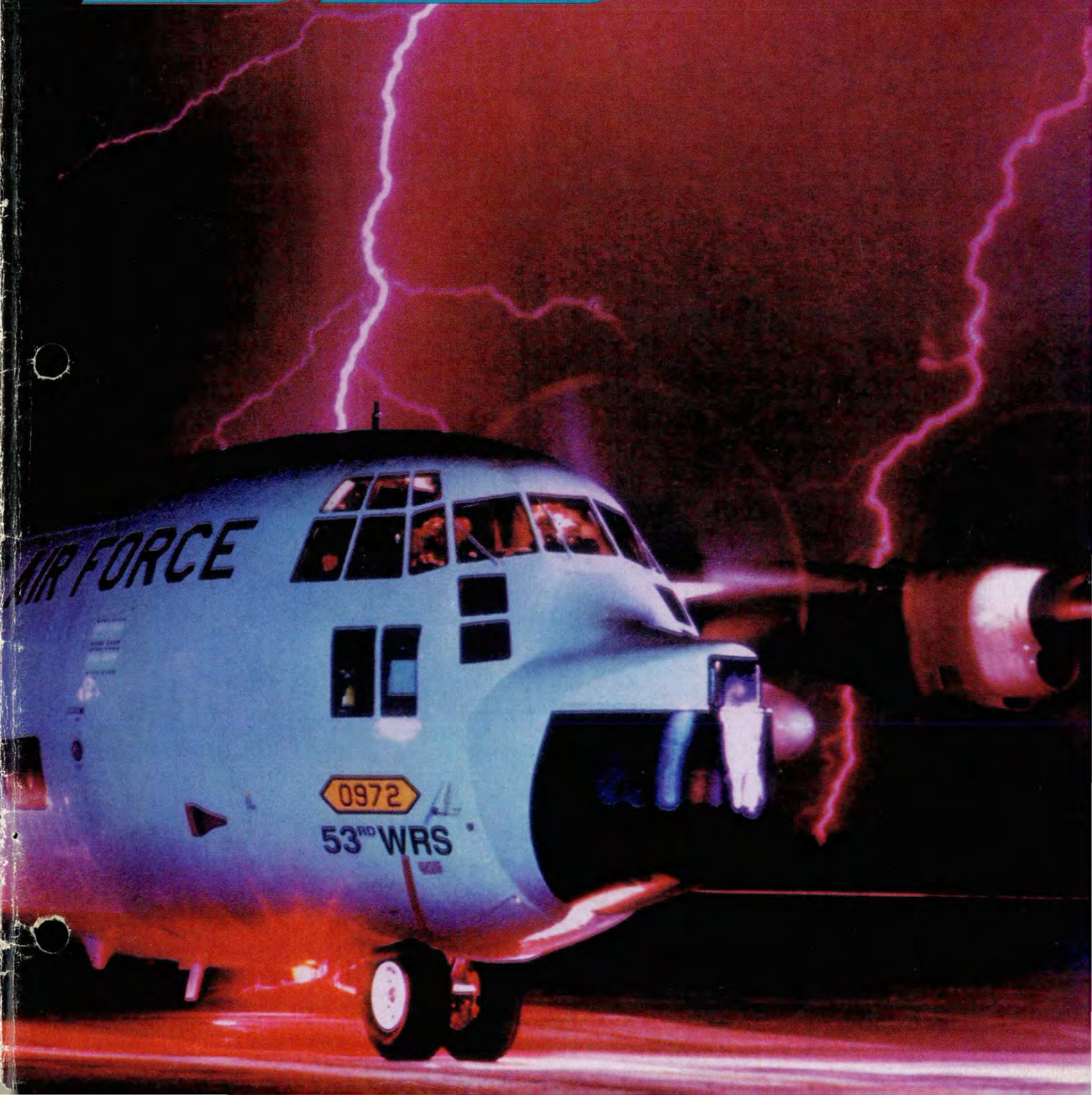
flying SAFETY

JULY 1996



KEEPING THE FIRST MISSION EDGE

■ Those of us who have flown combat will always remember our very first combat mission. I had meticulously prepared for it and couldn't wait to put my combat training to the test. I had just completed new guy school and had flown my required local area checkout, and it was now time to go to work. The mission had a 1200 hours TOT, and even with the majority of the planning done the day before, I was already in the squadron ops building by 0600 making the final preparations. I had memorized where to expect the enemy gun positions and had drawn up numerous back-up plans of attack just in case the first one was unworkable. I double-checked my survival gear making certain my radios worked and reviewed in detail my evasion plan of attack should I take a hit and have to bail out. I paid close attention to everything said and asked the old heads lots of questions. Even with my anxiety running at an all-time high, I felt prepared and comfortable.

GENERAL JOHN G. LORBER
Commander, Pacific Air Forces

The mission was exciting and tested my preparation to the limit. Weather and enemy defenses forced the flight to backup plans, but we hit the target, and all made it back safely — a successful first mission. As we were flying back to base, I remember thinking that if all my remaining missions were going to be like my first, I needed more insurance. Well, they were not. Some were even more exciting, but many were quite boring. Sometime during the tour I began to feel invincible, and with that feeling, I began to spend less and less time preparing for each mission. It was after a less-than-polished mission that a crusty major took me aside and gave me a bit of advice that probably saved my life. What he told me 26 years ago is still valid today: "You've got to plan and fly every one like it's your first combat mission. If you don't, you'll lose the edge, and a three-level gunner will get you." He was warning me not to become complacent, because unless you are extremely lucky, complacency will kill you.

Complacency was a threat then, and it's still out there today. If not corrected, complacency can reduce the effectiveness of the best equipped, best trained, and the most respected aerospace force in the world. It can happen to an organization or to an individual. When we get too comfortable with the task at hand, we have just increased the risk of doing business, and that's when accidents happen. We have to continuously work to keep the "first mission edge." You can learn a lot about organizational complacency from your new people. You know them, the ones who ask the questions that begin with, "Why do you do it this way here? That's not the way we did it back at my last base." It seems they always have a simpler solution to the operation. Before you summarily send them on their way by telling them, "This is the way we've always done it here," think what it is you're telling them — it's okay to become complacent. After a short while, they, too, will become one of the herd. Listen to their new ideas. You'll be surprised what they've observed in such a short time and what will help open the collective eyes of your organization. New ideas keep the edges sharp.

When's the last time your organization took the initiative to fix a complicated operational procedure that's been around for a long time — so long that nobody complains about it anymore? It may be a tough noise abatement climbout that the heavies have a hard time complying with, or an instrument approach so complicated that a single-seat pilot is task-saturated shooting it. Take the initiative and get the ball rolling to change the way things have been, especially if you know risk will be reduced. Get higher headquarters and other agencies involved in working solutions to your problem areas. We can use everyone's help sharpening edges.

Don't assume there isn't anything you can do to improve the aircraft you fly and the procedures you use even though the old warhorse has been around for 20-plus years. Every year there are mishaps involving aircraft systems and aircrew procedures where investigators uncover something that's obvious to outsiders but has been obscured to those on the inside for ages. More than likely, the mishap involved equipment or procedures that were seldom used by the mishap aircrews but frequently used by the aircrews in other weapons systems. Make it a point to crosstell crew techniques and systems operation information with your fellow aviators from other aircraft types. Don't let your buddy fly

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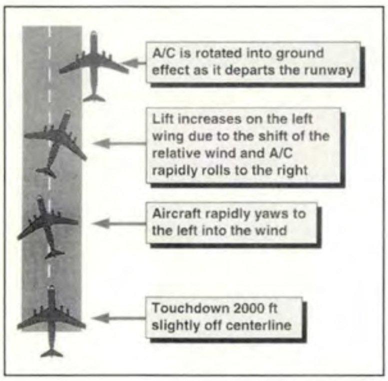

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Our cover photo courtesy the folks at 403d / PA, Air Force Reserve Keesler AFB, Mississippi

SPECIAL FEATURES

REGULAR FEATURES

CONTRIBUTIONS
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ZAP!

CMSGT ROBERT T. HOLRITZ
Technical Editor
Reprinted from *Flying Safety*, May 89

■ Summer is here, and with it comes the warm weather that brings thunderstorms. The number of days producing thunderstorms varies in the United States from as few as 3 in the Southern California desert to as many as 93 in central Florida. Each year, 200 people are killed by lightning in the United States alone.

A Deadly Phenomenon

Without a doubt, lightning is the least understood and most deadly of all weather phenomena. Although it has been more than 200 years since Ben Franklin performed his famous kite experiments, we still know little about the mechanics of lightning. What *is* known is that a thundercloud generates negative ions which finger their way earthward in pencil-size streams called step leaders. The strong, negative attraction of the cloud creates a positively charged ion shadow along the ground below it. It was this positive charge that made Franklin's fingers tingle during his experiment. Many scientists agree that had the kite actually been struck by lightning, he would have been reduced to a pile of ashes.

When the negative charge of the step leader meets the positive ions from the surface, they form an electrical path, and an upstroke of positive ions shoots skyward at the incredible speed of 241 miles per second in the form of a lightning flash. Therefore, in spite of the illusion, lightning actually strikes from the ground to the sky.

A typical lightning stroke generates temperatures of up to 50,000 degrees Fahrenheit, five times that of the surface of the sun. Because of the tremendous heat, the air in the path of a lightning bolt is literally vaporized, resulting in a vacuum. As a result of the surrounding air pressure, the vacuum quickly collapses, creating a thunderclap.

Electrical charges of 100 million volts and currents of 100,000 amperes are not uncommon. The effects of lightning are awesome and often bizarre. It has been known to weld manhole covers shut, destroy bridges, and even bake unharvested potatoes in the field.

Lightning Mishaps

From 1979 to date, at least 20 Air Force members have been injured or killed by lightning. Most of these mishaps occurred on the flightline. Flightline operations are particularly susceptible to lightning strikes, simply because metal aircraft, with their tall vertical stabilizers, naturally attract lightning. Because modern aircraft with their metal skin normally dissipate lightning, it is safe to say a pilot would be more at risk stepping to his aircraft in an electrical storm than flying through one.

When working on the flightline, it is important to understand lightning rarely strikes a human directly. Most deaths and injuries are caused by the intense electric field generated when lightning strikes an elevated object, such as an electrical power pole or a parked aircraft. Lightning shocked an airman when it struck the ground more than 25 feet from where he was standing, rendering him unconscious and permanently injuring him. And two airmen were killed when lightning struck a B-52 parked 75 feet from them. The fact is, you can be killed by a lightning strike as far as 700 feet away!

Servicing an aircraft is prohibited when lightning is within 3 miles (AFOSH STD 127-100). However, it is wise to stop all servicing at the first sign of thunderstorm activity. Don't wait until you see lightning. The first stroke is just as deadly as any. And the ion shadow is capable of igniting fumes during refueling operations. Note that launch, recovery, and end-of-runway operations are particularly hazardous when thunderstorm activity is in the area. This is because, under certain conditions, lightning strikes 3 to 20 miles away can induce voltages up to 60,000 volts on an ungrounded aircraft. Such voltages can be lethal.

Taking Cover

There is no absolutely safe shelter from a thunderstorm. However, a large building is the safest place to take cover. If at all possible, don't take shelter in a metal building. One airman received a jolt while leaning on a metal door inside a hangar, and an officer standing next to a metal desk received a shock through a zipper in his flight suit.

The next best place to take cover is in a vehicle. However, be sure to keep the windows closed, and don't lean against metal portions of the vehicle. Two security policemen, guarding the flightline, had a shocking experience. Sitting in a pickup truck with the windows down, they were zapped when lightning hit the FM antenna on the truck. It passed through the truck, knocked two holes in the concrete ramp, and exited through the two front tires, splitting the rubber down to the wire cords. Both were treated for electric shock and damage to their eardrums.

Injuries Are Preventable

Fortunately, most personnel injuries from lightning are preventable. Weather advisories are issued when lightning is within 10 miles. At that point, people should begin preparations to take cover. All outside/ramp activities must be terminated when the 3-mile lightning advisory is issued.

Meteorologists estimate lightning strikes somewhere in the world about 100 times every second. Consider this: The odds of you being killed by a bolt of lightning while working on an aircraft during a full-blown thunderstorm are greater than Ben Franklin's when he performed his kite experiments.

Don't Take Chances

Ben was lucky. Don't take chances. Ensure procedures are in place and followed! Treat lightning with respect, and you won't become a statistic. ✈

A MOST RECENT INCIDENT

One airman died, three were hospitalized, and several others were treated this year when lightning struck an AC-130 aircraft they were near. The AC-130H Spectre gunship belonged to AFSOC.

Four aircraft maintenance unit crew chiefs and seven AETC training personnel were in and around the main landing gear preparing to change the tires of the AC-130H when the incident occurred.

An observed weather advisory had been issued earlier that morning when weather personnel detected lightning within 3.2 nm of the field. The advisory procedures are to issue the weather advisory when lightning is withing 3 nm; however, as Florida leads the United States in lightning strikes, weather personnel were especially cautious.

Normally, an all-clear is given when there are no more air-to-ground strikes within 15 minutes. In this case, as the rainshowers moved over the field, the weather personnel waited for an hour and a half before lifting the advisory. The only other lightning strike to occur that day happened 8 minutes after the advisory was lifted, striking the AC-130H aircraft.

Flying SAFETY

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An Abrupt Loss of Control

CAPT JAMES A. REGENOR*
Joint Staff Intern

The mission was my first right-seat sortie prior to my departure to the Combat Flight Instructor Course (KC-135 instructor school) at Castle AFB, California. We had our crew mission brief the day prior since there was going to be training in all three crew positions that night. The crew numbered 10, an even mix of instructors and instructor candidates. The mission profile consisted of a night air refueling, followed by a navigation leg, and concluded with right-seat pilot proficiency training (P-70) for me, the instructor pilot candidate.

The weather at Altus that night was ideal for the mission — calm winds, clear, and a million. The air refueling and navigation leg were uneventful. As we entered the pattern, I began to think to myself about the differences of the right seat over the left seat. I knew I was ready, but I had to concentrate on the aimpoint picture in the right seat — it was slightly different.

As I briefed the approach — a four-engine, 50-flap ILS to a touch-and-go — I covered the required items from the Dash One to include our abort and unplanned go-around considerations. My abort plan for the touch-and-go was standard. If we encountered a problem prior to the pilot making the "push 'em up" call (advancing the throttles to the touch-and-go N1 setting), then we would initiate the abort bold face: **(1) THROTTLES IDLE, (2) BRAKES APPLY, (3) SPEED BRAKES 60 DEGREES.**

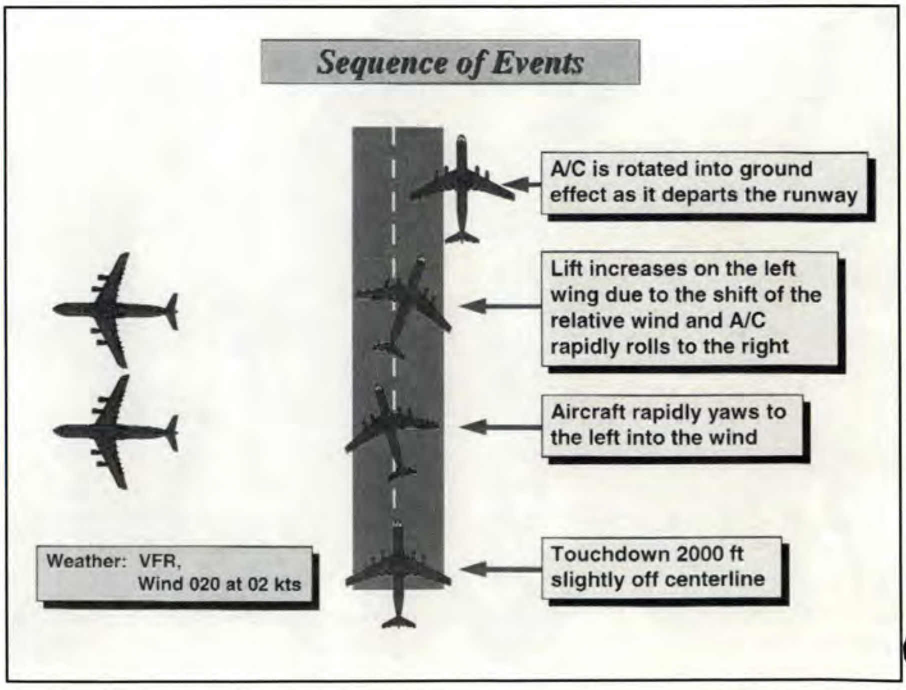
I called for the checklist, and the instructor pilot completed the checklist as I concentrated on flying the approach and providing instruction on proper target pitch and power settings. The approach went well, and I landed in the touchdown zone approximately 2,000 feet down slightly right of centerline.

I initiated the touch-and-go procedures by bumping the throttles up to a minimum of 40 percent N1. As I called for the instructor pilot to reset the flaps to 20 degrees and to adjust the stab trim to our downwind trim setting (approximately 1 unit nose up), the aircraft violently yawed to the left, followed by a rapid roll to the right and a rapid series of oscillations left and right.

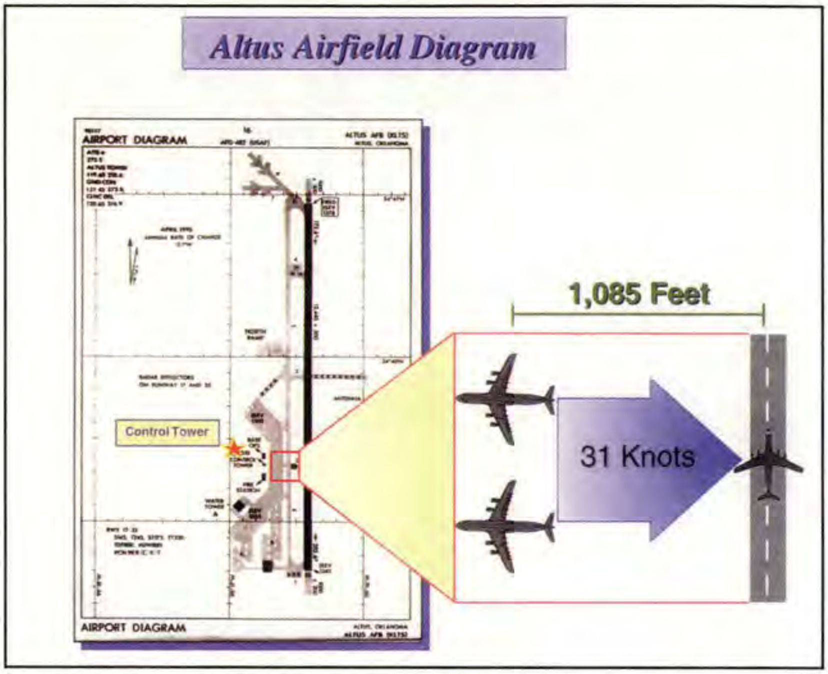
In less than a second I had lost control of the aircraft. I was now reacting to the aircraft — it had the upper hand. I wrestled with it — left rudder, right rudder, the ailerons went stop to stop. Confusion, oscillations — what's happening? I could feel the navigator in the jumpseat slam into the back of my seat. Fear was in the air. My heart pounded. The aircraft was now on only the right main gear truck. Am I dragging an engine pod? Am I going to drag the wingtip in the dirt?

As the aircraft raced towards the grass, the instructor pilot firewalled the throttles. I did all I could do to rotate into ground effect and level the wings. (See "Sequence of Events.") Finally, I had control of the beast. The engines were spooling up, and we began to accelerate and climb out. I looked over at the instructor pilot, and he had his hands on the yoke. We had not been fighting each other for control. Our inputs mirrored one another. I had control and continued to climb straight ahead to pattern altitude.

It seemed as though a lifetime had just passed. The aircraft was quiet and still. We were oblivious to the tower calling on the radio. We



This graphic provides a notional representation of the aircraft's movements during the loss of control experienced by the aircrew.



Depicted is the Altus AFB airfield diagram as shown in the approach book. The blowup portion represents the approximate location of the C-5s and a notional view of the situation encountered.

climbed up to pattern altitude and flew straight ahead for approximately 12 miles. The instructor and I looked at each other and said nothing. We scanned the engine instruments — nothing abnormal.

I asked the instructor pilot, "What happened? Did you step on the rudder?"

He said, "No," and he didn't know what caused the abrupt loss of control. We transferred aircraft control as I instructed the tower we were declaring an emergency and entering holding at the fix. We applied the basics: **(1) Fly the aircraft, (2) analyze the situation, (3) take the appropriate action.**

As we entered holding, we tried to analyze the situation. We focused on what could have caused the aircraft to depart controlled flight: Have we lost an engine, or did we have a runaway throttle? Did the engine failure assist system (EFAS) or series yaw damper (SYD) malfunction? Did we have a flap retraction malfunction? We had no idea what happened. There were no abnormal indications as we accomplished a controllability check. However, we decided to be conservative and concluded whatever happened at the very least caused us to drag an engine pod. The navigator in the jumpseat reported the attitude indicator had gone all the way from 6 to 12 degrees of bank. We exceeded the Dash One limit for "pod-proofing" of 4 degrees of bank in a three-point attitude or 6 degrees of bank in a two-point attitude.

Based on the lack of information and inconclusive analysis of the aircraft malfunction, the pilot team decided the instructor would fly a 30-flap full-stop landing. We elected to do a 30-flap landing so we would have a higher airspeed resulting in more effective flight controls and an increased ability to go around if the need presented itself again. Based on our controllability check, we knew the aircraft would fly just fine at 30-flap approach speed. The instructor flew an uneventful full-stop landing.

As we exited the aircraft, the operations group commander arrived on scene. He asked us what had occurred. We reported the facts and related we were perplexed as to the cause of the mishap. The group commander informed us two C-5As were performing maintenance engine runs at takeoff-rated-thrust settings on spots 44 and 45 (approximately 4,000 feet from the approach end of the runway and 1,085 feet directly perpendicular to the runway). Could that have caused the mishap? You bet! (See "Altus Airfield Diagram.")

Further investigation revealed the C-5s were producing a 37-mph (31 knots) crosswind. The limit for the KC-135 on a touch-and-go is 15 knots; a full stop 25 knots; and the structural limit for our gross weight that day was 28 knots. As you can see, entering an instantaneous band of high velocity crosswinds can catch you off guard — and could possibly cost you your life.

Before we discuss how to improve our situational awareness (SA), we must examine our actions in the cockpit. As the pilot flying the aircraft, it was my job to advance the power to the touch-and-go N1 setting after the pilot not flying the aircraft made the "push 'em up" call. Wrestling with the aircraft required me to take my hand off the throttles — I needed both hands to regain aircraft control. I was lucky the instructor pilot had the SA to slam the throttles to the firewall — power was life. During the approach, I briefed the crew that I would initiate an abort if something happened prior to the "push 'em up" call — I did not call for the abort. Looking back, the abort probably would have resulted in the aircraft departing the runway and entering the grass. Taking the aircraft into the air was the best decision for our set of circumstances. I got lucky!

There is no doubt a coordinated effort between the pilots saved the aircraft. However, two pilots manipulating the controls is a bad idea. We had talked about a positive transfer of aircraft control in the event one was required. Again, we got lucky.

Would I change anything I did that night? No! We made some mistakes as a pilot team, but our combined skill, the instructor pilot's situational awareness, and a lot of luck prevented a major catastrophe. Upon final investigation, it was determined we neither scraped an engine pod nor dragged a wingtip. The aircraft had sustained no damage.

continued on next page

What went wrong? The tower controller was aware the C-5s were accomplishing engine runs because he cleared them to do so. Moreover, he knew we were in the pattern because he just cleared us the option. The base regulation did not prohibit a "heavy aircraft" from accomplishing a touch-and-go when a C-5 was doing an above-idle engine run. However, it did prohibit "nonheavy aircraft" from doing a touch-and-go, takeoff, or landing.

The tower controller did not do anything contrary to the base regulations. The C-5 maintenance personnel were familiar with their regulations requiring caution when equipment or personnel were within 800 feet of the aircraft. They did not do anything wrong. However, a couple of "did not do anything wrongs" nearly resulted in the loss of 10 lives.

The base underestimated the resultant force of the C-5 engines with respect to their relative position and proximity to the runway. The base needed to reevaluate the restrictions imposed on aircraft when a C-5 was accomplishing an above-idle engine run.

The controller witnessed the aircraft swerving off the runway. In fact, he queried us to see if we were all right. We felt very uneasy in holding when we could not determine what had caused the aircraft to act as violently as it did. We guessed it would not do the same thing on the subsequent approach. If the controller had informed us of the engine run, perhaps we would have figured out what caused the mishap. We were lucky the C-5s had finished their work by the time we accomplished the full-stop landing.

Following the investigation, the base regulation was rewritten to restrict above-idle engine runs on spots 41-48 when any aircraft was performing a takeoff, landing, or touch-and-go. The responsibility is now on the tower controller to inform the maintenance crew when an aircraft is ready for takeoff, needs to taxi behind, or is on a 5-mile final for a landing or touch-and-go. The maintenance crew must then terminate the above-idle engine run.

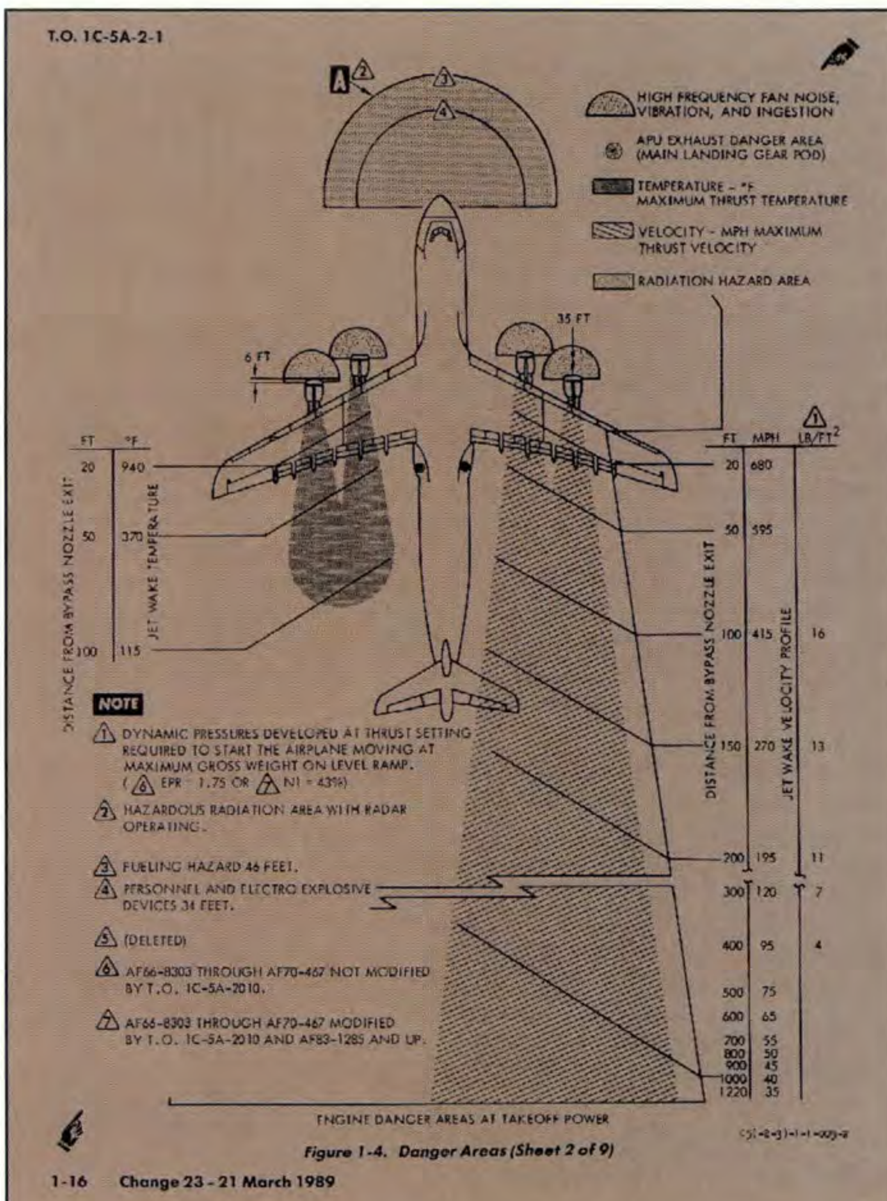
As a flightcrew member, you must always be alert to signs that engine runs are being performed. Have an idle flightcrew member monitor the ground control and command post frequencies. Look for rotating beacons (aircraft are required to have their rotating beacons on while their engines are running). If in doubt, query the controller.

Today, the aircraft industry is building engines exceeding 80,000 pounds of thrust output. These engines pose a very serious hazard potential which could cause the same near catastrophic effects that happened to us. Keep your eyes and ears open. Don't lose your SA, and you won't have to rely on luck!

FLY SAFE. ✈

*Capt James A. Regenor and Capt Todd J. Reidt received the AMC Excellence in Airmanship Award for their actions.

Editor's Note: Although the figures depict the situation for the C-5 aircraft, the problem for the KC-135 as described by the author is exactly the same.



This graphic taken from Technical Order 1C-5A-2-1 provides a visual representation of the velocity of the blast from the C-5 engines.

Intro to TCAS-101

(Or, What Have You Been Missing?)

MAJ BEN RICH
Air Force Reserve

From the early 1900's when the Wright Brothers completed their second aircraft, the potential for midair collisions has existed. Remarkably, it took 9 years before a 1912 midair collision between two Wright Flyers started the deadly trend. Throughout the first two decades of aviation development, a cynical view of this "daredevil" sport prevailed, and aviation-related deaths were an accepted occurrence.

Although the 1930's and 1940's saw advances in air traffic control procedures and equipment, it was not until 1956 when a midair collision between a TWA Constellation and a United Air Lines DC-7 caused a public outcry which forced strong government action. The loss of 128 lives provided the catalyst required to attract full government attention and increased levels of spending. The air traffic control system as we know it was born.

To reduce the potential for midair collisions, the government pumped millions of dollars into the development and deployment of an en route radar system. The advent of the Air Route Traffic Control Center (ARTCC), in conjunction with airspace restrictions (positively controlled traffic operating under instrument flight rules (IFR) above 24,000 feet and later lowered to 18,000 feet), provided the structure for our current system. This was a good start, but unfortunately, not good enough.

The en route radar system probably would have prevented the 1956 TWA-United collision. However, a lack of terminal area radar was highlighted by the 1960 TWA Constellation and United Air Lines DC-8 collision over New York City.

For an unexplained reason, the United jet proceeded past a holding clearance limit and collided with the TWA Constellation on approach to New York's LaGuardia Airport. This tragic mishap clearly demonstrated the immediate need for a capable terminal radar system integrated into the en route system to provide "radar coverage" from takeoff to landing. In 1962, the FAA opened the first of 243 Terminal Radar Service Areas (TRSA) and thus, the final groundwork for "lift-off to touch-down" radar coverage was laid.

One later modification to the national air traffic control (ATC) system was the introduction of the Terminal Control Area (TCA) in the early 1970's. TCAs enabled the FAA to impose certain restrictions on aircraft operating in extremely high density areas — usually around large airports. All aircraft operating under IFR and visual flight rules (VFR) would be under positive radar control. The airspace had become too saturated to allow uncontrolled aircraft to operate in busy terminal areas.

The Need

While many databases concerning near midair statistics are available, I will use figures published by the Air Force Inspection and Safety Center, now the Air Force Safety Center. Because of the similarities in performance between Air Force aircraft and high-performance commercial aircraft, this article assumes the threats encountered by Air Force aircraft are similar to those problems encountered in the civilian and commercial community.

However successful we were in our efforts to avoid midair collisions, we must consider the evidence which shows that the threat, however remote, is still there. An 8-year study of Air Force hazardous air traffic reports (HATR) filed for near midair collisions indicates the greatest hazards exist below 7,500 feet with between 79 percent and 87 percent of annual near midair collisions (NMAC) occurring in this area. Statistics show the single largest cause of NMACs was a "failure to see and avoid," which accounted for approximately 60 percent of the NMACs. Pilot deviations and ATC errors placed a distant second and third, averaging 21 percent and 10 percent respectively.

Failure to see and avoid becomes more important as aircraft speeds increase. According to Lt Col Robert P. Belihar, a former senior flight surgeon/ophthalmologist at Edwards AFB, California, the average perception and reaction time for a pilot and his aircraft is 5.9 seconds. This period is broken out as follows:

Detect and visualize	0.4 seconds
Recognize	1.0 seconds
Decision and process	2.0 seconds
React and change aircraft path	2.5 seconds
TOTAL	5.9 seconds

Consider the example of an aircraft traveling at 230 knots closing head-on with another aircraft traveling at

continued on next page

TCAS

370 knots — a closure rate of 600 knots (a little over 1,000 feet per second). While good visual clearing techniques should eliminate this scenario, we see the minimum visual acquisition distance is approximately 1 nautical mile (5.9 seconds X 1,013 feet per second = 5,977 feet), and if the aircraft are on a collision course within this distance, they will collide.

As aircraft performance has improved and speeds increased, reaction distances have also increased to the point where visually acquiring an opposing aircraft in time to avoid a midair collision is very difficult (sky conditions, sun glare, dirty windscreens, etc.). One possible answer is in the technological arena.

Technological Advances

During the mid-1960's, the Air Traffic Radar Beacon System (ATCRBS) was incorporated into the FAA's ARTCCs. This new development enhanced the overall system by allowing controllers to attach a "secondary" alpha-numeric identification tag to a "primary" radar return. At first, the alpha-numerics were limited to a four-digit code and could be used only if the participating aircraft was transponder equipped. Developments enabled altitudes and airspeeds, followed by aircraft types and identifications to be displayed, greatly reducing the controller workloads. Finally, a ground-based "conflict alert" system was incorporated which warned controllers of a potential collision.

The system I have described was a giant step forward. Prior to this, controllers manually tracked aircraft, and the ATCRBS greatly enhanced tracking capabilities. However, the ATCRBS relied on two important factors. First, to fully integrate into the ATC system, both aircraft had to be equipped with adequate navigation, communications, and *radar beacon equipment.* The latter is no longer true as updated radar systems allow controllers to attach an identification tag to a "primary" target. Second, and most important, is for the system to reach its maximum efficiency, all pilots had to participate, to include turning on their transponders. One of the primary drawbacks of the "conflict alert" system was the *human factor.*

Investigation of the 1970's midair collision between a PSA Boeing 727 and a Cessna revealed that the air traffic controllers had received numerous "conflict alerts" on the two aircraft. They were ignored because the Boeing crew had been issued "traffic" on the Cessna and *had reported the aircraft in sight.* It is not known if the Boeing crew lost sight of the conflicting aircraft or misidentified another aircraft as the conflicting Cessna. Whatever the case, the result was the same!

Until now, all avoidance systems were ground based using the ATCRBS for data and the conflict alert system for warning. What was needed was an alternative collision avoidance system that complemented the ground-based systems.

TCAS (The Solution)

Throughout the 1960's and 1970's, various systems were studied including ground-based and airborne-based systems and combinations of the two. A decision was announced on 23 June 1981 when FAA administrator J. Lynn Helms disclosed the selection of the *airborne-based* traffic alert and collision avoidance system (TCAS).

Simply stated, the TCAS system uses a transmitter/receiver which interrogates nearby aircraft radar beacon equipment, or transponders, and informs the pilot when a threat exists. There are two basic systems with varying capabilities. The TCAS I system is aimed at the light aircraft community as a low-cost alternative and simply indicates to the pilot that an intruding aircraft is in the vicinity while providing minimal information.

The TCAS II system, designed for larger high-performance aircraft, monitors the surrounding airspace by interrogating the transponders of other aircraft. The interrogation reply enables TCAS II to compute the following information about the intruder:

1. Range to the intruder.
2. Relative bearing to the intruder.
3. Altitude and vertical speed of the intruder, if reporting altitude.
4. Closing rate between the intruder and your aircraft.

Using this data, TCAS II predicts the time to and the separation at the intruder's closest point of approach (CPA). Should TCAS II predict that certain safe boundaries may be violated, it will issue a traffic advisory (TA) to alert the crew.

If the intruder remains a threat, TCAS II will issue a resolution advisory (RA) to maintain safe vertical separation between your aircraft and the intruder. TCAS II bases the alarms on a 5-second crew reaction time to achieve adequate separation. Increase or reversal of an RA requires a reaction in 2 1/2 seconds. Two TCAS II-equipped aircraft will coordinate their resolution advisories using a Mode S transponder data link. The coordination ensures that complementary, not contradictory, advisories are issued in each aircraft.

TCAS II Traffic Display Symbols

TCAS II will display four different traffic symbols on the traffic advisory displays. The symbols change shape and color to represent increasing levels of urgency and are displayed on a dedicated TCAS display, a combination traffic alert/vertical speed indicator (TA/VSI), or interfaced through the color weather radar display.

The traffic symbols may also have an associated altitude tag which shows relative altitude in hundreds of feet, indicating whether the intruder is climbing, flying level, or descending. A "+" sign and number above the symbol means the intruder is above your altitude. A "-" sign and number beneath indicates it is below your altitude. A trend arrow appears when the intruder's vertical rate is 500 feet per minute or greater.

If the intruder is *nonaltitude reporting*, the traffic symbol appears without an altitude number or trend arrow. The type of symbol selected by TCAS II is based on the intruder's location and closure rate. If TCAS direction-finding techniques fail to locate the azimuth of another aircraft, a "NO BEARING" message appears on the screen.

An open white diamond indicates that an intruder's relative altitude is greater than plus or minus 1,200 feet or its distance is beyond 6 nm range. It is not yet considered a threat. This one is 1,700 feet below your own altitude, climbing at 500 feet per minute or greater.

A filled white diamond indicates that the intruding aircraft is within plus or minus 1,200 feet and within 6 nm range but is still not considered a threat. This intruder is now 1,000 feet below your aircraft and climbing.

A symbol change to a filled yellow circle indicates that the intruding aircraft is considered to be potentially hazardous. Depending on your altitude, TCAS II will display a TA when the time to CPA is between 35 and 45 seconds.

Here the intruder is 900 feet below your aircraft, climbing at 500 feet per minute or greater. A voice announcement is heard in the cockpit advising **"TRAFFIC, TRAFFIC."**

Under normal conditions, a TA will precede an RA by 15 seconds. The crew should attempt to gain visual contact with the intruder and be prepared to maneuver should an RA be sounded 15 seconds later. The crew should take no evasive action based solely on the TCAS II display, but only when accompanied by the aural "RA" command.

A solid red square indicates that the intruding aircraft is projected to be a collision threat. TCAS II calculates that the intruder has reached the point where a resolution advisory is necessary. The time to closest approach with the intruder is now between 20 and 30 seconds, depending on your altitude. The symbol appears together with an appropriate audio warning and a vertical maneuver indication on a modified vertical speed indicator (RA/VSI).

This aircraft is now 600 feet below your altitude and still climbing. A synthesized voice announces a vertical maneuver command, such as, **"CLIMB, CLIMB, CLIMB."**

The pilot will notify ATC and smoothly initiate any required vertical maneuver within 5 seconds from the time the RA is posted.* *An intruder must be reporting altitude in order to generate an RA.* Therefore, the RA symbol will always have an altitude tag. The vertical speed required to avoid the hazard will be indicated by green lights on the outer edge of the RA/VSI. In some cases, the TCAS will require that the pilot maintain the present aircraft vertical speed (climbing, descending, or maintaining level), and this action will be indicated by the synthesized voice announcing **"MONITOR VERTICAL SPEED, MONITOR VERTICAL SPEED."**

Operating Experience

In order to permit the aviation community to evaluate TCAS II prior to implementation, extensive in-service evaluations were conducted between 1982 and 1990. Over 6,200 hours of operational experience resulted in a number of enhancements to the TCAS II logic, improved test procedures, and a more detailed understanding of TCAS certification and operational requirements.

According to a March 1990 DOT/FAA program description, "The most important information obtained, however, was the nearly unanimous conclusions by the participating pilots and airlines that the TCAS II concept is both safe and operationally effective and that fleetwide implementation should begin as soon as practical."

The airline community initiated the installation of TCAS II approximately 4 years ago, and one asset of the system not anticipated by aircrews was the positive impact on terminal area safety because of the *peripheral benefits* derived. Obviously, collision avoidance is the primary benefit enjoyed by the participants of the system. A spin-off benefit involves traffic-pattern management and improvements in radio-frequency congestion.

Before the activation of TCAS II, it was not unusual for pilots of arriving aircraft to query air traffic controllers concerning the length of final for descent planning and where they were in the arrival sequence, relative to other aircraft. With TCAS II, a quick look at the scope can immediately determine the approximate final approach turn point and provide a fairly accurate guess of who and where the sequence is. In IMC conditions, a pilot can correlate descent instructions to altitude changes of other aircraft on the TCAS II scope, make a decision on configuration planning resulting in a stabilized pattern, and eliminate needless early configurations and wasted fuel.

Finally, by comparing the TCAS display, aircrews can quickly analyze the positions of other traffic and quickly determine the length of the sequence with reasonable accuracy. All of this is accomplished without one radio

continued on next page

TCAS

call, keeping the frequency clear for the controller to issue control instructions. Add 50 to 70 aircraft per hour to the equation, and you can easily see the peripheral benefits enjoyed and the positive impact on safety achieved.

Air Force Participation

In 1992, the Air Force requested the Lockheed Aeronautical Systems Company (LASC) include a TCAS system in the FY92 C-130H configuration and later requested similar configurations for the HC-130H and C-130J aircraft. In response to this request, a "Military-TCAS" system was designed by Allied Signal Aerospace which not only provides basic TCAS II capabilities (including next generation TCAS-III capabilities), but also provides a *rendezvous and station-keeping capability.*

In 1993, the Air Force determined that aircrews flying in night visual meteorological conditions without formation-positioning systems or radar (as was necessary for OPERATION JUST CAUSE) are easily subject to unsafe visual illusions and require inordinate concentration while attempting to maintain position throughout various maneuvers. This causes rapid onset of fatigue and leaves minimum time to react to unanticipated events. (Does this situation remind you of the C-141 formation midair collision a couple of years ago?)

The opinion also indicated tanker aircraft relying on radar for formation positioning need this capability for safety considerations. Airlift aircraft using current positioning systems are plagued with system anomalies and emit easily detectable signals. An improved capability is needed because rapidly changing world situations could thrust our forces into threat environments requiring formation operations at a moment's notice. The Military-TCAS appears to be one answer to this need.

The Military-TCAS not only provides collision avoidance and traffic information capabilities, but it also provides formation flying and aircraft rendezvous capabilities. In "normal" operations, Military-TCAS provides formation position keeping, maneuver commands, airdrop coordination functions, and intra-formation data link message encryption capabilities. In position-keeping operations, the system will provide track and relative altitude guidance through steering bar commands. For rendezvous, the system will provide a "fly-to" symbol with guidance and revert to position keeping when the proper formation position is attained.

The Military-TCAS also provides airdrop data link capability to element aircraft. After the leader's airdrop occurs, the Military-TCAS automatically data links execution of the drop to the element follower's TCAS for display. The follower's TCAS CDU will display a drop-timer to count down the time to drop and provide bearing and range relative to the leader's drop point. In addition to all of this, the system is night vision goggles capable! Display symbols for the enhanced system include:

Maneuver	Symbol
Left Turn	⇦
Right Turn	⇨
Climb	⇧
Descend	⇩
Accelerate	✚

Maneuver	Symbol
Slowdown	SD
Drop	▽
No Drop	✖
Cancel	∅
Decelerate	▭

The Military-TCAS provides a "quiet mode" of operation to minimize the probability of detection or intercept in a combat environment. In quiet mode, the output power is automatically incremented from a minimum of 1 watt up to the power required to maintain communications. Quiet mode operation will be manually selected by the formation lead and data linked to the rest of the formation. Each formation member will be able to manually override quiet mode.

Current Status

The HC-130 with the enhanced TCAS began operational testing in January 1996 while some ANG C-130s have the basic system installed. Besides the Herks, other aircraft using TCAS include the T-1A, C-26A/B, VC-25A, T-43, and some specialty aircraft. Like other programs, Military-TCAS must compete with other programs for funding, and as the value of this system is demonstrated by the current installations, we may see additional fleets identified for TCAS use. ✈

*ATC responsibility for providing separation does not resume after an RA is executed until one of two things happens: (1) Aircraft returns to original assigned course and altitude or (2) alternate clearance is given.

CONTROLLERS' PERSPECTIVE OF TCAS OPERATIONS

MSGT GEORGE INGRAM
Chief, FAA/USAF Military ATC Procedures
HQ Air Force Flight Standards Agency
Andrews AFB, Maryland

■ Late one evening, while working Approach Control at Home AFB, Anywhere, USA, an air traffic controller heard the following radio call: "Home Approach, United 007, TCAS climb." What? Say again!!! What is a TCAS climb? What's TCAS? Which aircraft are TCAS-equipped?

This scenario is representative of what an air traffic controller may face while controlling an aircraft equipped with the TCAS system. For those unfamiliar with TCAS, this article should help answer some of the questions our fictitious controller from Anywhere, USA, might be asking.

Of course, all controllers received training on TCAS in July 1995 when controller and pilot TCAS resolution responsibilities were clarified in Federal Aviation Administration (FAA) Order 7110.65J, the governing federal directive for providing air traffic control (ATC) services. However, the following information should help improve the understanding of both controllers and pilots on how the TCAS system works from a controller's perspective.

Implementation of TCAS has placed unique operational requirements on both civilian and military air traffic controllers. TCAS is an airborne collision avoidance system based on radar beacon signals which operates independently of ground-based equipment.

Lightweight aircraft are normally equipped with TCAS I which generates traffic advisories only. Heavy aircraft are equipped with TCAS II, a more sophisticated system which generates traffic advisories and resolution (collision avoidance) advisories in the vertical plane. Flight progress strips will indicate which aircraft are equipped with the TCAS system by adding a prefix to the aircraft call sign. Just as "H/" indicates a heavy aircraft, "T/" now indicates TCAS-equipped, and "B/" indicates an aircraft is both heavy and TCAS-equipped.

TCAS

FAA Order 7110.65, paragraph 2-1-27, simply states, "When an aircraft under your control jurisdiction informs you that it is responding to a TCAS Resolution Advisory (RA), do not issue control instructions that are contrary to the RA procedure that a crewmember has advised you that they are executing." As controllers, we are only responsible for providing safety alerts regarding terrain or obstructions and traffic advisories for the aircraft responding to the RA and all other aircraft under your control jurisdisction, as appropriate. Unless advised by other aircraft (one or more) that they are also responding to a TCAS RA, do not assume that other aircraft in the proximity of the responding aircraft are involved in the RA maneuver or are aware of the responding aircraft's intended maneuvers. Continue to provide control instructions, safety alerts, and traffic advisories, as appropriate, to such aircraft. Once an aircraft begins a maneuver in response to an RA, the controller is not responsible for providing standard separation between the aircraft, airspace, terrain, or obstruction. A controller's responsibility for standard separation resumes when one of the following conditions is met:

1. The responding aircraft has returned to its assigned altitude.

2. Aircrew informs you that the TCAS maneuver is completed and you observe that standard separation has been reestablished.

3. The responding aircraft has executed an alternate clearance and you observe that standard separation has been established.

Bottom line: FAA-approved operating manuals require pilots to follow RA instructions when received, and pilots are mandated to immediately notify ATC of the maneuver and when they return to the originally assigned altitude. ✈

A Crew Coordination and Communications NIGHTMARE

Official USAF Photo

Courtesy *FlightFax*, Mar 96

■ The UH-1H "routine" administrative support mission called for us to pick up six passengers and transport them to a small airport about 150 miles away. At 9,500 pounds with our passengers and auxiliary fuel on board, we departed.

The flight was uneventful until we encountered what seemed to be a fog bank covering our route of flight for the last 50 miles. We chose to fly on top of the fog, checked weather at our destination and other nearby reporting stations, and then calculated we had sufficient fuel to return, if needed, to our home base, which was still reporting VFR. After ensuring we had met all VFR over-the-top requirements, we continued to our destination, which happened to have an NDB on site but no published DOD approach.

As we got closer to our destination, the fog turned into a layer of clouds approximately 1,000 feet thick. A few miles out, I saw a few tiny holes in the cloud layer and saw that it went to the ground. Suddenly, the automatic direction finder needle swung, and the IP, who was on the controls, started a descending left turn. I silently noted a small hole in the cloud layer that revealed a wing of an airplane and the painted field elevation on the ramp. I was not sure what the IP on the controls had seen.

I began to get disoriented and came inside to view the flight instruments. I informed the IP our airspeed was nearing zero, our bank angle was 30 degrees, and our rate of descent was more than 1,000 feet per minute and increasing. The radio magnetic indicator was spinning rapidly.

Looking outside, I saw we were completely IMC. I remembered the field elevation marking on the ramp had shown 571 feet MSL, and I immediately checked the altimeter. It was coming down through 1,000 MSL.

When I announced I had the controls and pulled as much collective as I could, I thought I was already dead. The IP didn't release the controls. I felt him resisting my inputs. I then jerked the controls and yelled "I have the controls" over the intercom. I was totally disoriented and went to my artificial horizon. It was completely white. If it had not been for the word "climb" on the top of the circle, I don't know what I would have done.

Our descent stopped at approximately 750 feet MSL. We started climbing and continued until we broke out above the clouds. I then headed for an airport that had reported VFR during my previous weather check. No words were spoken for a very long time.

Lessons Learned

We had experienced a crew coordination and communications nightmare. The IP did not discuss his intentions with me. He was from another unit and just happened to be a field grade officer. I, just a CW2, had not been "inquisitive" enough or forceful enough due to the fact he was an IP. And this was the crew chief's first flight after being signed off as a nonrated crewmember. He was riding in the jumpseat and recording all instruments on his kneeboard, to include the torque (I had no idea of what torque I had pulled). He didn't speak up either.

We used this incident in our unit to bring about some interesting conversation on crew coordination and communication failures. Good crew coordination stems from every crewmember (regardless of position, regardless of rank) knowing exactly what each other is doing at all times and speaking up when anything feels uncomfortable. But nobody questions IPs, do they? If not, you should. If I had, I might not have had to make that quick decision that turned an imminent accident into a near miss. ✈

When LIGHTNING Strikes

LT BRAD COLLIER, VP-8
Quality Assurance Officer
NAS Brunswick, Maine

■ There is never a *good* time to be caught in a thunderstorm. Flying at 1,500 feet, under the goo, on a dark night over the Mediterranean, is an especially bad time to have one sneak up on you.

It was 20 November 1995, and my crew and I had taken off in our P-3C from Naval Air Station, Sigonella, Italy. We were tasked with conducting surface search and surveillance operations in the Adriatic. We knew the weather was going to be bad before we took off. The weather brief indicated multiple cloud layers and isolated thunderstorms.

We arrived on station at 17,000 feet and were in and out of the clouds. I had instructed our radar operator to keep us out of any build-ups as we attempted to maintain VMC. I knew if we were required to identify any contacts we would have to descend. After about 4 hours of maintaining a high altitude radar plot and picking our way through the clouds, we were tasked with visually identifying a surface contact.

We found an opening in the clouds and descended to 1,500 feet, hoping to remain under the clouds. We estimated the ceiling to be at 2,000 feet. As we began our run-in toward the contact, it began to rain. It was as dark as it could get. I kept asking the radar operator if he had any build-ups off the nose.

As we continued, the rain started to intensify, and Saint Elmo's fire started building on the front and side windshields. Suddenly, there was a flash of lightning off to the left side of the aircraft. I decided to turn to the right and exit the weather the way I had entered. The rain became even more intense. It was coming so fast you could hear the rain hit the aircraft above the sound of the engines.

In an effort to evade the lightning to the left, we found ourselves entering heavy clouds to the right. The turbulence became so bad it took both pilot and copilot to hold the aircraft steady. Our vertical speed indicator was bounding up and down so frantically it was hard to tell if we were climbing or descending. Suddenly there was a bright flash that filled the entire windshield and a very loud BANG which sounded like someone hitting the fuselage with a sledge hammer.

Before we knew what had happened, we were in a THUNDERSTORM! My only thought was to get out of the weather as quickly as I could. I asked the radar operator for the best heading to get us out of the weather. After about 10 of the most hair-raising minutes of my life, Mother Nature's rage came to an end, and we finally broke out on the other side of the storm.

We immediately climbed back up to 17,000 feet and began to check the aircraft for damage. We couldn't find anything wrong with the aircraft, and all the avionics seemed to be working fine. After landing back at Sigonella, we discovered a 6-inch crack in the nose radome wide enough to fit your finger. The lightning had struck the nose, traveled down the static discharge strip, and exited at the base of the radome. The lightning had also "fried" the infrared detection system located in the nose.

We brought home more than one lesson that night. First, remember lightning can strike at *any* time, regardless of altitude or perceived weather conditions.

Second, if the weather starts getting bad, it may be time to turn around.

Finally, one of the reasons our radar operator did not see the thunderstorm was he had the radar tilted downward, searching for the surface contact.

Remember, if it is absolutely necessary to fly into bad weather, take a look above you. There may be more up there than you realize.

A thunderstorm is no place to be at 1,500 feet on a dark night. I, for one, have gained a new respect for Mother Nature and the power of a thunderstorm. ✈

USAF Photo

ouldn't
f flying
strapping
elf in...
ot do it in
car ?

Wear your seatbelts

AFFSA Instrument Quiz

MAJ BOBBY G. FOWLER, JR.
HQ AFFSA/XOI

■ Today's visit will take you and your crew to the desert of New Mexico. The mission, should you choose to accept it (like you have a choice), is to get into Socorro Municipal Airport. The only approach into the airfield is the VOR/DME or GPS-A. You are not yet outfitted with an FAA-approved GPS, so you're stuck using the VOR/DME. The weather will vary with the question, and, of course, you are always restricted by AFI 11-206 and AFMAN 11-217 (yes, the old 51-37) that should be on the streets by now. Good luck, and enjoy the ride!

1. You're inbound to the airfield in your Category B aircraft after having been given a descent to 12,000 MSL and told to contact Albuquerque Center. Center tells you the weather is 1700 OVC, 2 3/4 miles visibility. He also vectors you to ONM and clears you for the approach. What now?

A. Turn toward ONM, enter the Holding-In-Lieu, and proceed with the full approach.

B. Ask for clearance to hold at ONM, and wait for the weather to come up to minimums.

C. Proceed to your alternate.

D. B or C above.

2. While you were deciding what to do, the weather miraculously cleared and is VFR. Winds are 150/8 (at least for this question). Center once again clears you to ONM for the VOR/DME. The only problem is you are now a Category D aircraft. Now what?

A. Cancel IFR once you're legally VFR, and fly VFR to the airport to land.

B. Do what Center said and fly the approach to the airfield using Category C mins. They're high enough, and you're basically a straight-in anyway.

C. Request clearance to another airport. You can't fly a Category D aircraft into the airport.

D. Fly down to your own minimums. The NA for Category D means "Not Applicable," and you can create your own weather and descent requirements.

3. New plane, new day. You are cleared to ONM at 12,000 MSL and cleared for the approach. You are coming in from the north on the R-002. When can you descend for the approach?

A. After passing the VOR, inbound to the airport.

B. Immediately. The MSA is below you, and 8000 MSL is the minimum altitude for the inbound leg of the approach.

C. Enter the Holding-In-Lieu at ONM and descend to 8000 MSL once you are established in holding.

D. Established on the procedure turn course, inbound for the approach.

4. You have finally made it past the FAF and are inbound to the MAP. As you pass the ONM 18 DME, what is the 179° 1 NM for?

A. A visual heading and distance to the airfield.

B. A Dead Reckoning course you need to follow to the runway.

C. Part of the approach you are required to fly. It just comes after the MAP.

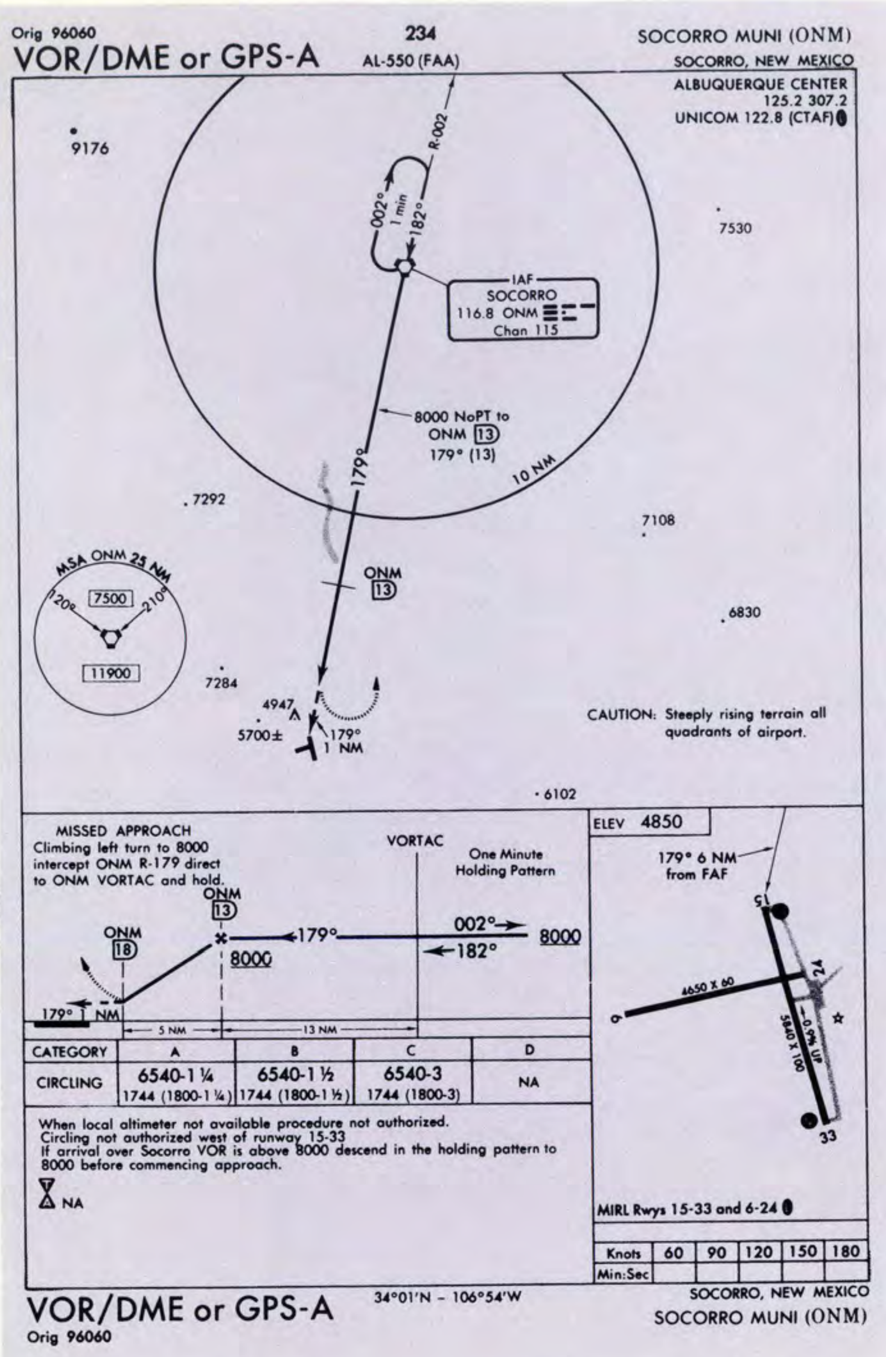
D. Circling instructions. Since there are mountains around, you are not authorized circle to the other runways.

5. Winds have now changed to 060/26. Your aircraft has a 25-knot crosswind and a 50-knot headwind limit, and the winds show no sign of letting up. How do you plan to get into the airport?

A. Circle to the west and land on RWY 06.

B. Come in VFR if the weather permits and your command guidance allows.

C. Not me. I wouldn't even let



my most foolish pilot try that one.

D. Time to go to the alternate.

BONUS: What type pattern would you expect arriving VFR aircraft to fly into the airport?

A. Bug smashers can't fly into airports this high.

B. Call the FSS or look at the airfield's windsock to see if it has landing patterns depicted.

C. Look in the VFR supplement or IFR supplement.

D. Look in the airfield directory.

My Guesses

1. **D.** AFI 11-206, 8.14.1: Pilots may start a published straight-in or sidestep approach or an en route descent only if existing weather is at or above the visibility minimums published for the intended approach. The reported weather must be at or above the published ceiling and prevailing visibility (PV) minimums for a circling approach. The ceiling of 1700 OVC is below the 1800 required.

2. **A.** There are two different problems here. The first is the NA in Category D. This means Not Applicable — the airfield or approach cannot handle the aircraft. Check the IFR supplement or call the local FSS to see which. Whichever is true, because the NA applies to your Cat D aircraft, there is no legal published approach for you to fly. The second is AFI 11-206, 8.1: Pilots should fly IFR to the maximum extent possible without unacceptable mission degradation. Since there is no published approach, AFI 11-206, 8.4.2 applies. Pilots may file IFR to a point en route (where forecast weather is VFR at the time of arrival) or to a point served by a published approach procedure (where the pilot can make a descent to VFR conditions) and then continue under VFR to the destination.

3. **C.** The note on the IAP states, "If arrival over Socorro VOR is above 8000, descend in the holding pattern to 8000 before commencing approach."

4. **A.** In the Legend for Instrument Approach Procedures (which all of us should review periodically), this symbol is defined as a Visual Flight Path.

5. **B.** Another two-problem question. The note on the IAP states that circling is not authorized west of RWY 15-33; therefore, the approach procedure will not apply for landing RWY 6. The second part is back to the same answer for Question 2. If you need to land there and your command allows VFR ops, a CAREFUL VFR approach would be the only way to land RWY 6.

BONUS: B. Airfields are required to display their traffic pattern direction within the wind circle at the airport. Flight service stations should also know the intended traffic patterns, so check which direction to enter when you check local NOTAMs. ✈

You Call Your Gas, I'll Call Mine

CAPT ERIC WASSERSTROM
Chief of Safety
Lajes Field

■ The two most dangerous words at Randolph AFB, Texas, Pilot Instructor Training are TEAM SORTIE. The idea is to send two aspiring T-38 instructor pilot trainees on a confidence-building flight together. This is a lot like giving a 16-year-old the keys to the family Ferrari.

On one particular day, another trainee and myself were on the schedule for a team navigation sortie. The only hitch was that I had been tagged to stand in a change-of-command ceremony which ended shortly before our scheduled takeoff time. We agreed he would do all the flight planning for the relatively short flight to Barksdale AFB, Louisiana, and fly the leg there.

After over an hour of standing alternately at attention and parade rest on a cement ramp in Texas' hot June sun, I hoofed over to life support to grab my gear and meet my flying partner in base operations. I felt a tad dehydrated, but nothing a few sips from the water fountain and my carry-on flask couldn't handle. I scanned the fuel card (mostly to say I had — after all, this was a milk run), scrunched a VFR map in my G-suit, and was out the door.

We had prebriefed that my flying partner was to be in charge and flying on the leg to Barksdale, so I mostly played the safety observer and watched the scenery go by. He elected to execute the high penetration for an instrument approach followed by radar vectors for a second approach and then burn off the rest of our gas in the overhead pattern. The only other traffic in the area was a flight of two A-10s that had just switched over to approach control frequency. By the time we passed the final approach fix, or FAF, we had burned considerably more gas than we'd anticipated. I had set a personal limit of 1,200 pounds of fuel remaining at the FAF as my cutoff for conducting another radar pattern because vectors usually burn up about 300 to 350 pounds of fuel, and our minimum fuel was established at 600 pounds. At the FAF, our gauges showed just a tad over 1,100 pounds remaining. Seeing as how we were the only ones in the pattern besides those A-10s which would be down shortly and a single instrument approach just wasn't enough, we agreed to go for one more approach.

Wouldn't you know it? A B-52 entered the pattern as we were turning crosswind, and we ended up on a full 25-mile final! No problem. We still had about 750 pounds of fuel. Hey! Wait a minute! Those dang A-10s were just now flying up initial for the overhead pattern. Just then, the controller informed us we were

USAF photo by Mr. Walter Wright

No. 3 for landing following the flight of two A-10s. We slowed down to get on approach speed right away and to give us plenty of spacing on the Hogs — not enough, though.

As we floated down on short final, the second A-10 was taking his sweet time clearing the active runway. The Hog was just about clear of the runway when the controller directed us to go around on short final. No problem. The guy flying cleaned up the airplane (raised the gear and flaps) and asked for a closed overhead pattern, simultaneously informing the controller we were minimum fuel. The controller acknowledged and cleared us for the overhead behind a B-52 on a 5-mile final. Now we had a problem.

To fit behind the B-52, we'd have to slow down and extend our pattern. We also needed several miles separation behind the B-52 to avoid its wake turbulence. Our fuel gauges showed 250 pounds each for 500 pounds total. Emergency fuel for the T-38 was 400 pounds, and I personally know of someone who flamed out an engine while taxiing with 200 pounds still registering on the gauge.

We squeezed ourselves behind the B-52 and were even in the flare when the controller directed us to go around due to the B-52 not having cleared the runway at the far end of the field. I was beyond my limit and immediately told the guy in the backseat to tell them "unable" and continue with our landing as we had plenty of clearance on the B-52.

Unfortunately, the backseater selected full afterburner and initiated a go-around. I literally felt the seat cushion rising toward my nostrils. We got our closed traffic pattern and conversation ceased. I guess oral vibrations probably increase fuel consumption. As we rounded the final turn with our gas gauge needles bouncing, I went through my pre-ejection checklist, preparing for what seemed an inevitable flameout on short final.

The landing was uneventful, but the mile and a half taxi to parking was a nailbiter. I kept waiting for one of our engines to wind down due to fuel exhaustion. The gauges still registered around 100 to 150 pounds each, but that couldn't have been correct since even a "mil" power overhead pattern consumed 200 pounds of fuel.

The T-38 holds 598 gallons of TOTAL fuel — not usable — TOTAL. That day, they gassed our jet up with 586 gallons of JP-4. I'll let you do the math.

Not only did I make my peace with God that day, I also made my fuel limits inviolable. Years later, I received occasional ribbing by other instructors in UPT about calling it quits on some sorties a little early. All I could do was smile and say, "You call your gas, I'll call mine."

It's been said a million times and still falls on deaf ears. Never, ever push the gas. When you're out of gas, you're out of options. ✈

PACAF Commander

concluded from page 2

through a known threat area if you already know it's hazardous. Threat avoidance skills exemplify sharp edges.

Don't let yourself fall into the complacency trap. How do you know you're in it or about to fall into it? Listen to the comments you make to your fellow fliers. "We're just going on another range ride." "It's just another airdrop mission." "It's just a canned BFM mission." Or, "I've been there, done that." When's the last time you really studied the emergency procedures section of your Dash One before you flew? The tactics manuals? When you start to think the mission is just another sortie you've done a hundred times before, you are a prime target for the lowly three-level gunner. Plan every sortie as if it is your first combat mission. Keep the first mission edge.

Each and every one of us is responsible in identifying the hazards to our flying operations and bringing them to the attention of the decision makers for resolution. Don't become complacent and assume someone else will notice the hazards and step forward to fix them. Whether a hazard can be fixed on the spot or take years to mitigate, take the initiative and get on with fixing them now. We can't afford to lose anyone, not even to a three-level gunner. ✈

MUNITIONS NEWS

A Dummy Round of Miscommunication

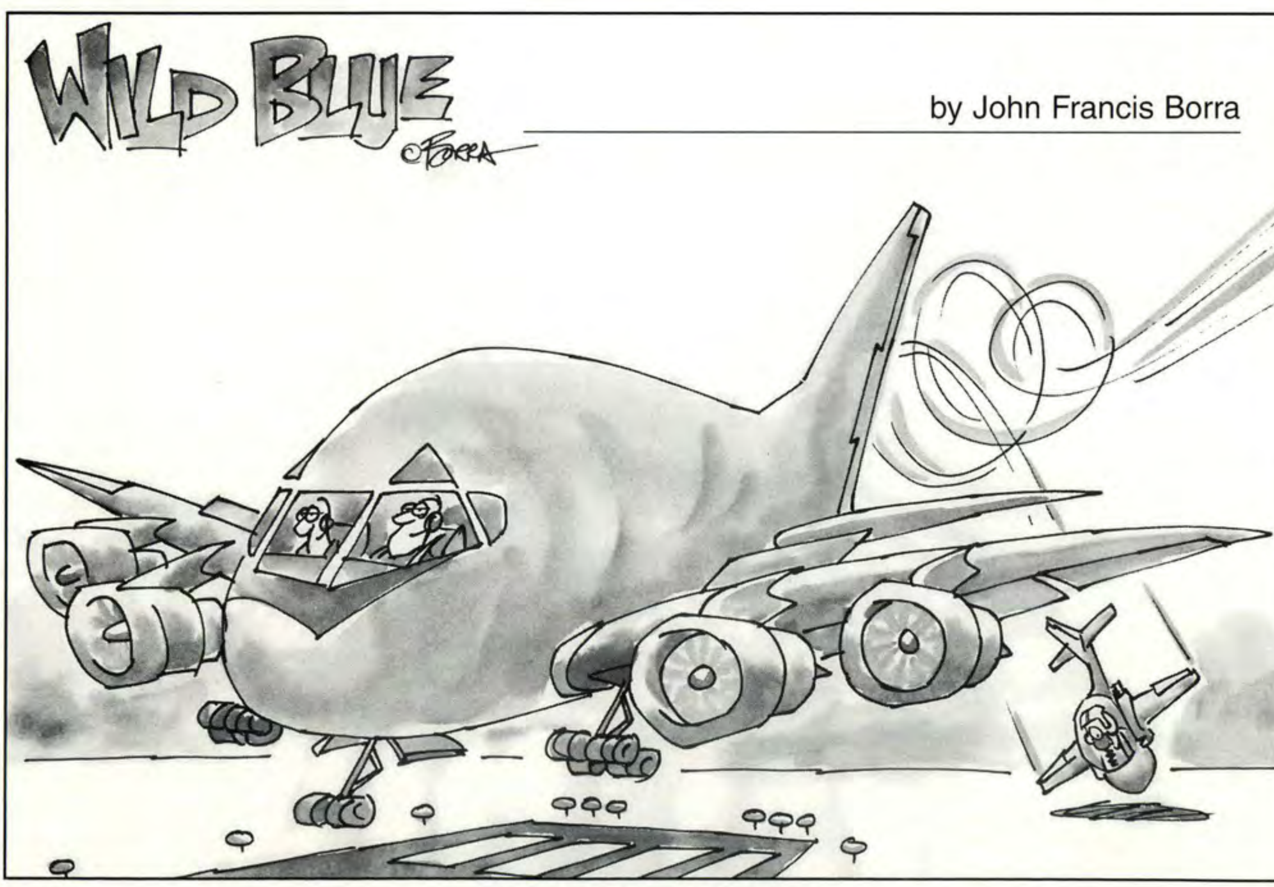
■ Two munitions maintenance technicians (MMT 1 and MMT 2) were tasked with downloading an aircraft weapon's automatic loading system. MMT 1 was loading a 20mm ammunitions dummy round in the weapon's replenisher when he realized the round was cocked. He immediately tried to reset it.

When MMT 2 saw MMT 1 remove his hands from the replenisher's danger zone the first time (not knowing there was a cocked round loaded), he squeezed the trigger to start the replenisher. But when he observed MMT 1 start to put his hand back into the danger zone again, he immediately released the trigger.

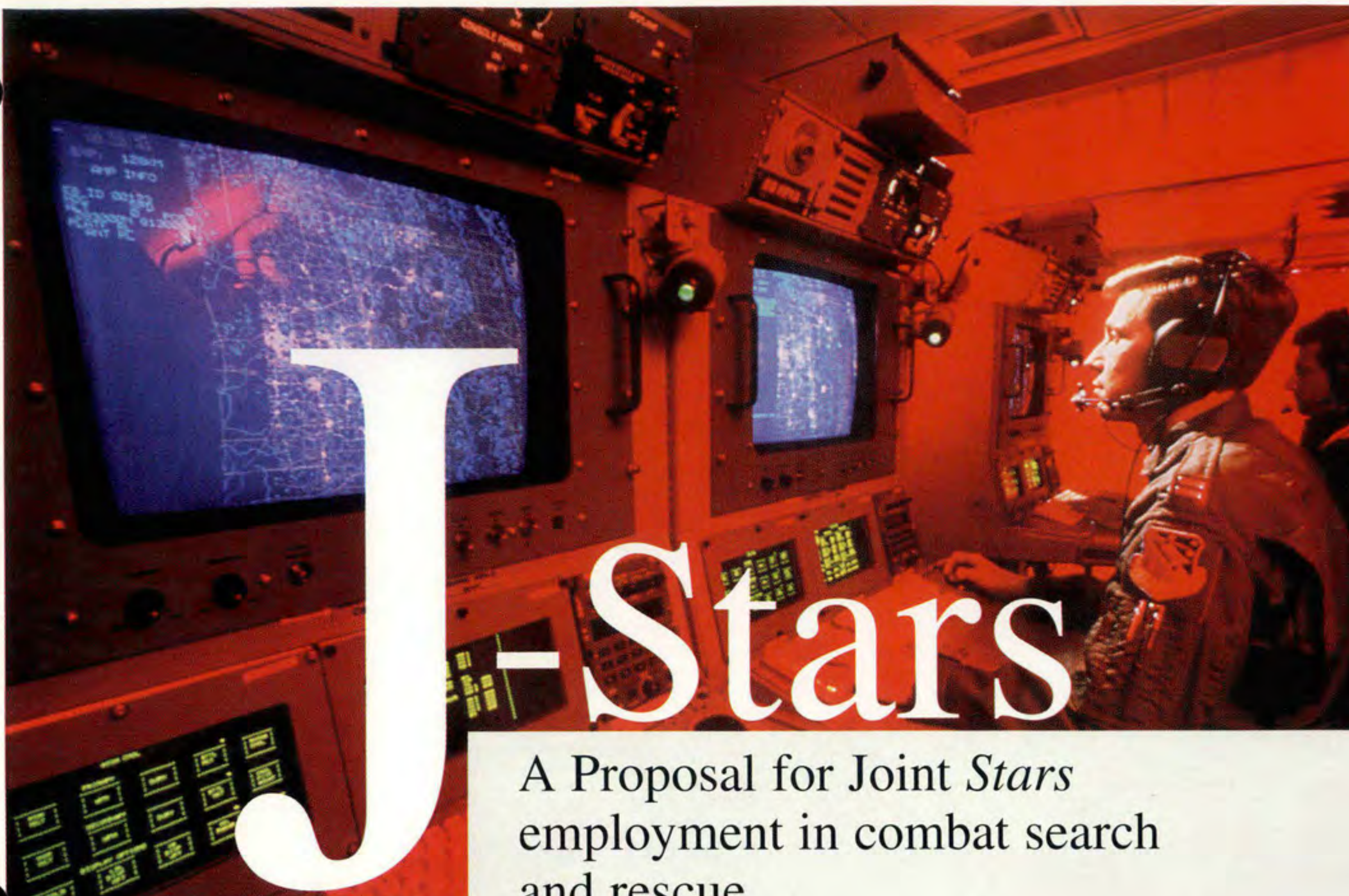
MMT 1, having already placed his hand in the danger zone, tried to remove it when he realized MMT 2 had started the replenisher. OOPS! Too late! One of MMT 1's fingers got caught in the replenisher's mechanism, and he had to spend several days at home recuperating. At least the incident didn't involve live ammunition or result in the loss of life or limb.

Two intelligent, trained minds coming together to accomplish one task, regardless of complexity, can be extremely dangerous unless they effectively communicate, coordinate, and cooperate with each other. This has been proven time and time again since the beginning of aviation.

Never assume the other person knows your next move. Tell them first! ✈



Their wake, your funeral



J-Stars

A Proposal for Joint *Stars* employment in combat search and rescue

Official USAF photos courtesy the author

MAJ JEFF C. ALFIER
USCENTAF/A-5 DOXCR
Shaw AFB, South Carolina

"Everything Pierre saw was so indefinite, that in no part of the scene before him could he find anything fully corresponding to his preconceptions. There was nowhere a field of battle such as he had expected to see, nothing but fields, dells, troops, woods, campfires, villages, mounds, streams. With all Pierre's efforts, he could not discover in the living landscape a military position. He could not even distinguish between our troops and the enemy's.

'I must ask someone who understands it,' he thought . . ."

Leo Tolstoy, *War and Peace*

Military analyst Ralph Peters reminds us today's military professional "perceives the temporal, spatial, and mechanical dimensions of warfare in a radically different manner than did his predecessor of 20 years ago" (Ralph Peters, *After the Revolution*, Summer 1995). As a critical part of this change in perception, commanders will require systems capable of providing a comprehensive picture of the dynamics of the modern, nonlinear battlefield. Such information aids commanders in making effective decisions affecting the employment of their assigned forces.

The E-8A/B/C Joint Surveillance and Targeting Attack Radar System (JSTARS) is a joint Army/Air Force system capable of providing this comprehensive picture in near real-time. One JSTARS system consists of an Air Force-owned E-8A/C aircraft manned by Air Force and Army mission crews and Ground Station Modules (GSM) staffed by Army personnel which receive and distribute the airborne E-8's air picture. As such, JSTARS has the capability to detect, locate, and track thousands

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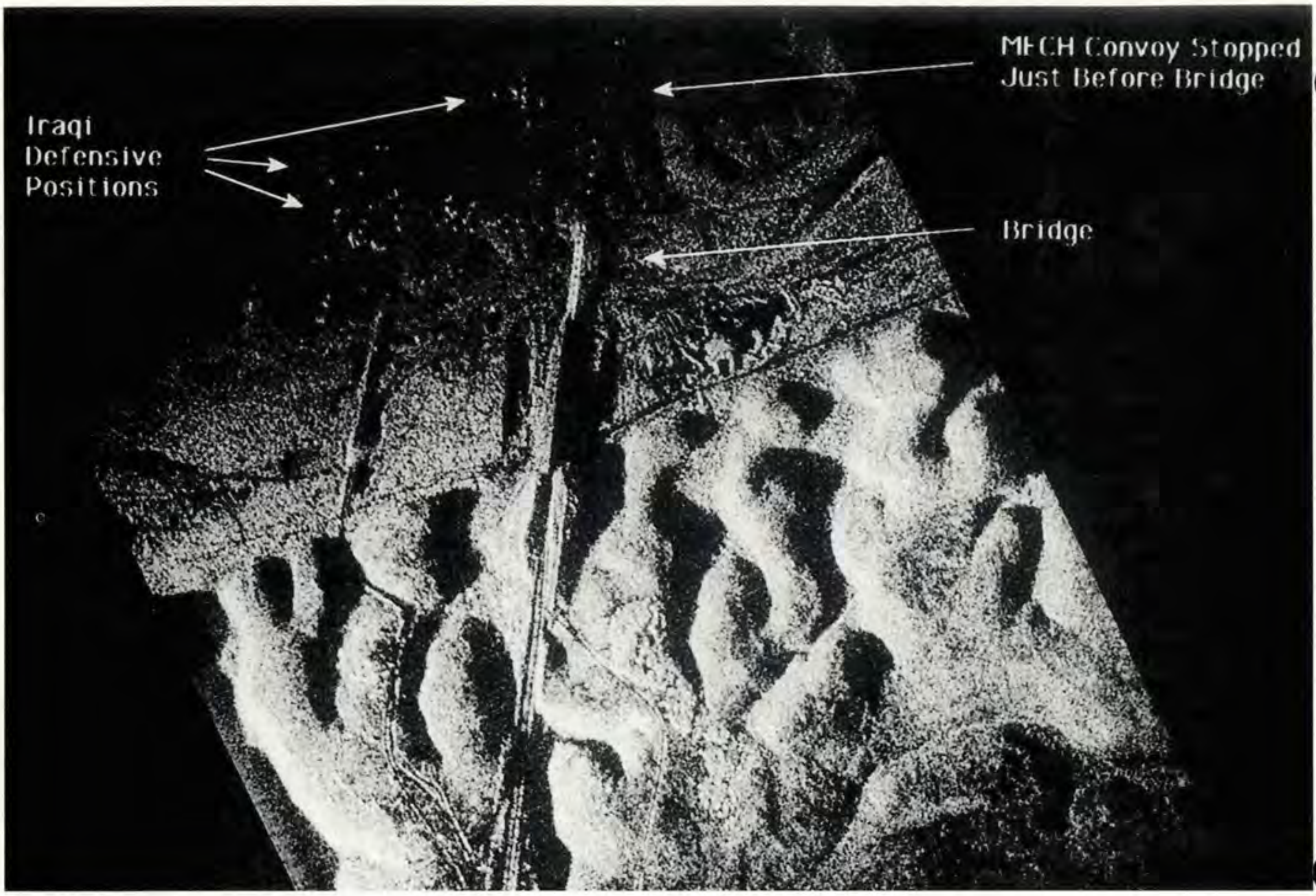


of fixed and mobile targets on the ground over thousands of square kilometers from a great standoff distance. The technical and operational applications of this new system proceed to grow as the system continues to be fielded, and this technology will impact Combat Search and Rescue (CSAR).

All participating forces will support the CSAR effort when directed, and any personnel with information on the loss of an aircraft should contact the Joint Search and Rescue Center (JSRC) by the most expedient means. The E-8 is thoroughly equipped to manage the flow of such vital information, including the call sign of the downed aircraft, the exact or anticipated location of the downed aircrew, the aircrew's physical condition, and whether there is any air or ground activity in the vicinity. This is where JSTARS' unique capabilities will readily come into play.

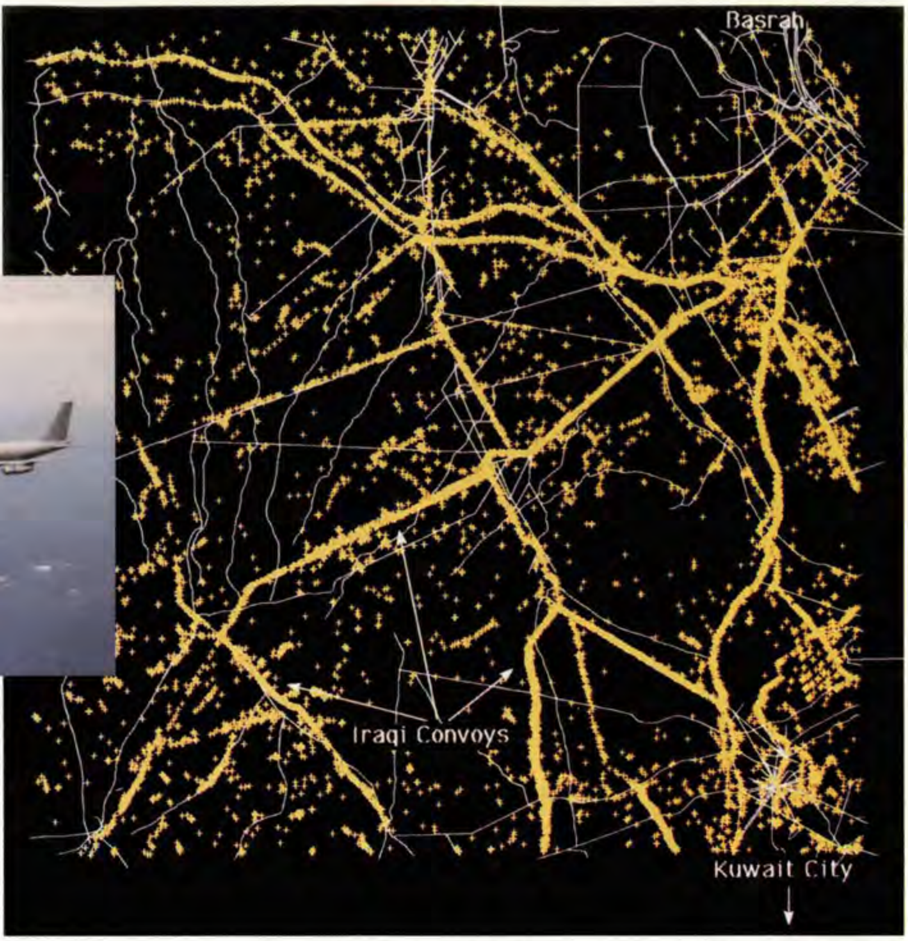
Although the E-8 may not be the primary aircraft directing CSAR operations, it is quite possible it could assume an eminent role undertaking CSAR coordination duties. This situation could arise because a fighter aircraft lost over hostile territory may have been under advisory control of a JSTARS controller at the time of its downing. Therefore, the last person in communication with the unfortunate aircraft, and the one who knew its location, would be the controller.

What are the capabilities that the JSTARS will bring to bear upon CSAR efforts? Overall, the crux of JSTARS' capabilities are the E-8's radar modes which provide both wide- and small-area surveillance. Specifically, details from the E-8's Moving Target Indicator (MTI) and Synthetic Aperture Radar (SAR) modes can greatly aid CSAR-dedicated aircraft in their recovery efforts, whether they are conducting maritime, inland, or coastal searches. Through the MTI, JSTARS will locate moving vehicles — classified as tracked, wheeled, or unknown — slow-moving fixed or rotary-wing aircraft, and even rotating antennas. The MTI radar can provide informational updates on convoy movement with direction, speed, location, and time; choke points and bridges based on traffic analysis; and assembly areas. The other primary radar mode, the SAR, provides imagery to aid in target tracking by allowing for continuous observation of high interest mobile targets that have become stationary. In addition, it can provide images of land features such as defensive positions.

Joint STARS can assist in the overall orchestrating of CSAR activities. Many of these tasks would be performed by sharing data with other radar or imagery sensors. For instance, to assist in its CSAR efforts, JSTARS will interface with the growing unmanned aerial vehicle (UAV) technology that will permit the observation of areas that are blocked to the E-8's radar. Furthermore, UAVs could be directed, through remote control, to cover those areas that the E-8C's radar cannot see during a CSAR effort.

In addition to the radar modes, communications are also integral. In support of a CSAR effort, the E-8 will communicate via voice and data link with other command and control agencies such as AWACS, the US Navy's E-2C, or the EC-130 Airborne Battlefield Command and Control Center (ABCCC). The JSTARS communication suite includes an impressive package of data links, UHF, VHF, and HF radios by which to communicate with any survivors, passing information on their location and physical condition to other units within the CSAR network. Most coordination will probably be with an airborne AWACS to ensure that participating aircraft have the situational awareness regarding any environmental factors that JSTARS is cognizant of. Communication would also be made between several other airborne elements, such as Rescue Combat Air Patrol (RESCAP) aircraft, the On-Scene Commander (OSC), and the SANDY aircraft that are specially trained in search procedures, aircrew survival, and authentication techniques. In addition to establishing contact with any survivors, communication would include command nodes such as the Joint Air Operations Center (JAOC) and the JSRC.

In any CSAR effort, characteristics of the terrain are of prime importance and would include natural features along with man-made objects such as bridges and revetments. By giving a description of natural and man-made terrain features to the pilot of a CSAR-dedicated aircraft, his loiter time could be reduced, while possibly expediting aircrew recovery. This is especially important in the modern battlefield's high-threat environment where such vital factors as ingress and egress routes need to be determined.



Facing page

Solving "Pierre's dilemma": The Joint STARS' Synthetic Aperture Radar (SAR) shows details of the terrain and Iraqi positions near a bridge spanning desert hills in this example from the Gulf War (1991).

Above

Aggressors in flight: This display of the Joint STARS Moving Target Indicator (MTI) mode shows the Iraqi retreat from Kuwait during the Gulf War (1991). This example amply illustrates how the E-8C would warn downed crewmembers, or CSAR aircraft, of approaching vehicles.

Moreover, if a suppression phase becomes necessary, the E-8's controllers would be ready to provide targeting data to the RESCAP aircraft which determine the degree of enemy activity in the objective area and provide suppressive fires if required. Relatedly, the E-8 crew can help ascertain possible landing sites for CSAR helicopters. This is where the E-8's radar modes once again prove their value. SAR imagery, for instance, can be used to develop a cartographic background to enable road-assisted tracking in uncharted areas. Furthermore, by melding the MTI radar with products from the Defense Mapping Agency (DMA) and the French *Observation de la Terre Probatoire pour Une Image de la Systeme* (SPOT) satellite, a type of "topographical synergy" is produced. This is what was accom-

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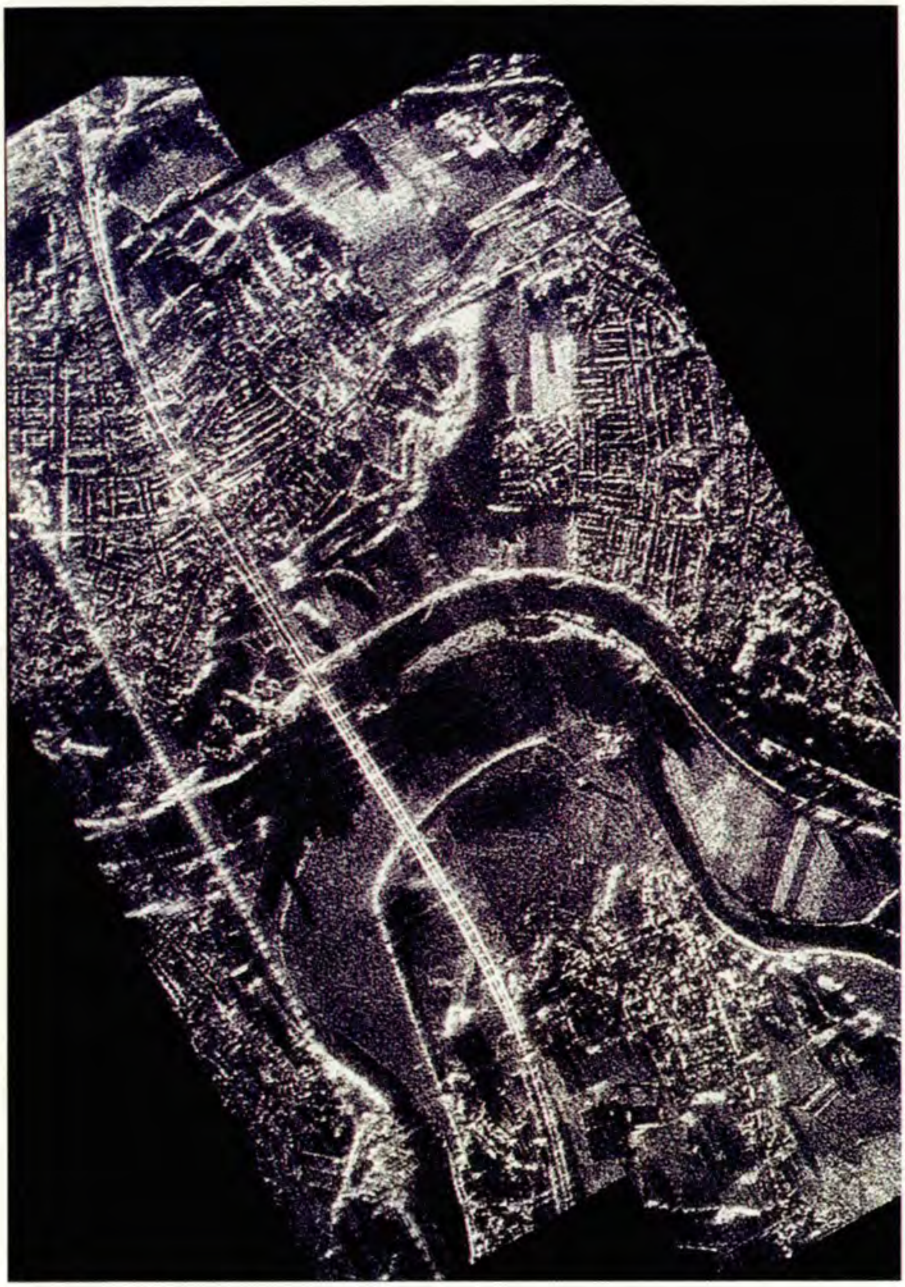

No bridge too far: The Rhine River and the surrounding countryside is clearly shown winding its way through Germany in this picture of the Joint STARS Synthetic Aperture Radar (SAR) mode. This mode furnishes imagery of land features, along with mobile targets that have become stationary, providing CSAR-dedicated forces with details concerning the terrain where downed crewmembers may be located.

plished in JSTARS' recent participation in Operation JOINT ENDEAVOR. The value of such information would prove itself if used to help ascertain travel routes, or whether primary or secondary roads were being used by the enemy.

In another possible scenario, special operations units participating in CSAR missions could communicate with JSTARS through satellite communications (SATCOM) and high frequency (HF) radios, as they operate behind enemy lines at night or in bad weather. In addition to pointing out enemy or unknown vehicles, JSTARS could point out several activities or features within any given area, including estimated distances to friendly ground forces that the evaders could proceed to in order to effect their recovery.

Conclusion

Although we anxiously await JSTARS' applications to the realm of search and rescue, we must keep in mind that this system faces many dynamic taskings and on-station time constraints, often dictated by operational or command needs. Hence, it may not always be available for participation in CSAR efforts. However, the possibilities continue to present themselves. As Joint Publication 3-50.2 states in reference to command and control resources, "Availability of support aircraft is often the difference between success and failure of a CSAR operation." (Joint Publication 3-50.2, "Doctrine for Joint Combat Search and Rescue," 26 January 1996, page II-9.)

As professionals, JSTARS mission crewmembers will be fully aware of the CSAR Special Instructions (SPINS). But the process of education is always a two-way street. Operations and support personnel can start now by thinking of JSTARS when considering any CSAR planning. The JSRC, for instance, when developing integrated evasion and recovery concepts to support operations plans, should consider JSTARS in discussing such things as the joint force CSAR threat decision matrix. As this system becomes more plentiful, the unique capabilities of the E-8's radar modes will gain eminence.

With our armed forces facing scarce resources that adversely affect our ability to conduct CSAR operations, JSTARS' incipient capabilities are proving a timely arrival. For instance, in cases of maritime CSAR efforts, JSTARS can use its capabilities to counter such seaborne vessels as fast patrol boats. Because it provides highly accurate radar imagery in all but the most severe weather, battlefield confusion, exemplified by our bewildered character from Tolstoy's *War and Peace,* will be significantly reduced. As such, CSAR efforts stand to gain a natural boost from JSTARS' assured role in the dominant battlespace knowledge of the not-too-distant future. ✈

THERE WE WASN'T

or The Curse of the Mummy

Capt Joel Sparkman
42 ABW/SEF
Maxwell AFB, Alabama

■ I was enjoying the first 15 days of flying in the Southwest Asian Area of Responsibility (AOR) in the C-21 when we had our little problem. I was really looking forward to my time in Saudi as I would be there with a buddy. He assured me there were a lot of cool things to do (well, at least there was a gym).

Upon arriving, I was relieved to find the rest of my crewmates in the C-21 were really good guys (each from a different MAJCOM) and a lot of fun to be around. We worked well together, and there seemed to be no CRM barriers that I could see.

The mission was supposed to be a fun time — out to Riyadh, then up to Cairo West, then on to a night's stay in beautiful Turkey. Of course, since there were only four C-21 guys and one jet in the theater, the other two guys had to come along for "training" purposes.

We had one of the main problems in our flight planning — we couldn't find a current approach into Cairo West. The closest one we could find was an out-of-date approach from the C-130 guys. That was okay, though, because the weather was supposed to be great, and we had an alternate of Cairo East. Also, we couldn't get any NOTAM information on the airport. So we elected to file with two alternates, as per our regs.

The leg from Riyadh to Cairo West was supposed to take about 3 1/2 hours, but the winds were a bit stronger than we had planned. We still had fuel to make it to our second alternate, but just above what was required. We were all pretty excited about the possibility of seeing the Egyptian pyramids from the air. It would also go over well with our three-star passenger and his party.

As we approached Cairo, we got the weather at our destination. The visibility was 5 miles, and the ceiling was unrestricted. This is when things started to go wrong.

Since the weather was great, the AC asked the controllers about trying to get an air tour of the pyramids. It took some convincing, but soon we were circling them at 1,500 feet, trying to get photos and having a great time taking in the sights. Of course, while we were doing this, we were also burning off a good amount of fuel at low altitude.

When we finally decided to continue on to Cairo West, we were ready to get on the ground and pat ourselves on the back for our ability to enhance the mission. Wouldn't you know, during the 15 minutes of sightseeing, the weather at Cairo West had gone from 5 miles with no ceiling to 1 1/4 and fog.

I was copilot-qualified and sitting in the jump seat. There was an AC-qualified guy in the first passenger seat, an instructor pilot-qualified guy as copilot, and another AC-qualified guy as the aircraft commander. Everyone, including me, realized we no longer had the gas to get to our most distant alternate, and we had only a few minutes to land at Cairo West before we would be below what was required to fly to Cairo East and still be legal.

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No problem, we thought. We'll just shoot the localizer to Cairo West and be done with it. The only problem was that when we tried to bring up the TACAN, all the needle would do was spin around. By this time, we were talking to Cairo West approach, and we started asking them about the TACAN. They said a new one had been installed and gave us the frequency. And, by the way, it was in a new location.

We had two problems. The first was we had no way to identify the FAF and no idea where our azimuth and distance reading off of the TACAN were pointing to. But hey, that's okay. We can use radar to identify the FAF. On our approach, the localizer was working fine, and I could see the fuel gauge on the panel was starting to get a little low. Our missed approach point soon came, and somewhere off the left side of the jet we could see the runway. But we were in no position to land. We went around and got into the radar pattern. The vis was significantly less than 1 1/4 miles. We also realized the runway was not where it was depicted on the approach plate.

We had two problems. The first was we had no way to identify the FAF and no idea where our azimuth and distance reading off of the TACAN were pointing to.

As we headed around the radar pattern, I discussed the situation with the guy sitting behind me. He (the AC-qualified guy) asked me about the gas. I then asked the guys flying about the gas, but they were really busy and didn't give me a reply. I checked the gas and suggested we divert to Cairo East, somewhere that had a good approach. We would arrive at or slightly below legal fuel mins. The AC said, "Nah, I think we can make it in on this approach. We should be fine."

By this time, me and the guy behind me were getting a little nervous. We shot the approach, but just like last time, we went missed approach when the runway was in sight but not in a position to make a safe landing. Around the radar pattern we went again, burning more gas.

On downwind, the CRM broke down. The AC behind me told me to tell the guys flying that we needed to divert and asked what was going on with the fuel. I told the AC and IP that we might want to divert and that we could get there with enough if we declared emergency fuel.

The AC and IP were in a discussion over the exact position of the runway in relation to the final approach course. And, of course, approach was being no help. On downwind, the AC asked approach what the weather was at Cairo East. The voice of task saturation answered with "Shaft 22, you can get that information when you are on the ground." That radio call greatly increased the stress. The AC told everyone to shut up and assured us we were going to make it this time.

As we intercepted the localizer, we had enough gas to keep our low fuel light blinking intermittently, maybe 30 minutes left or so. I thought we were out of options even if we did divert. The AC flew the localizer, this time slightly to the left. As we reached the missed approach point, the runway came into view. The AC rolled into a 30- to 40-degree jink to the left, then another to align ourselves with the runway, all very low to the ground.

As the ground proximity warning system started yelping "SINK RATE! SINK RATE!" I tightened my lap belt and braced for impact. Luckily, impact never came. We touched down and taxied back to get some fuel. The AC and IP up front were severely irritated. And so was I. The AC told me, "Hey man, I just saved us from being a smear on the desert floor."

After everyone cooled off, we talked about what had happened. From the view of the jump seat, I thought we had gotten way too close to buying the farm for no reason. The guys in control were concerned with everyone trying to give them too much information at one time and interrupting ATC and the checklist.

There are a number of things I learned. First of all, always have a hip-pocket plan in the event something goes wrong.

Second, make the decision to divert early. Set a bingo fuel or a point of no return to force you to make the decision.

Third, if a situation becomes too complex, take the conservative route.

Fourth, if the NOTAMs are not available and the plates are out of date, don't assume anything until you've landed and your jet is refueled.

Fifth, communication within the cockpit can happen only if the receiver is ready to receive. Pick a time that is appropriate. But if need be, break in and make them listen to you.

And finally, don't let the fun of a mission take your mind off of thorough planning. ✈

DO THE HARD THING

IT'S THE RIGHT THING TO DO

MAJ MARK GIERINGER
Editor, *The Mobility Forum*

■ *A large, multi-engine aircraft was part of a three-ship cell preparing for a high-profile mission. After engine start, the crew chief reported smoke coming from an avionics-intensive section of the fuselage. A supervisor, parked nearby to supervise the launch, called the crew and said, "There's no smoke, continue." After the crew chief repeated his warning to the crew, the supervisor directed the aircraft commander (AC) to "get going," that there was no smoke.*

Dutifully, the crew taxied out and took off. When they got to 3,000 feet, in heavy weather, they experienced complete AC power failure, losing all navigation and communication equipment (except for one FM radio, which was improperly wired and should have failed), and the fuel transfer pumps.

The crew climbed to visual conditions using basic instruments. They contacted command post and another aircraft in their formation on the single FM radio. The second airplane led the crew to an approach at another airfield where they landed moments before fuel imbalance would have made landing impossible.

Who was to blame here? Was it the supervisor for directing launch with a known problem? Or was it the crew chief or AC who didn't stand up to a bad decision? They all chose the easy way out, which eventually put the aircrew in a very tough spot and nearly caused the loss of an airplane. *Someone* should have stopped the launch. It may have been hard, but it would've been the right thing to do.

How do you know what you should do when faced with hard choices?

Your parents taught you many things when you were a child. Their lessons were backed up by your pastor, teachers, coaches, drill sergeants, military instructors, and others. What lessons? *Do the right thing. Don't steal. Don't cheat. Do unto others as you would have them do unto you. Be responsible for yourself and your actions.* Basic stuff to live by, I always thought — until lately.

Many Americans seem to have tossed responsibility out the window in the last few years. Military members must avoid falling into this trap, which can ruin lives and careers.

Supervisory Responsibility

As individuals, we are responsible for ourselves and our actions, and our behavior is governed by the mores and values of society. Air Force members are further governed by rules and regulations dictating standards of appearance, performance, and conduct. On occasion, we can be both ethically *and* legally bound to look out for others.

For some of us, the scope of responsibility is broader than it is for others. The crew chief is responsible for providing a safe aircraft to the crew. The AC is responsible for effectively executing the mission, but also to safeguard his aircraft and crew. The DO and commander are responsible for mission accomplishment and for the safe operation of all aspects of accomplishing that mission.

There are many Air Force regulations that have portions beginning with "There is no peacetime mission requiring __________." People in responsible positions sometimes have to fill in that blank for themselves and their unique situation. It may be an O-6 supervising launch activities, an AC with a maintenance problem, or the crew chief trying to get her airplane mission ready.

Have enough integrity to stand up and take responsibility. It's the hard choice, but the correct one. If you are in charge of an operation and observe something unsafe, *do the hard thing*. Stop the activity until the problem is taken care of. If you are being told by someone higher up to do something unsafe, *do the hard thing*. Stop the activity until the problem is taken care of.

Sometimes there is a fine line between mission accomplishment and safety. When you are faced with making a difficult decision, *do the right thing!* Base your decision on the rules and regs that are based on experience and were designed to help avoid costly mishaps.

Take responsibility for your own actions. Look out for others whenever you can. This will benefit all of us and make you feel better and more positive about yourself at the same time.

And if you don't? You'll only have yourself to blame. ✈

OP's Topics

Snow FODs Out APU?

■ Let's see. An aircraft's operating aux power unit's (APU) exhaust is hot, very hot. And snow is "frozen moisture cold" — ice cold! Well then, how could ordinary, fine-particle snow cause an operating APU to seize up with damage costing over $60,000? You're right if your answer is ***"Must've been caused by human error!"***

The short-and-sweet reason for this ground mishap? Flightline maintenance supervisors prematurely released an aircraft to aircrew members when it wasn't properly prepared or crew-ready!

A C-5 airlifter had loaded up with a significant amount of snow. Maintenance was only halfway through the deicing operation when they relinquished the aircraft to flight engineers who had arrived in the morning to perform prelaunch duties for an evening mission. The aircraft was **not** scheduled for an immediate departure. **Why then the rush to let ops have the aircraft?**

Anyway, while doing the preflight's flight control checks, the outside scanner cleared the cockpit operator to lower the flaps. Yep! You guessed right again. A significant amount of snow came off the flaps and trashed the APU — stone cold, seized up dead! Basically, it was because the snow went through the APU exhaust screen and smothered it! When the affected APU (the other wing had been cleared of snow) seized up, it also gave off a fire indication, and a flight engineer had to fire off both of the APU fire bottles.

Okay, the scanner should've properly cleared the wings — that's an indisputable fact. But didn't maintenance play a significant role by turning the aircraft over to the aircrew members *before* the snow removal job was completed?

On the other hand, could we expect the aircrew members to request the rest of the deep snow on the wings be removed if they were to properly perform their outside preflight walk-around duties, e.g., checking the conditions on the top of the wings and fuselage for leaks, panel securities, etc.?

Was the production super consulted *before* the deicing operation was suspended? Were the aircrew members asked if they wanted the deicing operation suspended? There's nothing unusual about all these questions because **this is how it's supposed to be done!**

Effective ops/maintenance communications are, and will always remain, the keys to successful, safe ground and flight operations! We can't afford any mishaps like this one.

Bottom line: **Several ops and maintenance folks lost their situational awareness and focus on what was being accomplished that morning through ineffective communication and "team" resource management — period!**

A Bird Strike Abort Not Told

An instructor pilot and student had a little excitement on their takeoff roll when they experienced multiple bird strikes to their jet. It wasn't primarily the bird-strike damage causing their grief — it was safely stopping the jet! However, shutting down both engines when a runway departure loomed immediately ahead probably helped prevent further aircraft damage.

So if the bird strikes didn't disable the T-38A enough to cause the "runaway ride" down the runway, what did? Well, listen up, y'all. This can happen to you, too!

This particular day definitely wasn't their day to fly. The mishap abort was their second abort, and the mishap jet was their second jet for a simple, peacetime training sortie. Naturally, by the time they stepped to the spare after the first abort they had already missed their scheduled morning takeoff time. And, as luck would have it, there was a runway change for shifting winds before their second takeoff attempt.

You've probably guessed by now what might have caused their wild abort ride down the remaining runway. **They didn't recompute the takeoff and landing data (TOLD) during the time between the first and second takeoff attempts — especially in light of the runway change!** Besides the shift in winds (from headwind to tailwind), there was an increase in the ambient temperature. No wonder the jet didn't seem to be slowing down during the "bird strike" abort!

When we reach the point of "Mach 3, no heading" and haven't even broke ground yet, then it's time to pause for the cause or just cancel out altogether. Maybe it wasn't meant for us to soar with the eagles at that time or that day. Either way, you're bound to finally catch your breath, refocus, and have an opportunity to "fly safe" again, and again, and again. ✈

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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

CARSON E. SMITH

HQ 55TH WING
OFFUTT AFB, NEBRASKA

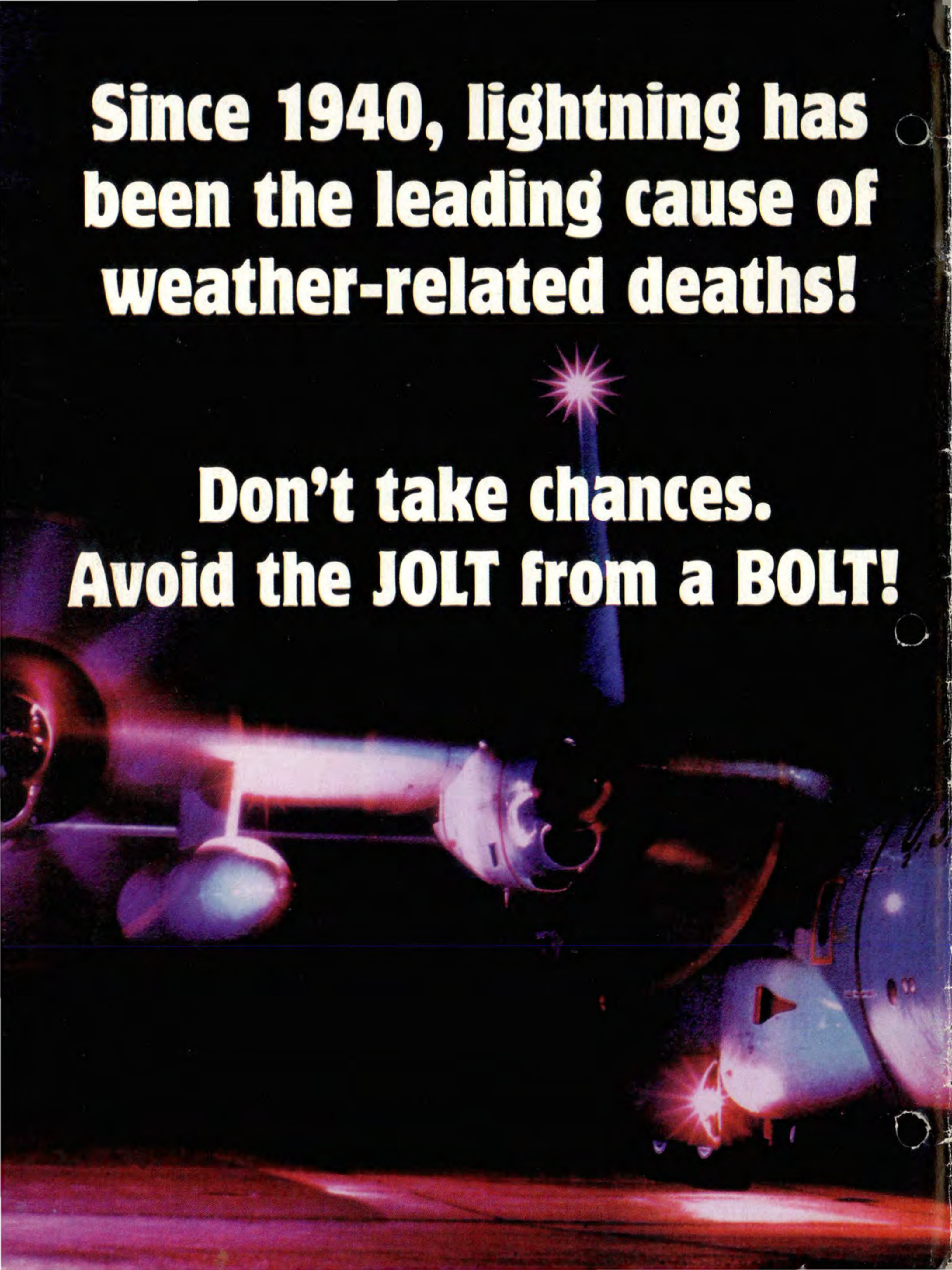
■ SSgt Carson E. Smith was monitoring a LOX servicing operation near the tail of an RC-135V parked on the 55th Wing flightline at Offutt AFB, Nebraska. At 0330 hours, he noticed smoke billowing from the nose area of an adjacent RC-135. Immediately, he ordered the LOX operation discontinued and ran to the nearby aircraft to find the source of the smoke. The burner of an H-1 heater unit used by a repair team had "flamed out" and was leaking JP-8 fuel onto the flightline.

SSgt Smith quickly released the parking brake of the unit to remove the heater from the area. Just then, the heater exhaust port burst into fire with flames shooting outwards more than 15 feet according to witnesses. The burning cart was only 10 feet from a $400 million national asset, and less than 100 feet from a volatile LOX servicing operation. With complete disregard for his personal safety, he dragged the burning heater unit over 200 yards from the endangered aircraft. Then, SSgt Smith battled the flames for several minutes before finally suppressing the fire.

With the fire out, he directed the cleanup of the spilled JP-8 and the removal of the heater to prevent any further danger to aircraft parked on Offutt's ramp. The courageous, selfless actions of SSgt Smith prevented a mishap with potentially catastrophic results.

This exemplary airman deserves the recognition and gratitude of the men and women of Air Combat Command and the U.S. Air Force.

WELL DONE!


Since 1940, lightning has been the leading cause of weather-related deaths!
Don't take chances.
Avoid the JOLT from a BOLT!