Force organizations may reprint articles from *Flying Safety* without further authorization. Non-Air Force organizations must advise the Managing Editor of the intended use of the material prior to reprinting. Such action will ensure complete accuracy of material amended in light of most recent developments.

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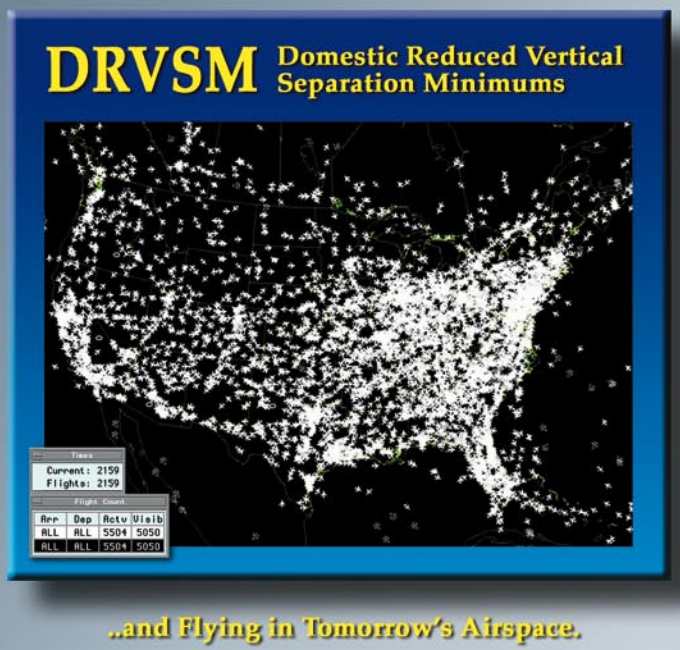



**MAJ BUD CARLSON**
**USAF Advanced Instrument School**

Some pilots still hold to the idea that the "Big Sky" theory will keep them out of harm's way. They probably haven't flown within the last 10 to 20 years. With the number of general aviation, commercial and military flights continuing to increase as our economy grows, the Federal Aviation Administration (FAA) recognized that changes were needed to deal with the air traffic congestion. Air Traffic Control (ATC) and the FAA decided to make some changes to allow more airplanes into the same airspace and still keep everyone safe.

One of those changes is the implementation of Domestic Reduced Vertical Separation Minimums (DRVSM), which starts at 0901Z, 20 Jan 2005. DRVSM is the application of reduced vertical separation minimums (RVSM) in U.S. airspace. RVSM is new to the United States, but implementation began on a limited basis in the North Atlantic Region in 1997 and is now implemented in the majority of Europe, the Pacific, the Middle East, and Australia.

As has been demonstrated in these regions, domestic RVSM is projected to accrue the following benefits:

**Operators**

- Fuel Savings Benefits 2005-2016:
  - $5.3 billion
  - 6/1 benefit/cost ratio
  - $393 million first-year savings—with 2.0 percent annual increase
- Greater availability of more fuel-efficient altitudes
- Greater availability of most fuel-efficient routes
- Increased probability that an aircraft will be cleared onto the desired route or altitude

**Air Traffic National Airspace System (NAS) Operations**

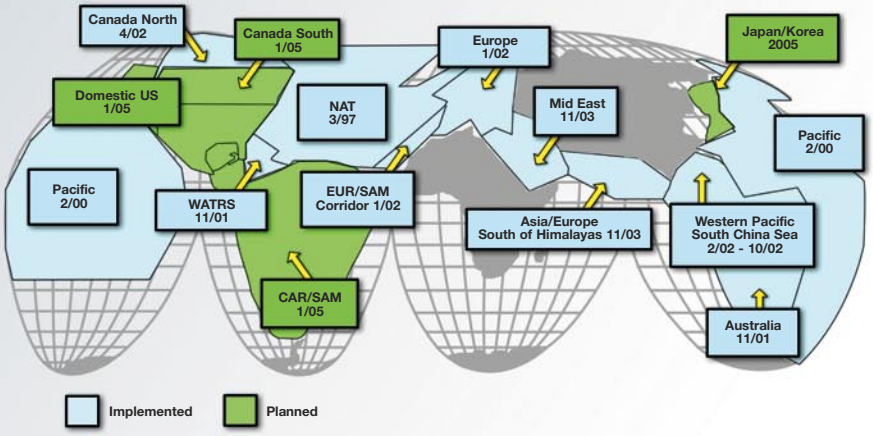
- ATC Flexibility (e.g., routing aircraft around storm systems)
- Mitigates conflict points
- Enhances volume of aircraft that can be accommodated in a given sector (sector throughput)
- Enables crossing traffic flows to be accommodated
- Reduces controller workload (e.g., reduced vectoring and FL changes)
- Provides for growth in NAS en route airspace capacity

The new areas where RVSM will be applied include the lower 48 states, Alaska, Atlantic and Gulf of Mexico High Offshore Airspace (including Houston and Miami Oceanic), San Juan FIR, southern Canada, and Mexico.

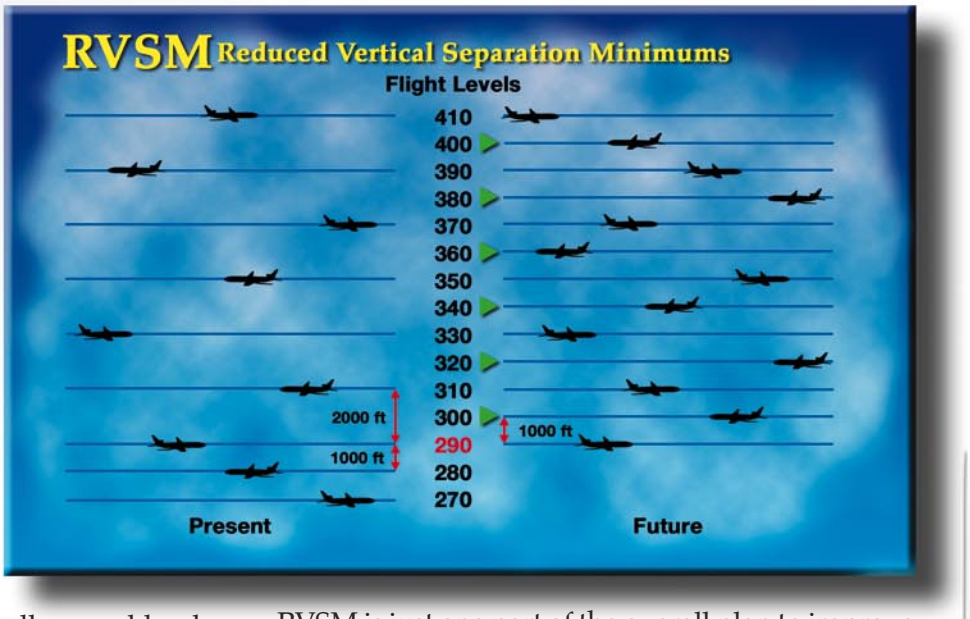
What is RVSM? The short answer is that at flight levels (FL) 290 through 410, you will have only 1000 feet of vertical separation from other traffic instead of the standard 2000 feet. This opens up six new altitudes that ATC can assign. But, what is the catch? Will it still be possible to maintain the same level of safety?

In order to operate in airspace where RVSM is being applied, both you and your aircraft must be certified to operate under the RVSM rules. For the pilot, certification is a training issue. For an aircraft to be certified, it must meet the standards defined in Appendix G to FAR Part 91. Some of the most significant requirements include two independent altimeter systems, an autopilot that can maintain altitude ±65 feet, and an altitude alert system to warn you if aircraft altitude deviates more than 200 feet.

What if your aircraft is not RVSM compliant? Can you still get cleared to a higher altitude? The short answer is "maybe." FAR 91 Appendix G states, "RVSM airspace is special qualification airspace; the *operator* and the *aircraft* used by the operator must be approved by the Administrator." The Memorandum of Understanding between the FAA



and the DOD states, "The FAA will accommodate non-RVSM compliant military aircraft operation within DRVSM airspace, without mission degradation, to the extent practicable based upon existing traffic and safety considerations." That sounds great …but, the FAA ran some computer simulations using RVSM rules and found that approximately 83 percent of operational errors occurred due to non-RVSM aircraft operating in RVSM airspace. Subsequent simulations lowered this error rate, but with the stipulation of no more than one non-RVSM aircraft per sector operating. Aircrews should remember that accommodation is based on controller workload, existing traffic and safety considerations. Other factors, such as weather or traffic saturation, may impact the controller's decision to grant access to RVSM airspace. If safety is the main goal, what do you anticipate ATC will say when you ask to climb above FL 290? The bottom line is you need to plan your flight at altitudes below RVSM airspace if you are non-RVSM compliant.




If you must fly in RVSM airspace (and your aircraft is non-compliant) to accomplish your mission, you have three options:

—File an Altitude Reservation (ALTRV).

• Requires long lead times and little to no flexibility.

• Provides guaranteed altitudes.

—Call ARTCC and coordinate flight times and altitudes. (You will need to coordinate 60-240 minutes prior to filing your flight plan.)

• Try to incorporate a LOA with local ARTCCs for routine flights.

• Provides a better chance of getting accommodated.

—No Call—no advance coordination.

• File and Fly—Taking chance of getting accommodated.

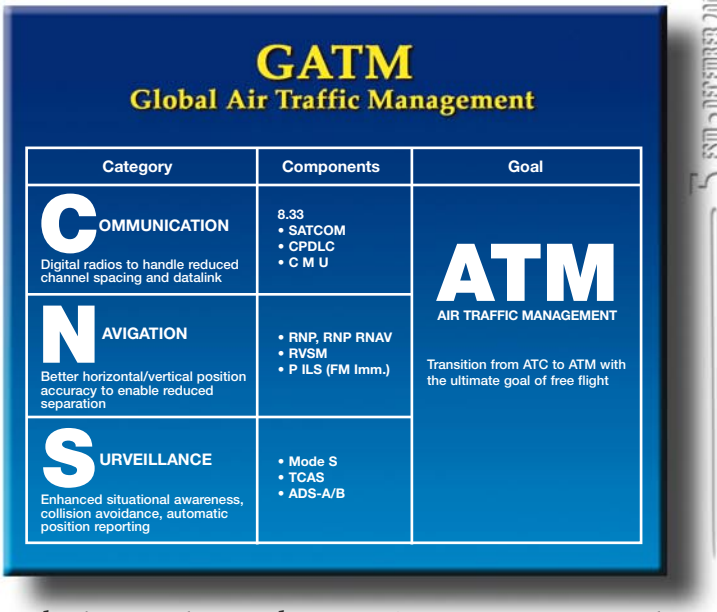
• Have enough fuel to fly below RVSM or prepare to divert.

Additionally, once in RVSM you must report "Negative RVSM" on:

1. Your initial call to each controller
2. Each request of a flight level change
3. Every read back a flight level change
4. Every read back a clearance to climb into/descend from RVSM airspace

Pilot and dispatcher procedures specific to DRVSM will be added as they are developed and will be published in FLIP, AIM and AP/1. Until incorporated, be sure to check the applicable NOTAMs and MAJCOM guidance.

RVSM is just one part of the overall plan to improve airspace usage and make our national airspace system more efficient. The GANS/GATM (CNS/ATM for civilians) concept incorporates a wide range of aircraft equipment and ATC software changes designed to make instrument flying more precise and safe.




The bottom line is that DRVSM is on its way and as professional aviators we need to know our role and limitations with its implementation. For more details on DRVSM, the Air Force Flight Standards Agency has published a paper entitled, "United States Air Force Enabling Concepts for Domestic Reduced Vertical Separation Minimums." Training personnel may refer to RVSM "Training Programs and Operating Practices and Procedures" as guidance,. It is available on the Web at http://www.faa.gov/ats/ato/rvsm_documentation.htm. For overall RSVM information go to http://www.faa.gov/ts/ato/rvsm1.htm.

# Due Regard

**MAJ ERIC CAIN**
**HQ AFFSA/XOP**

The Department of Defense issued DOD Directive 4540.1, *Use of Airspace by United States Military Aircraft and Firings Over the High Seas*, for situations when DOD aircraft are not able to accomplish the mission while complying with ICAO procedures for point-to-point and navigation flights. There are operational situations that do not lend themselves to ICAO flight procedures. These situations may include politically sensitive missions, military contingencies or classified missions. When operations of this type are not conducted under ICAO flight procedures, they are conducted under the "due regard" prerogative of military aircraft. Due regard means that the aircraft commander, of a state aircraft, will operate that aircraft with "due regard" for the safety of all air and surface traffic. Before an aircraft commander can declare due regard, there are certain conditions that must be met:

(1) Aircraft shall be operated in VMC; or

(2) Aircraft shall be operated within radar surveillance and radio communications of a surface radar facility; or

(3) Aircraft shall be equipped with airborne radar that is sufficient to provide separation between themselves, aircraft they may be controlling, and other aircraft; or

(4) Aircraft shall be operated outside controlled airspace and, when possible, away from high density traffic areas.

Essentially, flight under the "due regard" option obligates the aircraft commander to be his own ATC agency and to separate his aircraft from all other aircraft. Following the above conditions provides a level of safety equivalent to that normally given by ICAO ATC agencies and fulfills US Government obligations under Article 3 of the Chicago Convention of 1944. Flights under "due regard" are considered deviations from normally accepted operating procedures and practices and shall not be undertaken routinely.

In addition to the above guidance, aircraft commanders should consider the following information before flying "due regard."

(1) The due regard option can only be flown over international waters. If you aren't over water and 12 NM or greater from the shores of another nation, then you cannot fly due regard.

(2) Aircraft operating "due regard" at even altitudes above FL290 in airspace where RVSM is applied are flying at altitudes which are now used for air traffic. There is no longer the guarantee of 1,000 feet separation from other aircraft on these air traffic routes. Maintaining 500 feet separation ("well clear") is insufficient to prevent civil traf-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USAF Photo by MSgt Val Gempis
Photo Illustration by Dan Harman



fic from receiving TCAS traffic advisories (TA) and resolution advisories (RA). The protected volume of airspace, which surrounds each TCAS-equipped aircraft, is based on the speed and relative heading of the aircraft involved. Flying at 500 feet above or below normal flight levels will trigger a TCAS TA and/or RA if the protected volume of airspace is entered.

(3) An increasing amount of the world's airspace is controlled and is getting more dense every year. Additionally, the daily relocation of oceanic tracks, user preferred and random routings as well as dynamic re-routings make it very difficult for aircraft commanders to know where high density areas are, much less plan a route that will avoid them.

(4) Airborne surveillance aircraft (i.e., AWACS) fulfill the "surface radar facility" requirement and can be utilized for separation guidance.

(5) Currently, no specific language is published for notifying a controlling agency that you are exercising the "due regard" option. Aircraft commanders must ensure that the affected controlling agency understands his intentions. Prior coordination can help limit potential communication problems. If possible, include a brief comment in the remark section of the flight plan. Oceanic controlling agencies have expressed a desire to have the point or fix from which you will proceed due regard annotated on the flight plan. If you plan to return to the same point later in the flight and pick up an IFR clearance, you may file the flight plan similar to a delay. If you plan to proceed to a different point and pick up an IFR clearance, it may be best to file two separate flight plans.

(6) Attempt to find out as much information as possible about the area in which you will be flying. The following documents will be helpful:

a. DOD Directive 4540.1, *"Use of Airspace by United States Military Aircraft and Firings Over the High Seas"*

b. FLIP GP Chapter 7

c. ICAO Document 9554, *"Manual Concerning Safety Measures Relating to Military Activities Potentially Hazardous to Civil Aircraft Operations"*

d. ICAO Document 9433, *"Manual Concerning Interception of Civil Aircraft"*

The "due regard" prerogative is a valuable tool to help aircraft commanders complete the mission. A thorough understanding of when and how to declare "due regard" will aid in mission accomplishment and enhance overall safety.

Questions or comments should be directed to Lt Col TJ Miller, HQ AFFSA/ XOP (thomas.miller2@andrews.af.mil) or Mr. Allan Storm, HQ AFFSA/ XAX (allan.storm@andrews.af.mil).

# Pushing Too Far

**CAPT JEREMY GOODWIN**
**Pope AFB, N.C.**

So, you're just back from a deployment to Southwest Asia, having flown operational missions in extremely dangerous locations. Tactical airlift is a risky business these days. In the C-130 community, risk is certainly inherent in our day-to-day operations, and the hazards are only increased in the wartime environment of Iraq and Afghanistan. As combat aircrew, we are forced to take risks we wouldn't normally take at home station. Our leadership has assessed these risks and accepts them as necessary to defeat our enemy and combat global terrorism. This is just Operational Risk Management (ORM) in action—something we do ourselves every day of our lives, whether we want to admit it or not.

Now, I'm not going to preach the gospel of ORM and how we all need to adopt it in every facet of our lives, analyzing every action we take. Not only is this impractical, it's just the type of formal program that turns people off. However, as we return from a contingency deployment, I think a refocus on risk assessment in a training environment is appropriate. We are all mission hackers who are willing to do whatever it takes to get the mission done. This is only enhanced during wartime and something that's hard to leave behind in the transition to home station operations. Risk management can play an important role in this transition, ensuring that our priorities remain in check.

You can be certain that your squadron's number one priority when returning home after a lengthy deployment will be semi-annual training requirements. The pressure will be on to get crewmembers re-current in tactical events and to complete six months' worth of training in, most likely, less than half that time. The tendency to lean forward on each and every line to accomplish this goal is sometimes overwhelming. Sure, we do ORM worksheets before every flight, identifying the hazards we might face, but the real pressures and risks come in the dynamic environment when we are actually flying. This is when we, as crewmembers, must use risk management. We have all felt these pressures before, but we tell ourselves we are in control and that we won't let the situation get out of hand. Well, I am here to tell you: If you have the wrong mindset, it will get out of hand. We must think our actions through, think about the risks involved and make educated decisions.

Truthfully, until I attended the Flight Safety Officer course, I never really consciously thought much about ORM, yet I realized that I had been practicing it for quite some time. A few years earlier, as a young navigator flying the mighty C-130 Hercules, I was trained in risk management, but never really thought it applied to me. ORM was something that the leadership did before we flew to make sure we were safe. It was their job, not

USAF Photos
Photo Illustration by Dan Harman

mine. I could not have been more wrong. My belief and conversion to the principles of risk management can all be traced back to a solitary flight.

It was my first mission checkride out of the FTU and one I will never forget. It was a three-ship day formation flight, something we do every day around the "flagpole." The plan was for us to be on the wing as No. 2 for a Station Keeping Equipment (SKE) route and then lead the formation on a visual low-level through the Alaska Range. The forecast called for high ceilings that shouldn't be a factor all day, along with light, variable winds. From an ORM standpoint, this was a fairly low risk mission; a local training line that we did almost every day, instructor pilots in every airplane and checkride weather. Everything was looking good for a great day of flying.

Of course, standard C-130 operations took over, and nothing went as planned after we left the planning room and stepped to the airplanes. To make a long story short, the No. 3 aircraft broke on engine start, and we were delayed for maintenance as well. We took off late to join Lead in the middle of the route, performed a rejoin and flew the wing position to a successful airdrop. As we escaped off the drop zone, we took the lead of the formation and proceeded toward the Alaska Range at 300 feet AGL. After a rough start to the day, with more than a few helmet fires, things were starting to calm down. As a crew, we thought we had everything under control.

We flew across a wide valley approaching the mountains and then noticed that clouds obscured the mountain peaks. No big deal; we were staying in the glacial valleys between the peaks anyway. As a crew, we also noticed that the solid deck of clouds and the white snowfields of winter in Alaska made it fairly difficult to discern a visible horizon. Even though the visibility was more than three miles, the white snow in front of us just blended into the clouds, and it was becoming more and more difficult to tell where one ended and the other began. Now, about this time you would think something would click that maybe flying into rising terrain that was hard to differentiate from a lowering cloud deck wasn't a good idea. Well, it didn't. We were entirely focused on the mission at hand and completing the check ride. That was our mission, and we were going to get it done, no matter what.

As soon as we made the turn to climb up the glacier, we regretted the decision. We had no way of turning around in the narrow corridor, and the terrain of the valley was rapidly rising approximately 5000 feet, dangerously close to the base of the clouds. We hadn't assessed the hazards as we made this turn, and now we were stuck with our decision. Our only hope was that we would not go IMC before we reached the crest and the terrain started falling away from us. It was a tense situation that we had gotten ourselves into. Using every means of navigation available, we reached the crest at 300 feet AGL with mountains rising 5000 feet on either side of us and the clouds just above us. I have never been as nervous in an airplane as I was at that moment. Fortunately, we never lost sight of the ground and were able to stay on course until we could descend. We were extremely lucky. The result could easily have been disastrous. We had definitely pushed too far, and our personal risk management had failed.

My point in relaying this story to you is that we all need to think about the things we do, and preferably before we do them. I was fortunate enough to learn from hindsight in this instance, but we may not all be that lucky. In the C-130 community and in much of the Air Force, our high ops tempo and deployment rate limit our training opportunities and get us in the mindset of mission accomplishment no matter the cost. This is the wrong way to do business. Hopefully, the formal ORM process will do a good job of limiting the hazards we face, but it won't in all cases. There will always be risks out there, and we are the last line of defense in the risk management process. It is our responsibility to recognize these hazards and use our judgment to control them. This is the heart of ORM, and it cannot be emphasized enough. You don't need to overdo it, but I urge you to think about the consequences of your actions, weigh the costs and benefits, and take the necessary actions to come home safe.

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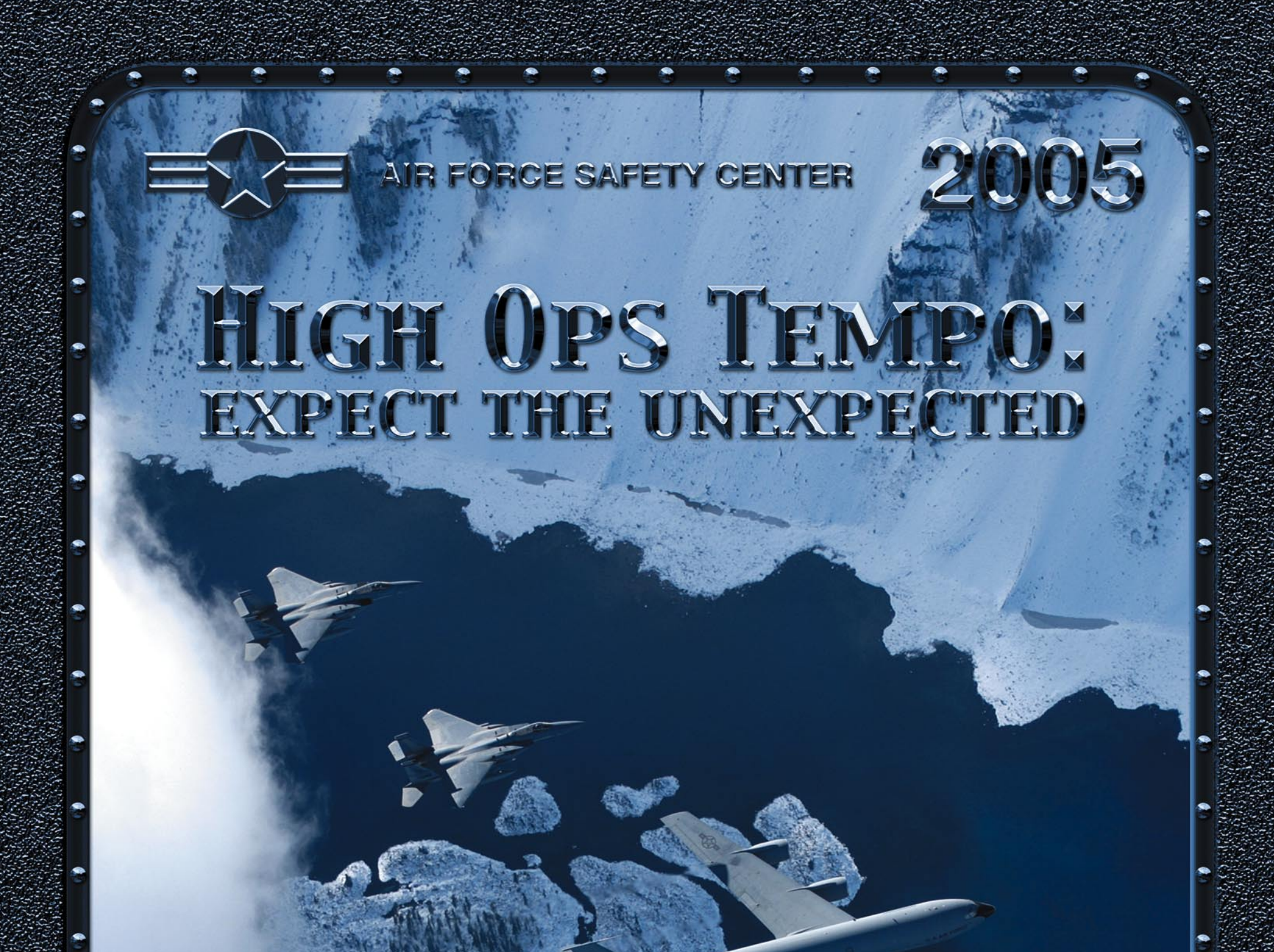
# High Ops Tempo:
## Expect the Unexpected

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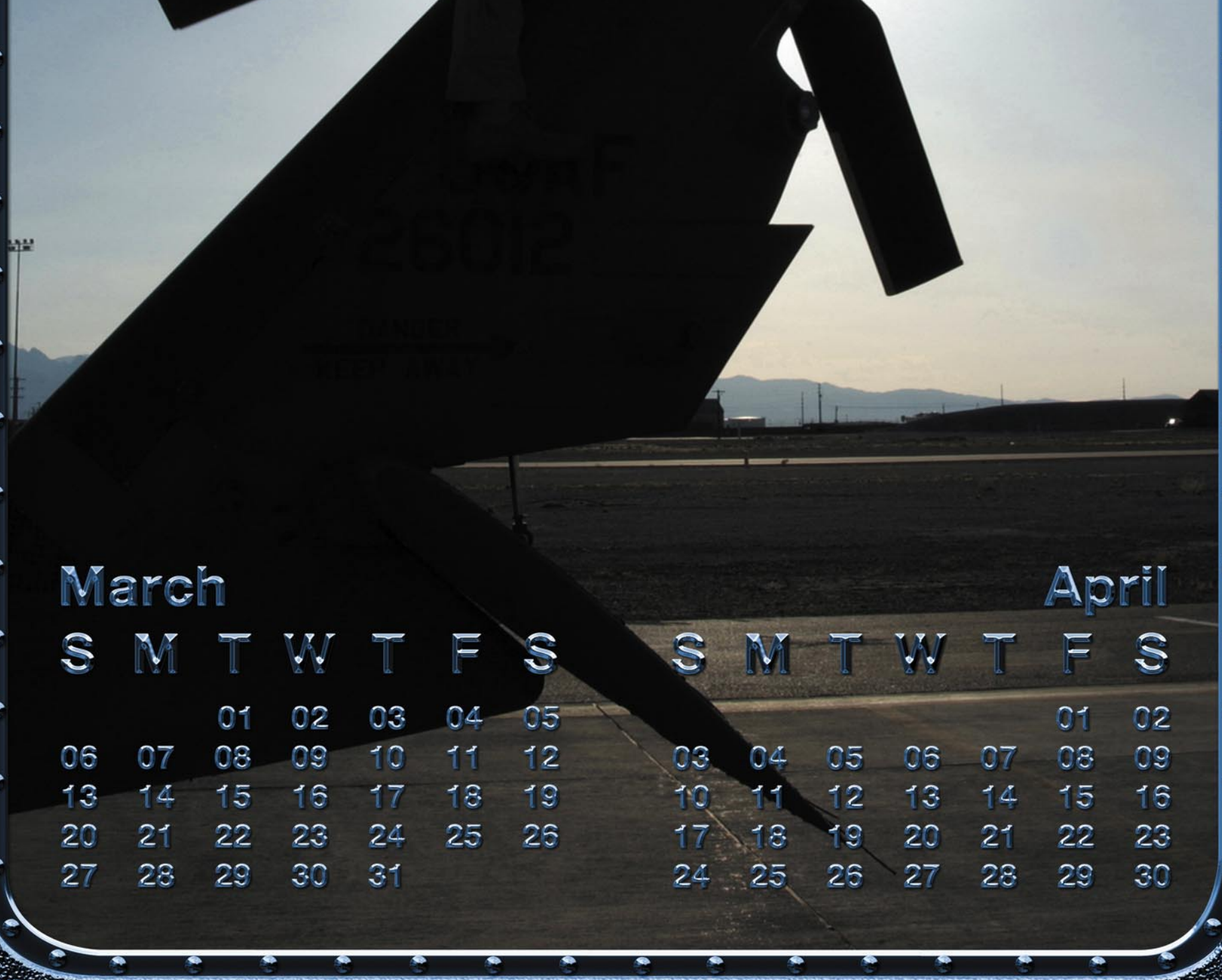
# Risk Management
## in all Situations



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FIX IT LIKE
YOUR LIFE DEPENDS ON IT

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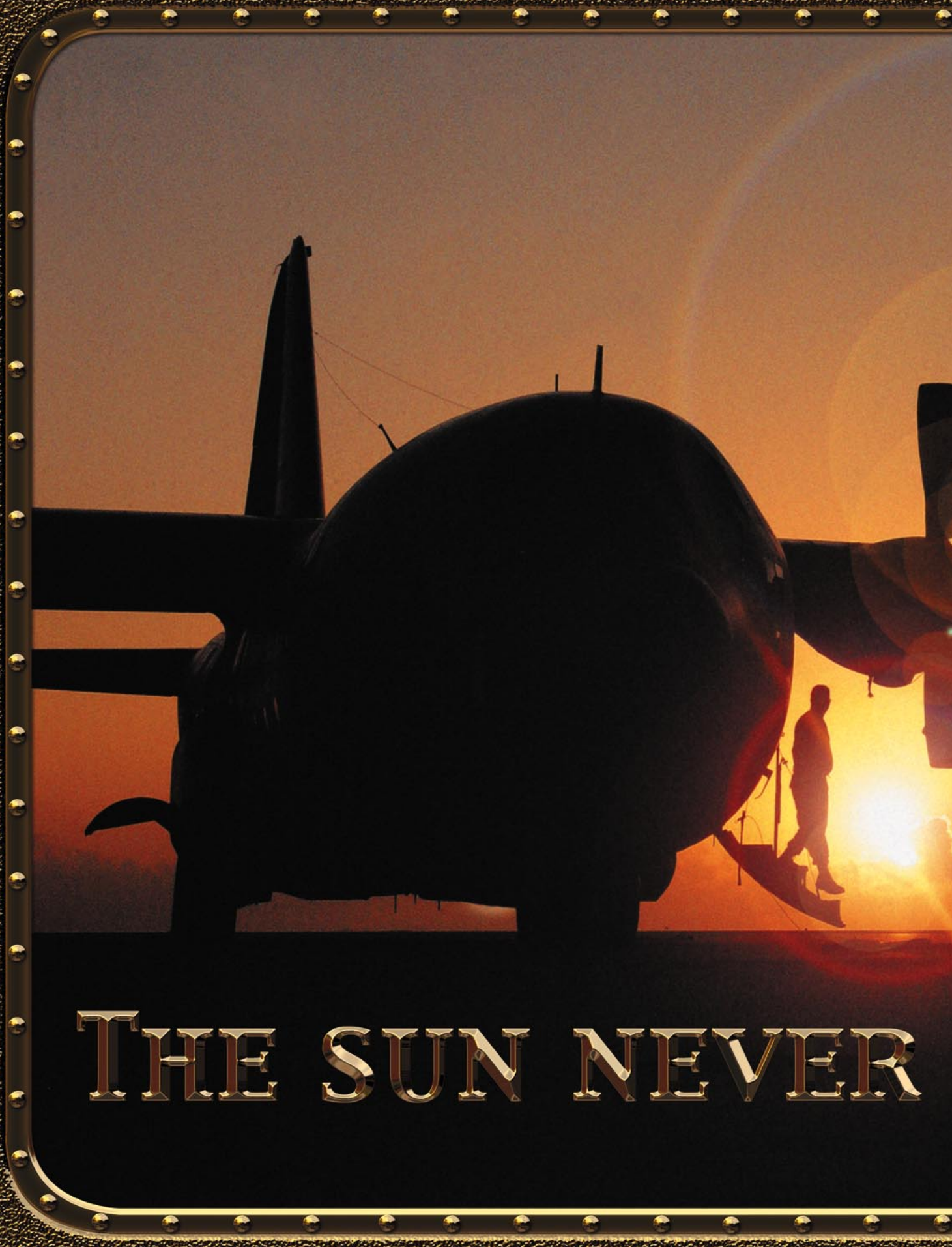
THE SUN NEVER


USAF Photo by SSgt Jennifer C. Wallis


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LOOK BEFORE YOU LEAP
THAT KIND OF SUMS UP SAFETY

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DoD Photo by TSgt Mike Buytas, USAF

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# Rules Are Good
## No Workarounds


USAF Photo by SSgt Michael Gaddis

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# WINGMAN

## YOU ARE YOUR BROTHER'S KEEPER


## November

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USAF Photo

# We Plan Ahead...



**CAPT TIM HALE**
**325 BS/SEF**
**Whiteman AFB, Mo.**

"We plan ahead; that way we don't do anything right now." That's one of my favorite quotes, from what is otherwise a very bad movie. There's a lot to be said for that comment. We do this every time we mission plan. Mission planning day is not a hindrance to your normal day, or just a time to quickly slap together a route of flight and give the obligatory briefing from the In-Flight Guide (IFG). This precious time should be fully utilized to set objectives, build the flight plan, talk tactics and foresee contingencies. Good mission planning will, more often than not, save you when your plan falls apart. Entirely too often, I see the tasking of one's "Additional Duty" overshadow the importance of addressing all of these critical areas.

I was reminded of this not too long ago on a routine training sortie in the mighty B-2. The sortie was planned as a two-ship departure to air refueling, followed by some range activity releasing two BDU-56s. We covered the basics. We looked at the flight plan, called the tanker, called the range, crew-briefed and attended the formation brief. By law, we covered all of the minimum items required to accomplish our sortie. We were good to go, and we got back to work with enough time in the day to finish up our individual tasks in the office. It all seemed fine, until shortly after takeoff.

We took off as No. 2 in the formation, but weren't able to lock up Lead on the radar. We never had a good radar lock; therefore, had never called visual, or tied. We continued to look for Lead on the departure, but we never picked him up. We did, however, continue to climb and proceeded on our flight plan route. What could go wrong with that? We had the same route of flight as Lead. We knew roughly where he should be. We continued to climb through a solid deck about 6000 feet thick. We reached the intermediate level-off block and continued to hunt for Lead, but to no avail. We did eventually call "Broke lock," which in the B-2 world equates to "Two's blind." We made this call just as Center was asking Lead if he intended to rejoin with us. That's never the call you want to hear when you should have been together the entire time! After calling for Yardstick from Lead, and getting a few pointers from Center, it became evident that we had overrun Lead. We regained situational awareness, got into proper position

# ...that way we don't do anything right now.

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Photo Illustration by Dan Harman



and continued on to A/R. Center didn't really seem to mind helping us with our buffoonery. Two was in, we didn't hit each other, and nobody got violated. Score!

The rest of the sortie went well, but it was evident that we really had not sat down and taken the extra time to look at a few contingencies back at ground speed zero. In this particular case, Lead climbed out at 280 KCAS, and we continued to maintain the standard climbout of 325 KCAS. Now it's easy to see how we got out of position. During the formation brief, the climbout was briefed as standard, and why not; that's why we have standards. We never did, however, take the time to cover how that would affect the formation in the event of weather. That omission was indicative of our entire mission-planning day. That doesn't make us bad pilots, but instead highlights the fact that perhaps we didn't put enough focus on maximizing the effectiveness of our sortie. In the end, we didn't plan ahead; therefore, we worked too hard once the sortie was airborne.

I vowed, "Never again!" I decided I would never be caught like that again. A short time later, I was afforded the opportunity to put this new mantra into practice. Just a couple of months after our grand formation debacle, I was told I would get to be the flight lead for a B-2 flyover of the Royal International Air Tattoo (RIAT), at RAF Fairford.

The flyover profile was anything but standard. The plan called for a two-ship B-2 deployment to RAF Mildenhall coupled with the air show activity. Two crews would fly in from Whiteman, do the fly-by on Saturday with two F-15Cs from RAF Lakenheath and recover at Mildenhall. I would then lead the formation for the air show profile on Sunday, followed by the return trip to Whiteman. One B-2 fell out, so that left only us and two Eagles for the Sunday fly-by.

The profile called for us to launch out of RAF Mildenhall and join with the Eagles from RAF Lakenheath. We were to fly north, through the Daventry corridor, then southeast for the Fairford fly-by. We then planned to fly north, back through the Daventry corridor, and up to A/R on the Flamboro track.

We arrived several days in advance, in order to meet with the Eagle guys over at Lakenheath and

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# OPS TOPICS

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

Here are a few events that caused some missed sorties and aircraft damage. Think before you act, and maybe we can prevent things like this from happening.

### T-38 Convertible

The student pilot (SP) briefed and stepped for a solo contact training sortie. Following engine start, the SP lowered the front canopy to confirm the canopy warning light extinguished indicating both canopies were properly closed and locked. The canopy warning light went out and the SP opened the front canopy without first selecting ram dump as required by the checklist. Taxi to the end of the runway, including taxiing down a parallel runway, was uneventful with a maximum-recorded airspeed of 37 KCAS. The taxi speed did not exceed the Dash 1 published canopy limit of 50 KIAS. When cleared for takeoff, the SP taxied into position, closed the canopy, ran up the engines and initiated the takeoff roll. At approximately 80 KIAS and 300 feet from the runway threshold, the SP heard a loud noise and noted the wind rush as the front canopy departed the aircraft. The SP initiated an abort reaching a peak of 87 KCAS as recorded by the flight data recorder.

Post-mishap aircraft inspection revealed that the front canopy had become unlocked during the takeoff roll and separated from the aircraft when exposed to the relative wind. The front canopy hinges were fully intact with no apparent damage, indicating the release system had functioned as designed. Egress specialists fully demonstrated normal and emergency operation of the canopy movement and locking mechanisms without a canopy installed. Egress specialists also checked operation of the canopy warning lights and activation switches and found they were within specified tolerances. The canopy warning light switch also activates a solenoid in the cabin pressure regulator to begin cabin pressurization and canopy seal inflation when the canopy warning light is extinguished. Therefore, cabin pressurization and canopy seal inflation do not occur until after the canopy is fully down and locked. Maintenance performed a full check of the cabin pressure regulator, and no failures of the regulator were found.

Prior to taxi from the chocks, the SP closed and locked the canopy and checked that the canopy warning light went out. This is a normal practice for a solo pilot to confirm the security of the rear cockpit. Normally, the check is done prior to engine start, but it can be performed after the engines are running. However, if the canopy is lowered with the engines running, the cabin pressure switch should be moved to "ram dump" prior to opening the canopy IAW tech data. Selecting ram dump depressurizes both cockpits and deflates the canopy seals.

Tech data states: "If canopies are opened from the closed and locked position: Cabin pressure switch—ram dump." The checklist further adds the following warning: "Loss of cano-

py and severe injury may occur if either canopy is unlocked prior to depressurizing to field elevation. The canopy could blow off its hinges and fall into the cockpit area. Anytime the aircraft has been pressurized, ram dump must be selected and the cabin pressure checked prior to opening the canopy." The checklist further adds the following caution: "After placing the cabin pressure switch to ram dump, ensure the cabin altimeter displays field elevation before opening the canopy. Pressure equalization may take several seconds."

There was inadequate evidence to conclusively determine the cause of the canopy becoming unlocked, but the most likely scenario is that the canopy was not fully locked prior to initiating the takeoff roll. Do you know all the procedures to ensure your aircraft doesn't become a convertible?

**Emergency Jettison, Oops, No Emergency**

The night prior to the sortie, maintenance performed a 30-day weapons inspection on the aircraft. Prior to step, the pilot was notified that the aircraft and another aircraft in the line-up would require an operational check flight (OCF) for extended downtime in conjunction with the mission. The aircraft had not flown in the previous seven days. The Squadron Top 3 directed the pilot lead the two aircraft requiring an OCF on an alternate mission. During ground ops, the pilot discovered that he could not access the armament display of the programmable armament control set (PACS) on the multipurpose color display (MPCD) and called for maintenance. While troubleshooting the PACS, the pilot determined the push button associated with the armament display was not faulty as it could be used to access other MPCD pages. Neither the pilot nor maintenance could correct the display problem. After discussing the amount of time required to replace the MPCD, inoperable systems, and mission requirements with maintenance supervision and the Squadron Top 3, the pilot elected to take the aircraft and continue the mission, and work the PACS problem after landing.

The pilot taxied to the end-of-runway quick check for arming prior to takeoff. The arming crew confirmed that all switches were off, safe and normal, and that hands were clear, and then passed a thumbs-up to the rest of the arming crew. The two mishap weapons specialists (MWS) proceeded to arm station 2. As the MWS pulled the armament safety pin out of the station 2 pylon, the cartridges fired causing the pylon, missiles, and external tank to drop from the wing. The pilot made a radio call for emergency response vehicles, shut down and egressed the aircraft.

Post mishap inspection showed that the emergency jettison button was depressed in 3/16th of an inch, which energized the emergency jettison circuit. When energized, the emergency jettison circuit will send a firing signal to all carted pylons and fuselage mounted missiles. These cartridges are electrically and mechanically safe when safety pins are installed. When MWS removed the pin the electrical signal was sent to the cartridges. The force of the firing cartridges and the weight of the falling pylon broke the safety pin into three pieces.

The emergency jettison button is hot with internal or external power on the aircraft, and need only be pressed as little as 3/16th of an inch to activate the jettison circuits. The button is spring-loaded to return to the normal position after it has been depressed. A voltage detector was connected to the pylon breeches of Station 2 and external power was applied to the aircraft. All voltage indications were normal, but the emergency jettison button had to be tapped with a pin to get it to return to the normal position eight out of 10 times it was depressed.

Tech data states: "Although the emergency jettison button is spring-loaded to the normal position, a means is provided to determine that the button is not stuck in the jettison position. In the normal position, only the color black on the inside lip of the button guard can be seen above the button. If the button is stuck in the jettison position, yellow color can be seen in the switch guard below the black color." The yellow color below the black paint in the switch guard of the emergency jettison button on the aircraft was more of an orange/rust color.

In addition, the PACS will only work on the emergency jettison task while the button is pushed, so the PACS display management task wouldn't be functional until the button is released. The PACS suffered a failure of computer programmer (CP) cards. The cards that failed in the PACS are tied into the emergency jettison button electrical system. Based on operational theory of the PACS CP in relation with the emergency jettison button, with the jettison button in the closed state for the extended period of time, it created an over-voltage. This would create a short to the emergency jettison circuit card assembly.

Several events led to this mishap, but it all comes down to ops and maintenance not seeing a potential mishap. The pilot had a malfunction and took an aircraft that maybe he shouldn't have. The colors may not be the right ones, but when was the last time you took a good look at the emergency jettison button in normal and jettison? Do you really know how the system works?

# Maintenance Matters

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

This edition is about the mighty "Herc" and some of things we have done to shorten the time they spend in the air. How would you have dealt with these issues?

**Fuel Tank Safety Wire**

During the cruise portion of flight, the flight engineer attempted to transfer fuel from both external fuel tanks using the air-refueling panel. The engineer turned on the dump switches for the external tanks, but the air refueling manifold pressure gauge indicated zero pressure. Crossfeed operation was normal, so the crew continued the flight and accomplished fuel management using normal crossfeed procedures. Upon landing, the crew discovered the left and right external fuel tank dump valves were safety-wired closed. The valves were damaged in the attempt to open them while safety wired. The valves were removed and replaced with no further discrepancies noted.

What happened, you might ask? Several days prior to the flight, the aircraft's external fuel tanks were removed to complete a TCTO on the external fuel tank pump. The fuel dump valves (one each wing) were safety-wired closed and the bypass valves (one each wing) were safety-wired open in accordance with the "Secure Fuel System for Airplanes with External Tanks Removed" procedure in the tech order. The valves' electrical connector plugs were covered with bags, which were safety-wired on as well. This procedure is usually performed when flight without the external tanks is anticipated, or when the tank installation will not occur immediately following the removal. Since the aircraft was having other work performed during the same period, maintenance supervision chose to secure the fuel system in accordance with the job guide. After TCTO completion, the tanks were reinstalled on the aircraft. Before the installation, the maintainers performed the procedure to "unsecure" the fuel system as required in the tech order.

As part of this process, a 3-level maintainer (EM1) removed the bypass valve safety wires and the screw bags from the electrical connectors, but failed to remove the safety wires from the left or right external fuel tank dump valves. A 5-level maintainer (EM2) was present and responsible for checking the work of EM1, who was not qualified to perform the installation on his own. EM2 saw the safety wires and screw bags that EM1 had removed, but did not visually inspect the valves to ensure all steps were completed properly. Failure to remove the safety wires from the left and right external fuel tank dump valves rendered them inoperative. A review of written guidance, however, revealed that there is no operational check required of the external fuel tank dump valve after external fuel tank installation. In most cases, T.O. procedures require aircraft components to be checked for proper operation after installation. Current job guides do not require an operational check of the external fuel tank dump valves. I know our experience levels are low, and the five and seven levels are maxed out, but we must check the work of the young troops to prevent having to redo their work.

**Extra Hardware No. 1**

All events up to and including initial climbout were uneventful. The crew leveled off at final cruise altitude, and allowed the aircraft to accelerate. Approaching cruise airspeed, the pilot attempted to set cruise power, and as the pilot retarded the throttles, the No. 1 throttle bound. The No. 1

engine was then shutdown IAW tech order procedures. Approach and landing were uneventful. Maintenance investigation found a screw and washer that had fallen into the throttle quadrant, causing the throttle cable to bind. Maintenance removed the parts and the aircraft was cleared for flight. But, where did the extra parts come from? Cleanliness and ensuring all hardware is accounted for is a great thing in aircraft maintenance.

### Extra Hardware No. 2

After departing home base and leveling off, the aircraft was cleared for a higher altitude. While the copilot was advancing the throttles, binding was discovered in the No. 1 throttle. The engine was shutdown with the fire handle IAW the Dash 1, an IFE declared and a divert to the closest base was coordinated. Landing and taxi were uneventful. Maintenance found an engine access door assembly chain had wrapped around the throttle cable and was wedged against the throttle pulley. No damage was discovered. Maintenance removed the chain and the aircraft was returned to flight, but why (how) did a chain get where it wasn't supposed to be? Careless maintenance cost us a bunch of rework and lost mission capability that the Air Force can't afford.

### Loose Cap

Upon engine start, the loadmaster noticed a puff of smoke coming from the No. 4 engine, and the crew noticed a faint odor in the aircraft. As the crew upsped the engine, the prop low oil light came on and the engine was shut down using the normal shut down sequence. Maintenance took a look, and to their surprise, found that the crew chief failed to install the pin of the prop oil servicing cap correctly. Another case of failing to follow tech data that costs us more time we don't have.

### Fuel Foam Does Its Job

An aircraft was scheduled for a depot-level TCTO in conjunction with programmed depot maintenance (PDM). After completing PDM Cells 1 through 4, the aircraft was assigned to Cell 5 for major maintenance and accomplishment of the TCTO. When 30-40 percent of Cell 5 maintenance was performed, the TCTO revealed that repairs were necessary on the flap track located in the inboard aft wall of the tank. Several cavities of foam plus structural parts were removed to allow mechanics access to accomplish this inspection. There were also several leaking fasteners in the center of the tank that were discovered during the flap track inspection. More foam and structural braces were removed to accomplish this repair. Once repairs were completed, the fuel tank was reassembled and leak checks were performed.

At this point, the fuel tank foam was known to be serviceable and exhibited no evidence of fire damage. Fuel quantity calibration was accomplished and the aircraft was towed to the purge station. While conducting the fuel system's contamination check by operating the switches in the cockpit to empty fuel from the aircraft, maintenance personnel discovered that two of three circuit breakers (one for each phase) for the No. 2 fuel tank dump pump had tripped. The Cell 5 shop was notified and gave instructions to the purge station to continue conducting the fuel system's contamination check, using the boost pump instead of the inoperative dump pump. The shop planned to troubleshoot the dump pump when the aircraft was returned to the Cell 5 maintenance area. While troubleshooting the No. 2 dump pump, Cell 5 personnel entered the No. 2 tank and found evidence of a fire in the form of melted/charred foam and soot on aircraft structural members.

The foam and dump pump were removed from the aircraft for closer examination. Teardown of the pump found a conductor with an internal path (short) to the pump housing. The lab also found a non-conductive coating of an unknown type on the mounting base of the pump that most likely prevented the pump from being electrically bonded to the aircraft structure. By design, internal shorts would ground through the housing to the aircraft structure. These two findings support the theory that an arc occurred between the pump housing and a surrounding entity (possibly a conduit, fuel line or the conductive foam) resulting in ignition of fuel vapors in the tank. It was also discovered that the mishap pump was not the correct part number for this application. It appeared as though the electrical conduit connection for this wrong pump was twisted 180 degrees to fit this installation. This may be a contributing factor to the pump shorting internally. Installation of this wrong pump occurred prior to arrival at this depot. Three conditions must exist for the dump pump to produce an external arc and cause a fire:

(1) The dump pump must have an internal failure to cause an electrically charged housing.

(2) The pump housing must be improperly bonded to the aircraft structure.

(3) An explosive atmosphere (oxygen, fuel and igniter) must be present in the tank.

The probability for all three conditions to exist simultaneously is rare, but can be reasonably expected to occur (and in fact did occur). The explosion suppressant foam extinguished the fire as expected. Luckily, we had a system in-place to put out the fire and protect the aircraft, but somewhere at sometime, the wrong pump was installed and caused extra work to make the pump fit and to repair the future damage.


**FY05 Flight Mishaps (Oct 04-Nov 04)**

**7 Class A Mishaps**
**1 Fatality**
**1 Aircraft Destroyed**

**FY04 Flight Mishaps (Oct 03-Nov 03)**

**5 Class A Mishaps**
**0 Fatalities**
**2 Aircraft Destroyed**

| | | |
|---|---|---|
| **03 Oct** | | A C-5B sustained damage to 2 engines after multiple bird strikes. |
| **04 Oct** | | Two F-15Cs collided in midair; both returned to base OK. |
| **07 Oct** | | A B-2A suffered an engine failure on climbout; HPT and LPT severely damaged. |
| **18 Oct** | | An F-16C tire tread separated on takeoff; barrier was engaged and gear collapsed. |
| **20 Oct** | ✈ | An HH-60G crashed during a rescue mission; 1 fatality and 5 injuries. |
| **04 Nov** | | An F-15C departed the runway when its MLG collapsed. |
| **09 Nov** | | An F-15E had an engine fire on takeoff; T/O aborted. |

- 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.
- Reflects only USAF military fatalities.
- "✈" 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 and ground safety statistics are updated frequently and may be viewed at the following web address: http://afsafety.af.mil/AFSC/RDBMS/Flight/stats/statspage.html.
- **Current as of 19 Nov 04**.



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work out all the details of a three-ship dissimilar formation in foreign airspace. We were in serious need of the corporate knowledge that the Eagles had to offer, to say the least. We had all read AP2, and were familiar with the nuances of British airspace and ATC. What we didn't have were the charts that displayed all the points and corridors that the Brits would expect us to know about. More importantly, our Air Force Mission Support Software (AFMSS) personnel did have these charts. The route of flight that was cut for this particular sortie would have to be extensively altered. We worked hard to identify these problems with our routing, and we anticipated which points would have to be manually input once we're in the jet.

I spent the days prior to the flight between Mildenhall Base Ops and the 493rd FS at Lakenheath, with the other pilot coordinating the particulars of Sunday's sortie. Thanks to some photocopies of the In-Flight Guide from Lakenheath and a copy of the British charts donated by the 100th ARW at Mildenhall, we felt we had all we needed to safely proceed to Fairford.

I spent the better part of the evening prior to the flight pouring over my charts, profile and notes from the briefing with the Eagles. I tried to envision different contingencies. I thought about what I would do in the event of delays, weather or fall-out of other players. I stepped to the jet confident that all had been covered. I was ready to walk out the door and show off the mighty B-2 to the crowd at the air show.

Everything went as planned, right up until our support out at Fairford called and said he needed us one hour early. No problem. We called the Eagles, and they were ready to go. I accomplished the replan and we took off on time for the rejoin with the Eagles. All went well, and we took off with a good blue line (flight plan line displayed in the cockpit).

Shortly after takeoff I noticed that my blue line didn't look quite right. The disk drive unit (DDU) that contained our mission data had malfunctioned. The cockpit depiction of our routing stopped just a few points ahead of our present position. In all of my planning, I hadn't envisioned such a malfunction, but was prepared nonetheless. Both the pilot and I had thoroughly reviewed the charts during the days prior to the flight and were able to gain situational awareness on the points leading to the Daventry corridor. The last thing I wanted was to have a fighter on each wing and look like we were losing control of the situation.

I still had quite a bit of work ahead of me. In my attempts to regain my flight plan routing, I was forced to reload the mission data from the DDU. Unfortunately, I lost all of my replanned points. Now I was back to square one with my TOT at Fairford quickly approaching. I quickly jammed in good points to Fairford, just in time to look up and see storms building right over our turn point. "Great. Let's see what else we can throw in," I thought. My pilot looked over and said, "So, do you really want me to fly through that?" as he pointed out off the nose. Well, I had decided way back in mission planning that there was no way I was dragging two F-15s through the weather, so, as planned, we turned early and went direct to the IP for the Fairford fly-by. We called the controller and advised that we would orbit at the IP in order to make our TOT. As a result, we shacked our TOT, with the F-15s in flawless fingertip position.

Now all that was left was the departure and A/R. I quickly worked to get good points for the corridor into the navigation system. The pilot did an excellent job of coordinating with me for the points he needed. I quickly referred to the IFG copy, and the chart. As I said before, neither one of us wanted to choke with the fighters still on our wing. We planned ahead, and our workload, although heavy, was significantly less than what it could have been, had we not prepared.

I shudder to think what would have happened had we blown off our mission planning in order to take in the local flavor. I learned a great deal from both of those sorties. The first sortie wasn't necessarily dangerous, and the second sortie certainly wasn't flawless, but both served as excellent examples of the utility, and the necessity, of good mission planning. It doesn't matter if it's training or combat, complicated or routine. Afford the proper time to effectively plan your sortie. Think contingencies, and always work to maximize your training. Always remember to plan ahead, thus avoiding work right now.



***I shudder to think what would have happened had we blown off our mission planning in order to take in the local flavor.***


Foul Weather
...Got a Plan?
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