flying

SAFETY

MAY 1986

USAF Instrument Flight Center

Riding Shotgun For The Shuttle

Privileged Information

Dodging Feathered Bullets

THERE I WAS

■ . . . going ACE for a few weeks is usually a good deal to get you off the local air patch for a while. But, even the best of us can be bitten by a combination of unfamiliar procedures at a strange field, a busy radio, and inattention to detail.

It was the classic setup. Departing McGuire AFB for Pease AFB, we filed for a radar departure at FL230 to pass west of the NYC TCA by 40 miles. No sweat. We loaded up and called for a clearance. "You're cleared the Point Pleasant-One Departure" read clearance delivery, "Hampton transition, direct Manta. Cross Manta at 6,000 . . . Departure on . . . Squawk. . . ."

I had a SID booklet on board but which of the nearly dozen was it? Oh . . . there it is; Number 10. Can I fly it? Yes.

It takes us out 50 miles east of the coast. We have the water wings and rafts . . . the climb rates are OK . . . no TACANs . . . good grief, it's 50 miles at 6,000 feet! There goes my fuel for approaches. . . . I'll probably get vectored to Virginia before I can head north.

A few seconds of mental calculations and I knew I could make it.

Takeoff was uneventful. Sure is hazy. "Proceed direct Coyle; maintain 4,000; traffic, one o'clock, slow moving, altitude unknown."

No tally, let's see . . . Coyle 113.4 and 81, that's to the east.

Then, not 30 seconds later, we heard "Proceed Direct Manta, climb/maintain 6,000, VFR traffic 11 o'clock at 4 miles, altitude 5,500, unverified."

I don't see the traffic. Whew! Where's Manta? The Sea Isle zero five nine at 76 . . . that's one-fourteen point. . . .

"Traffic now 2 o'clock, 2 miles, has you in sight." I gave the copilot the best fix-to-fix I could.

"Contact New York Center on 381.4."

The radios were so busy I couldn't raise the controller for what seemed like forever.

Suddenly, over all the chatter, I heard our call sign "Proceed direct Manta. You appear to be heading north. Turn to a heading of 110 and contact New York Center on 377.4."

Whew! We were on a good heading, weren't we?

Oh, no! I never finished dialing in the full VOR frequency. I was heading to the wrong fix! We turned and set our VOR and UHF radios.

Sure enough, I didn't tune, identify, and monitor! How embarrassing!

Then I got that chill. What if that had been a point-to-point in a nonradar, mountainous area with the wrong VOR station tuned in!

We were quickly given clearance to flight level and shortly thereafter vectored on course. But the lesson is: Apply the procedures. Tune, identify, and monitor. ■

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page 2

page 11

page 22

SPECIAL FEATURES

REGULAR FEATURES

DEPARTMENT OF THE AIR FORCE • THE INSPECTOR GENERAL, USAF

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USAF INSTRUMENT FLIGHT CENTER

LT COL JIMMIE D. MARTIN
Editor

■ Have you ever become frustrated over a needlessly complicated instrument approach or departure? I can remember a few I used to like to take students on to see if they really knew what they were doing. Are the instrument publications so vague as to be of no help? Do you feel no one cares about the aircrew member who has to decipher and fly these procedures? Take heart. You have an ombudsman — the USAF Instrument Flight Center.

The present USAF Instrument Flight Center (IFC) opened on 1 October 1983 at Randolph AFB, Texas. While many of the projects presently being handled by IFC are new, the Center is by no means new. The Center has a long history.

The roots of the IFC go back 40 years to Bryan Field, Texas, where in March 1943, Colonel Joseph B. Duckworth founded the first Instrument Pilot Instructor School (IPIS). Colonel Duckworth, an aviation pioneer, recognized the need to teach pilots instrument flying as well as visual flying. He and four other officers designed a full panel system for attitude instrument flying. They then developed a curriculum for IPIS.

IPIS continued to grow and moved to several different bases before settling at Randolph AFB in 1961. IPIS fulfilled the needs of the Air Force for many years. However, as instrument displays progressed from needle-ball-airspeed presentations to elaborate all-weather flight director systems and instrument procedures grew more complex, it became apparent IPIS was not enough. To meet the challenge of rapidly developing technology, the

Air Force saw the need for an organization that not only taught instrument flying, but also functioned as a center for standardization as well as research and development. Thus, IPIS was expanded to become the USAF Instrument Flight Center in December 1972.

For the next 6 years, the IFC provided the Air Force with quality instrument flight training and strong controls over instrument flight publications along with aviation research and development projects. However, in the mid-seventies, the Air Force was faced with massive cost reductions. Programs were cut back, bases were closed, and despite its excellent record, the IFC was closed in June 1978. The various functions performed by IFC were given to different commands and agencies.

It wasn't long before the results of this action became apparent. Without IFC, the Air Force began seeing degradation in instrument-related publications, directives, and instrument training programs. At the same time, there was an upward trend in instrument-related aircraft mishaps. It was clear there had to be a central manager to avoid unnecessary duplication and failure to get essential information to all concerned agencies. In late 1982, some of the Air Force planners started thinking about an IFC-type organization to try to get more control of instrument-related problems. In July 1983, HQ USAF approved the reestablishment of IFC.

Mission

Colonel Jay Baker, IFC Commander, explained "The USAF Instrument Flight Center is the focal point for Air Force instrument flight functions." Its mission is to develop Air Force directives and training programs governing instrument flight; determine USAF operational requirements for flight information; develop and apply Air Force, national, and international flight procedure criteria and standards; and when asked, to perform operational testing and evaluation of instrument control, display, and guidance systems.

Organization

The USAF IFC is an Air Force special activity which receives policy, direction, and priorities for operational objectives from HQ USAF, DCS Plans and Operations (HQ USAF/XOO). The IFC is assigned to HQ Air Training Command, Vice Commander (ATC/CV) for operational control.

Internally, the IFC has 28 people organized into 4 divisions. The divisions are Aeronautical Information, Flight Directives, Instrument Procedures, and Operational Plans and Programs.

The staff consists of 18 officers, 2 airmen, and 8 civilians. They not only have many years of experience in all aspects of designing, producing, and testing instrument procedures and publications, but also a wealth of flying experience. This includes recent experience in all our front line fighter, bomber, tanker, and transport aircraft as well as older miscellaneous aircraft and helicopter experience — a combined total of 50,000 hours. So, as Colonel Baker pointed out, "When there is an instrument issue that needs to be addressed, we can give it a very comprehensive appraisal." The varied backgrounds of the staff allow them to look at the issue from all angles.

Each division within IFC has certain primary responsibilities. However, none of them works completely independently of the others. There is a great deal of interaction within and between the divisions. We will take a brief look at each division.

Aeronatuical Information Division (AI)

Lieutenant Colonel Bill Harber, Division Chief, stated, "The division's main emphasis is to review flying publications for accuracy and utility of information. Is it worthwhile? Do you need it? If not, get rid of it. If it's there and you need it, is it correct?"

This division is the OPR for AFR 60-7, *Flight Information Publications* (FLIP). This regulation concerns how the many FLIP manuals, books, charts, etc., are processed and how to order them. The Defense Mapping Agency (DMA) actually publishes FLIP for the Department of Defense (DOD), but IFC/AI is a member of the FLIP Coordinating Committee (FCC) and is chairman of the FLIP Maintenance Working Group. The FCC coordinates requirements and procedures with the DMA, Army, Navy, NATO, and the various theaters of operation (Europe, Pacific, etc.).

continued

Although the IFC is located in a modern building at Randolph AFB, Texas, it is not an Air Training Command unit. IFC is an Air Force special activity under HQ USAF, DCS Plans and Operations.

Over the years, FLIP products have multiplied in volume. This is due to new airfields, new navigation aids, new approaches, etc., as well as new procedures. Without a central manager, publishing and distribution have been inconsistent. Some units or agencies were unable to get all the needed publications or their changes. New procedures were printed in some publications, but not in others. Outdated material was not always removed because there wasn't a knowledgeable point of contact (POC).

IFC/AI is establishing a POC for each department in all areas and theaters. This will help ensure the right entries are made and the information is reviewed on a regular basis by a knowledgeable person. Current plans call for an annual review for currency.

The Air Force Central NOTAM facility at Carswell AFB, Texas, is closing, and IFC is programmed to take over management of Notices to Airmen (NOTAMs). As with the FLIP, IFC will establish POCs in each theater to make sure all applicable NOTAMs are published and are deleted when no longer required. When this happens, AI will also be responsible for AFR 55-16, *DOD NOTAM Management*. This regulation establishes procedures for processing NOTAMs.

The growing volume and complexity of FLIP has contributed to confusion in the cockpit. Sometimes it seems no one has considered the flight crew in this matter.

USAFE contends the number of FLIP products that have to be carried has been a contributing factor in aircraft mishaps (particularly in the F-16). AI is now looking into publications specifically designed for the single-seat fighter. They see a need to examine all FLIP products in terms of how the flight crews are going to use them.

This is especially true for the single-seat fighters. The fighter pilot has limited storage space and doesn't have someone to help him find the right book for each phase of the flight, open it to the right page, decipher the information, etc.

The first step would be to eliminate all fields with runways too short for fighters. In Europe, this alone would cut the books in half. Many more fields could be eliminated because they don't have approaches that can be flown by particular fighters.

Then, several books could be combined into one. The one book could have approaches, departures, field diagrams, etc. This would eliminate searching for the right book. All the different procedures for each field would be arranged in logical sequence for ease of use.

AI is also looking at digital displays for the information. This could be done with CRTs or flat panel displays. But, there are problems with this approach. First, the data base is still being compiled by DMA. They are about 2 years away from completing this 5-year project. Second, such displays would need some kind of backup in case of failure or battle damage. This would probably have to be our present books or something similar. Also, Captain Emory Ellerbee, Aeronautical Information Specialist and C-141 pilot stated, "It's important to find a happy medium between what technology can offer in displays and what the pilot can really use. There is no standardization of the electronic displays. The capabilities are so far beyond what the pilot can use, they can actually be dangerous."

AI plans to publish ICAO codes for weight-bearing capability of airfields in the IFR supplement. MAC crews need this information for foreign destinations. The ICAO Air-

The Link Trainer, Model C-3, was first delivered to the Army Air Service in 1934 and remained in use through WWII. Pilots in IPIS received instrument procedures training in this model trainer. Do you suppose they made the exterior resemble an airplane to help the pilot pretend he was flying?

While the pilot flew the trainer through various climbs, turns, and descents, his course was traced in ink on the map on the table. After the flight, the instructor and the pilot could review the lines on the map to determine what the pilot had done.

craft Classification Number (ACN) and Pavement Classification Number (PCN) are actually more accurate and easier to use than our method. AI is also working joint tests with the FAA on MLS. At this time, they are mostly simulator tests flying curved path approaches using current steering bars.

Captain Keith Maring, Aeronautical Information Specialist and F-16 pilot said, "The biggest frustration of the job is that we can't make immediate changes. There are so many different people and agencies that use the products and they all must agree to the changes." The coordination process is very time-consuming. But, he added, "If safety of flight is involved, the process can move very quickly."

Flight Directives Division (FD)

Lieutenant Colonel Jim Curran, Division Chief, explained his division is responsible for those Air Force directives that relate to instrument flying. Since IFC reopened, Colonel Curran and his staff have been very busy with long overdue revisions.

They are in the final stages of completing an exhaustive revision of AFM 51-37, *Instrument Flying*. "The last time this manual was seriously looked at was in 1975," explained Colonel Curran. So, the manual was already due for updating before IFC was disbanded. "We picked it up again in 1983, and for the last 2 years, my 5 guys have been working on a new edition." The new 51-37 not only has updated procedures, it also has updated illustrations. No more T-33 cockpits; the pictures are now compatible with our newer aircraft and instruments.

IFC/FD is the Executive Manager for AFR 60-16, *General Flight Rules*. This regulation has also been completely revised and is in the field with a December 1985 date.

AFP 60-19, *Pilot's Instrument Refresher Course*, is all new and is in the field. In fact, it has already changed once. In addition, the division is developing a 60-19, Volume I. This pamphlet is designed to give the unit instructor pilot many of the tips, techniques, charts, etc., that used to be taught in IPIS before it was deactivated. Captain Ron Liddell, Airspace and Procedures Officer stated, "The purpose is to provide the units with as much information as possible so the unit instrument instructor can conduct the annual instrument refresher course most effectively."

Another way this is being done is through traveling road shows. This is a team of two to four IFC instructors that, on request, visit Air National Guard and Air Force Reserve units to conduct instrument training. The team presents a 6-hour training session on Saturdays. They are considering extending this service to active duty units, if needed and requested.

The division also monitors IFC's 24-hour/7 day a week phone answering service. This was installed in recognition of the fact that the duty day in Europe or the Pacific is not the same as the duty day in Texas. Now anyone with a question or problem can call in at any time. Your question will receive immediate attention on the next duty day if you call after hours. A knowledgeable person will then contact you as soon as possible with the answer. Make sure you tell them how to contact you. The telephone number is AUTOVON 487-3077, Commercial (512) 652-3077.

IFC/FD also forwards instrument articles to be published in this magazine. We have had many requests for resumption of these articles. I'm happy to say they will soon reappear.

Instrument Procedures Division (IP)

Lieutenant Colonel Fred Butler, Division Chief, explained his division is responsible for the technical development of procedures for all phases of instrument flight. During the time IFC was disbanded, there was no watchdog to look at all these things.

"Our biggest problem is the wide variety of criteria used around the world. We need to standardize procedures." There are three sets of criteria for Terminal Instrument Procedures (TERPS) — International Civil

continued

The control console of a modern T-38 flight simulator is a far cry from the old plotting table. Operators can provide any type of instrument approach or malfunction and really monitor the student's performance. IFC uses the simulators to evaluate procedures and approaches for validity, applicability, and safety.

Aviation Organization (ICAO) TERPS, North Atlantic Treaty Organization (NATO) TERPS, and US TERPS. There is basic agreement between these three systems, but some important differences remain, especially with ICAO TERPS. ICAO TERPS are generally more complex.

"But, when we go to another country, we must consider their criteria and procedures. This adds confusion and complications to an already unfamiliar situation. Pilots must fly these approaches with added caution." Mr. Harvey Payne, Flight Procedures Specialist, explained, "We would be better served by using common terminology, practices, and procedures. Unfortunately, it will take years to make the change to a common set of criteria."

One of IFC/IP's major efforts has to do with nonstandard procedures. They have recently been given waiver authority for all procedures which do not meet TERPS criteria. Sometimes equipment or location creates a situation where approaches, departures, etc., cannot meet all the TERPS criteria, but the procedure is still safe. In such cases, the responsible facility submits the procedure and their justification for it to IFC for evaluation and approval. If IFC agrees the procedure is safe and can be flown, they will approve publishing it.

An important consideration now is to develop criteria for the Global Positioning System (GPS) and the Microwave Landing System (MLS). Once the criteria have been developed, then pilot procedures for navigation and instrument approaches must be developed. Finally, the procedures have to be tested to see if they really work.

Lieutenant Colonel Jim Aston, Terminal Instrument Procedures Specialist, is deeply involved in the GPS. As with MLS, there are many definitions and many different ideas on how GPS is to be used. These things must all be ironed out and tested. He explained, "Once it has been decided what the equipment will do and what the pilot will see, we have to be prepared with the procedures the pilot will use. That is IFC's primary responsibility." GPS must fit in with the existing air traffic system. IFC is looking at ensuring the operational support, charts, IAPs, and instrument procedures as a whole are there when pilots begin flying GPS.

Operational Plans Division (OP)

This is the newest of the four divisions and has been in operation for about a year. Their basic task is to ensure the operator has some input into all the plans and programs the Center gets into.

Lieutenant Colonel Bill Ercoline, Division Chief, explained the division's main task is determining what the instrument training requirements are. "What are they, and how can we ensure our programs meet the needs of the pilot?" This encompasses a wide area. Three current areas of emphasis are the Head Up Display (HUD), Microwave Landing System (MLS), and the Global Positioning System (GPS).

Most of their efforts are concentrated on training requirements. The immediate need they saw was in the tactical community with the HUD. This was the key issue that opened up the division. The big problem is that there is no formalized training program to use the HUD as an instrument flight reference system. All of our pilots receive their instrument training in 1960s technology aircraft — the T-37 and T-38. They then go to the more modern HUD-equipped aircraft. This is true for fighters now and will be true for the heavies in the near future.

There are different approaches to using the HUD. Some pilots use it for everything. Some go to the cockpit instruments at the first sign of weather. Other pilots use the cockpit instruments as their primary reference, but bring the HUD into their cross-check.

Col Ercoline feels pilots will probably be taught to use the HUD as a primary reference with the cockpit instruments as part of the cross-check. IFC/OP will work with the using commands to establish training requirements and develop training programs to fulfill the requirements.

On the "heavy" side of the house, the division is looking at the differences between using the new electronics displays versus the conventional instruments we're all used to (ADI, HSI, etc.). This is an important factor because that's where our new aircraft are headed (C-17, B-1, etc.). We need to know what

The T-38 flight simulator doesn't look much like an aircraft except for the interior of the cockpits, but it sure flies a lot like one. Just as instrument procedures and trainers have progressed since Col Duckworth's day, the IFC has come a long way since its beginning as IPIS in 1943.

training needs to be done and be ready to do it as these aircraft come into the inventory.

All the new technology will be useless if our aircrews don't know how to use it. Even more important, it can be dangerous. IFC will be providing operational pilots and navigators for evaluating the cockpit of the future. There are no Air Force standards for cockpit layout. IFC is convinced one should be established.

The division also reviews all mishaps that are instrument related. They look for trends to see if there is a need for more training, different displays, capabilities, etc.

Future Plans

What does the future hold for IFC? They have been tasked to develop pilot procedures and assist the MAJCOMs in developing training programs for any new instrument or navigation programs that come on board. They are presently working on HUDs, GPS, and MLS.

Colonel Baker explained, IFC is working closely with Aeronautical Systems Division (ASD) and the MAJCOMs on the issue of cockpit instrument displays and layouts for future aircraft (C-17, B-1, ATF). "We're looking at the best way to lay out an integrated head up/head down cockpit where you do have a HUD for part of the information. How do you support that with head down displays for the pilot to use?"

IFC also has officers serving in an advisory capacity on the C-17 Flight Deck Configuration Panel. This panel is studying preliminary designs for the layout of the flight deck. Besides helping ensure the flight crews end up with a workable design, it helps IFC write AFM 51-37 because they know what's coming in future aircraft. This allows them to know in advance what pilot procedures need to be covered.

They are also working with the USAF School of Aerospace Medicine doing pilot factor evaluations to find out just how much the pilot can absorb and how to best display the instrument flight information to tell him what's going on with the aircraft.

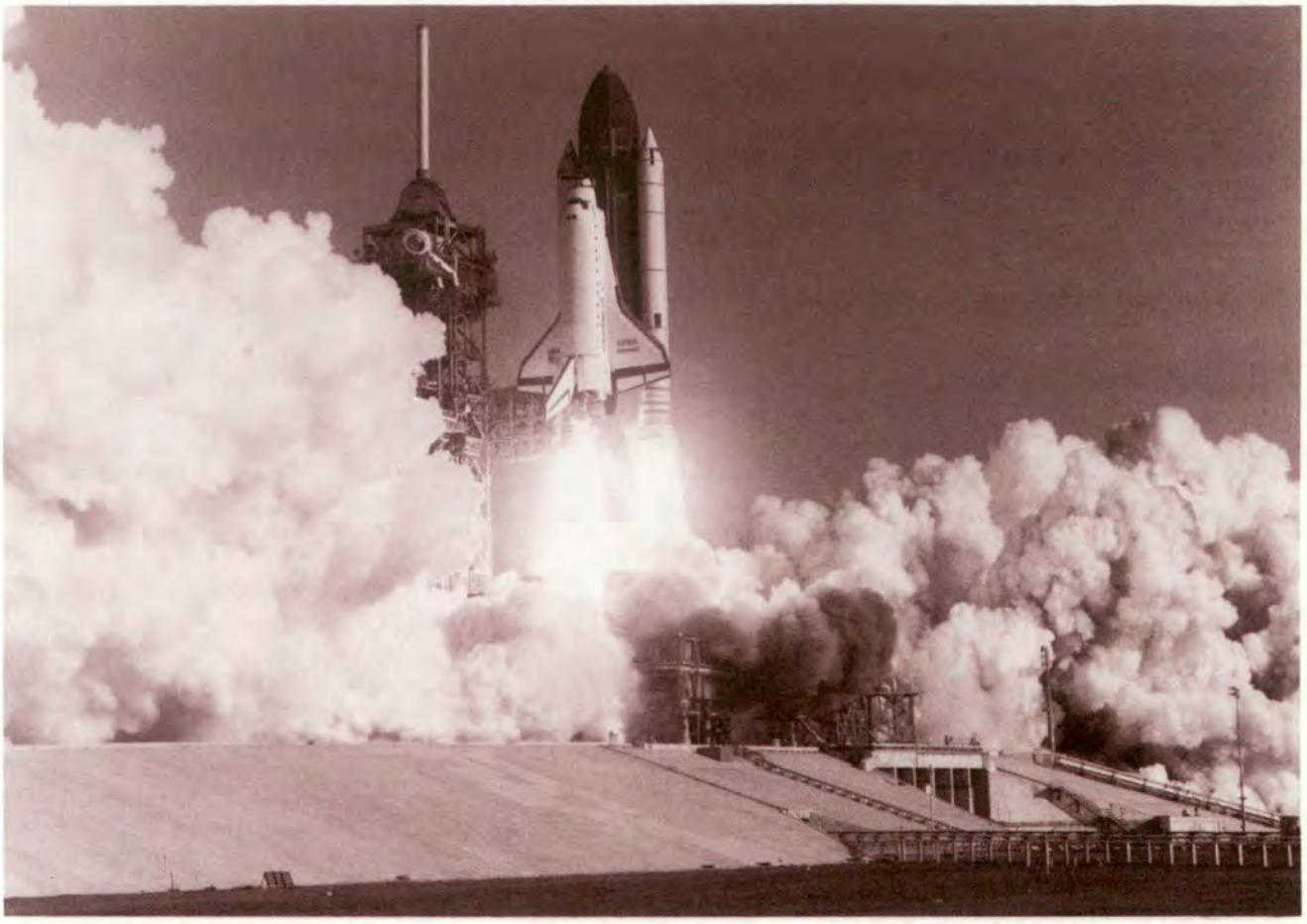
International standardization is a very big need and something the Center is actively pursuing. There are four main areas of emphasis. They are pilot procedures, aeronautical information, instrument procedures, and cockpit displays. This is a very ambitious goal and one that won't come quickly or easily, but will be of great benefit to everyone if it can be reached.

The Center would also like to reestablish the Instrument Pilot Instructor School. This would be a 4-week course involving classroom instruction, simulator, and aircraft missions. Under the plan, the Center would use four T-38s equipped with programmable HUDs for the fighter pilots and the T-39, C-21, or the proposed ATC Tanker/Transport/Bomber (TTB) aircraft for the other pilots. In this way, fighter pilots could fly a fighter-type aircraft that would display the same symbology on the HUD as the fighter they normally flew. The tanker/transport/bomber pilots would do the same thing in the other aircraft. The Air Force hasn't made a decision yet on IPIS. It has received mixed support from the MAJCOMs.

Summary

Even though there are four separate divisions, there is a lot of overlap and interworking between them. Each major project is worked through all the experts from each area so they can add their expertise. Each division also has people with expertise on certain areas, systems, aircraft, etc., and they are called on for their help at various times on different taskings. There is close cooperation throughout the Center.

Remember the Instrument Flight Center is your advocate. They are working to make instrument flying easier and safer for you. But, they need your help. If you know of a problem, let them know. If you see a mistake, think you know a better way, tell them. Use the 24-hour/7-day telephone number. Or write a letter. In the near future, they will provide a preprinted form for you to use to communicate with the Center. There are several ways to do this, and they are trying to work out the best way to do it. Watch for it and use it! ■



Riding Shotgun
FOR THE SHUTTLE

This article was written before the recent space shuttle explosion. That tragedy graphically demonstrated the importance of the mission flown by the 919th Special Operations Group. Their dedication ensured there was no collateral damage or injury from people being in the "wrong place at the wrong time."

CAPTAIN JOHNNIE D. AINSLEY
Director of Public Affairs
28th Air Division (AWACS)
Tinker AFB, OK

■ At the Kennedy Space Center, Florida, falling solid rocket boosters (SRBs) or fiery debris from an explosion might strike airborne or surface craft within the launch radius. Ensuring this launch area is clear before a space shuttle mission is a demanding job. Air Force Reservists from the 919th Special Operations Group (SOG) at Eglin AFB's Duke Field, Florida, routinely "target" anyone in the restricted area, a 40-mile by 140-mile long corridor, and warn them out of the area.

Because aircraft or ships inside the launch corridor could be struck by the shuttle's parachuting SRBs or explosive debris, the range safety officer stops the countdown if the range is not clear.

As had been done on the 11 previous space shuttle launches, the 919 SOG was tasked with calling out visual sightings of ships in the restricted area east of the launch site.

On Discovery's maiden voyage, our craft, Repod Zero One, joined another AC-130A Spectre gunship

(left) The space shuttle Discovery roars aloft from Launch Pad 39A on its maiden flight. The launch was approved only after the 919th Special Operations Group had declared the launch area was clear.

over Kennedy Space Center for safety surveillance of the area to ensure a clear range.

Our mission actually began the day before the launch with a 2-hour flight from Duke Field near Fort Walton Beach, Florida, to Patrick AFB near Cocoa Beach, Florida, where the crew attended an afternoon briefing on the launch.

The next morning we took off before dawn and headed toward the space center while another gunship flew southeast of the launch pad. Using sophisticated infrared and optical sensors which pierced the darkness, crewmembers could clearly observe traffic on Florida State Highway A1A as our gunship rose over Cocoa Beach. Nearby buildings surrendered their cover of darkness to the searching electronic camera.

As we passed over Cape Canaveral, Florida, the pilot lowered the cargo bay door so observers, safely tethered to the aircraft, could survey the sea below for intruding vessels. We leveled off at 4,000 feet over the Atlantic Ocean only a few miles from the Cape.

Air Force Captain Mike Hutto was the pilot who flew our gunship (No. 029) which is assigned to the 717th Special Operations Squadron — the only flying unit of the 919 SOG. Captain Hutto had no difficulty locating the ships transiting the launch corridor thanks to the special equipment and alert crew. The instructor pilot, Lieutenant Colonel William (Bill) Bosley, operated all radios from the copilot position. He was in constant contact with the Air Force's Range Safety Officer, Captain Steve Duttry, at the Range Control Center and with two CH-3 "Jolly Green Giant" helicopters flying below also on an observation mission.

For 2½ hours we flew within an imaginary "box," up to 5 miles east of Kennedy Space Center, calculating speeds of numerous vessels whose positions might place them in the danger zone when the shuttle roared aloft. The crew coordinated details over the plane's intercom in an impressive display of teamwork. The sensor operators zoomed in on and identified various ships and relayed their names to the cockpit crew.

At one point, we had to fly "just off the deck" to read the name of a freighter while the water raced beneath us. We could see deck workers waving at us as we passed by the ship. Soviet intelligence ships, disguised as fishing trawlers, often lie just offshore on such launches. However, we spotted no suspect vessels on this mission.

The other gunship, Repod Zero Two, was farther down range checking the area where the shuttle's SRBs were projected to parachute into the water.

Using information provided by our crew, the CH-3 helicopters from Patrick AFB's Detachment 15, 39th Aerospace Rescue and Recovery Wing, flew over the ships and ordered them to leave the area.

With only 15 minutes left in the countdown, Captain Hutto, our aircraft commander, flew toward our orbit point near Titusville, Florida.

Suddenly, a private plane flew into the launch area. Over the radio, we were ordered to intercept. Instructor Pilot Bosley said, "Better push it up, pilot. We have less than 10 minutes 'til blast-off and range safety is holding the countdown until we can get that plane out of there." As we began an intercept, the range safety officer gave us the plane's position.

"He's 7 miles east of the launch pad heading north at 7,000 feet," the IP told the crew. All eyes strained to spot the intruding aircraft. Almost in unison, everyone locked onto the two-engine Piper Aztec which was threatening Discovery's lift-off. Only 9 minutes remained when the range safety officer stopped the countdown while we intercepted and assisted the private plane in leaving the area. As Captain Hutto maneuvered the gunship to a safe distance from the intruder's right wingtip, crewmembers strained to read the tail number so NASA could relay it to Federal Aviation Administration officials.

Colonel Bosley radioed the tail number to range safety as we maneuvered closer to the aircraft. The sight of a huge, unmarked, gray warplane closing in must have been a menacing sight to the Piper's occupants. Even more menacing must have been the sight of our plane's four big guns pointing in their direction.

FAA officials in another aircraft soon took over the chase and followed the intruder to Jacksonville to

As the crew of the AC-130A gunship kept the area clear of encroaching aircraft, they enjoyed a "birdseye" view of the launch of the space shuttle Discovery.

continued

Riding Shotgun for the Shuttle continued

question the pilot and his two passengers. The pilot of the plane, a Jacksonville resident, had defied a notice to stay out of the warning area, Captain Duttry, the Air Force's Range Safety Operator, said later.

"This was not unlawful on his part but it displayed poor piloting judgment," said Major Jim Mills, Eastern Space and Missile Center Aircraft Coordination Officer at Patrick AFB. "As a result of a technical loophole revealed by this incident, more clearly defined restrictions have been placed over the launch area," he said. Major Mills said now it's absolutely forbidden to fly over the water east of the pad within 30 nautical miles during shuttle operations, per Federal Air Regulation 91.102.

Meanwhile, Repod Zero Two, which had been patrolling up to 125 miles down range, saw some action of its own. The Aircraft Commander, Colonel Terry G. Whitnell, Deputy Commander for Operations, 919 SOG, and the Copilot, Captain Victor S. Prawdzik, escorted a single-engine Beechcraft Bonanza from the southern sector of the launch area as it flew from Vero Beach to Jacksonville.

After a 7-minute hold, the launch countdown resumed. Captain Hutto flew our aircraft over Titusville and then west of the launch site. As he turned the gunship back toward the pad, the crewmembers seemed relieved their actions had cleared the way for launch.

Peering out the cockpit window, we could see the $1 billion shuttle rise "silently" skyward, pushed upward by its two massive SRBs and its three main engines. The main engines are fueled by a half-million gallons of liquid hydrogen and liquid oxygen stored inside separate tanks within the 15-story tall external fuel tank. At launch, the orbiter's three liquid-fueled engines, mixing propellants from the external tank, and the two SRBs together generate 6.7 million pounds of thrust.

As the shuttle runway receded behind us, Colonel Bosley cautioned, "We need to give him plenty of room in case of an abort." In such a case, the gunship would orbit the area to relay the shuttle's position to rescue units, Colonel Bosley said.

Captain Hutto turned the gunship northward as we watched Discovery shed its SRBs, a trail of gray-and-white smoke arching eastward from the launch pad. Before the spectacle receded from view, Colonel Bosley ended the wonder of the moment, "Pilot, there's another private plane leaving the pad area that just violated the airspace. Safety wants his tail number!"

It seemed merely seconds before we were at his "6 o'clock" position carefully intercepting the plane off its starboard wingtip. Because of the intruder's slower speed, Captain Hutto had to lower the gunship's landing gear and flaps to keep from overshooting.

The slow intercept speed prompted the IP to remind the pilot to monitor the aircraft's speed. "We're nearing stall speed" he reiterated as crewmembers tried to read the plane's tail number.

Because of the private plane's slower airspeed, we had to crisscross its flightpath from above several times. Only several hundred feet high at times, the pilot of the private plane appeared to increase and decrease speed, apparently hoping we'd lost interest and end the chase. But Captain Hutto didn't give up. When it seemed apparent we couldn't read his tiny tail number without compromising flight safety, Captain Hutto simply followed him until he landed at the New Smyrna Beach Airport, just south of Daytona Beach.

In a scene reminiscent of a vulture circling its prey, we orbited counterclockwise for several minutes watching the private plane park and its passengers disembark. Colonel Bosley radioed a terminal official for the plane's tail number. Colonel Bosley then passed it to range safety who gave it to the FAA.

National Aeronautics and Space Administration spokesman Hugh Harris said his agency has asked the FAA to revoke the licenses of pilots who enter the Kennedy Space Center's restricted area. Also, Captain Duttry of range safety said the FAA has begun a program to educate pilots about the dangers they pose to themselves, the shuttle, and support planes when they fly into restricted airspace during the 3-hour period before and during a launch.

As we headed for Patrick AFB, I felt proud of the 919 SOG Reservists and the important jobs they perform. As the blue waters of the Atlantic Ocean became ever closer on our landing approach, it seemed encouraging to know that although trained for war and prepared to use the gunship's awesome conventional firepower in defensive roles, the crews were instead on a mission to protect some of us from ourselves. ■

Unauthorized aircraft that enter the restricted airspace during shuttle operations get a close-up view of a big airplane sporting four big guns. The offending pilots are always very cooperative in departing the area immediately.

Protecting Privileged Information...

PEGGY E. HODGE
Assistant Editor

■ Each time a major flight mishap occurs, an enormous amount of information is generated. The proper handling of that information is vital to the continued success of mishap prevention and the Air Force's outstanding safety record.

The number of lawsuits filed as a result of Air Force flight mishaps has increased in recent years to a point where we can expect virtually every mishap to be followed by litigation of some nature. This increase in litigation has been paralleled by an increasing demand for mishap information and a need to guard against unauthorized or inadvertent disclosures of privileged safety information.

The Air Force promises each witness involved in an aircraft mishap the information they provide to the safety investigation will be treated as privileged information and used for the sole purpose of mishap prevention. The promise is made to promote full cooperation and help get to the real causes of the mishap.

Accurate cause determination results in corrective action that can prevent a similar mishap from occurring in the future.

This promise of privilege, which is vital to our mishap prevention efforts, is accompanied by both a moral and legal obligation to protect this information and ensure it is, in fact, used solely for safety purposes. Every time we experience an unauthorized or inadvertent disclosure of privileged information, that promise is violated, and we face the possibility of losing the executive privilege exemption under which this information is protected.

Many of us in the flying business routinely have access to privileged safety material. This is important because we need the information to do our jobs. But if we don't use care to protect that information properly, we're compromising the Air Force's legal position. If those who are not authorized gain access to privileged safety information — particularly if they get it because of our negligence (an unauthorized release, once made, is extremely difficult to undo), it will be a lot more difficult to protect. And what we are really protecting is our investigative process — our continuing ability to offer investigators and witnesses a promise of confidentiality and being able to enforce that promise.

It is essential everyone in the flying and safety business understand what can and can't be (limited use) released outside Air Force channels.

continued

Protecting Privileged Information

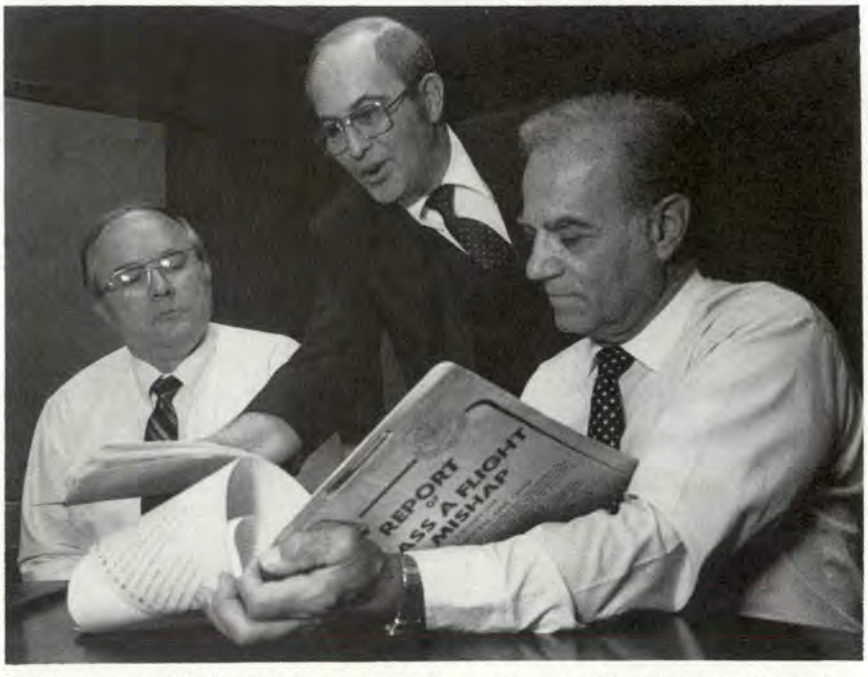
continued

Even though it isn't classified material, the privileged information in mishap reports requires protection. Your "friend" must be authorized access to this information and have a mission-related need for it.

We must familiarize ourselves with the Air Force's limited use information policy, its development, and the reports and their restrictions — what is considered limited use information?

The history of the present policy on release of information goes back to World War II. The first recorded statement that safety investigations were conducted solely for the purpose of preventing future mishaps was in Army Air Forces Regulation (AAFR) 62-14, May 1942. That regulation also stated such investigations were not conducted to secure evidence for disciplinary action; rather, a separate investigation was required for that purpose. Two years later, a change to AAFR 62-14 required witnesses to be advised of the purpose of the safety investigation and the limitations on the use of their statements.

These early regulations limited access to safety reports to "command personnel concerned and to representatives of the commanding general, Army Air Forces." Mishap information was not released outside the military.



Someone who suddenly expresses an interest in a particular mishap report may be working to get evidence to use in a lawsuit. Information or testimony you were supposed to protect may soon be in dangerous hands.

The next significant change in release policy was in 1967 with the passage of the Freedom of Information Act. As a result of this legislation, the Air Force began releasing factual information from safety reports.

A major change in the structure of Air Force safety reports was made in 1976 when AFR 127-4, Investigating and Reporting US Air Force Mishaps, was changed to provide for a two-part report with Part I containing releasable factual information and Part II deliberative analysis.

The most recent legal decision supporting the Air Force's position (1984) involved a contractor request for the release of witness statements. The Air Force appealed to the US Supreme Court to withhold such information. The Court decided in favor of the Air Force. Such release would jeopardize the promise of confidentiality.

It can be seen the claim of privilege in safety reports is nothing new but has been consistent Air Force policy for over 40 years. While the regulations and the format of the report have changed over the years to meet new circumstances, the value of the policy has been proven, and it has therefore been consistently adhered to.

What happens when a mishap occurs? What constitutes our reports? And, what are the restrictions?

When an aircraft mishap occurs, the nearest USAF installation commander deploys an initial disaster response force to the site. Within one hour of the mishap, the Public Affairs Officer (PAO) releases to the media a general description of the mishap, the time and location of the mishap departure point, destination, number of crew and passengers, type of aircraft, unclassified mission facts, and a statement the mishap will be investigated by a board of officers.

An aircraft mishap in the Air Force is normally subjected to two separate investigations. First, the Safety Mishap Investigation is conducted solely in the interest of avia-

Privileged information may be impossible to protect once it has been released to the wrong person. A compromise of the promise of privilege could lead to lawsuits and severely hamper our mishap investigation and prevention efforts.

tion safety to prevent recurrence of mishaps. The investigation is governed by AFR 127-4.

The formal safety report prepared in the Safety Mishap Investigation is divided into two parts. Part I is essentially factual, and in the case of major aircraft mishaps would include such information as the basic factual summary of mishap sequence, data on aircraft maintenance, aircrew flight records, flight plans, weather summaries, transcripts of recorded conversations (for example, tower tapes and air-to-air or air-to-ground communication), damage assessments, and photographs. *Part I is releasable information*.

Part II is the analytical section and includes the analysis, findings, and recommendations made by the Safety Investigation Board. It also includes the statements and testimony of witnesses and others involved (these are *not* made under oath), rebuttals filed by persons identified as causal in the mishap, technical and engineering analyses made by manufacturers, life science reports, and certain comments on Board findings and recommendations. Part II is protected as *limited use* and cannot be obtained by anyone not directly involved in Air Force mishap prevention.

AFR 127-4 specifies the investigations will not be used as evidence, or to obtain evidence in disciplinary actions of any sort, or to determine line-of-duty status or pecuniary liability. Every effort is made in safety investigations to persuade the individuals involved, including people of the military departments and representatives of manufacturers, to make full and accurate disclosure of all relevant facts, even though disclosure may be embarrassing to the individual or firm or constitute self-incrimination. Full and free disclosure is essential to the success of these investigations. To achieve this desired freedom of disclosure, assurance must be given statements made will not and cannot later be used in civil, criminal, or administrative actions.

The Air Force also conducts a separate investigation in cases where there is the possibility of litigation, claim for private property damage exceeding $50,000, fatality, or permanently disabling injury. This investigation is governed by AFR 110-14, Investigations of Aircraft and Missile Accidents. Its purpose is to preserve available evidence for use in claims, litigation, disciplinary actions, administrative proceedings, and all other purposes.

In addition to evidence, it contains a factual summary of the evidence, *but not opinions*, conclusions, or recommendations of the investigator. The report of this investigation is *completely released* to Members of Congress, the news media, litigants, and members of the general public on request and payment of the applicable fees.

It is important to note the difference between participation as a witness in the Safety Mishap Investigation and the Accident Investigation. The promise of confidentiality is given to witnesses in a safety mishap investigation (unsworn testimony), but there is *no* promise of confidentiality given to witnesses in an accident investigation (sworn testimony).

The promise of confidentiality is an effective way of gaining information to *improve safety*. Our continued low mishap rate is a result of factors including leadership, discipline, realistic training, and capable, reliable aircraft and crews. It also is a direct result of an aggressive flight safety program that relies on a promise of confidentiality. ■

Who's in Command Here?

CAPTAIN BRUCE PENNINGTON
410th Bombardment Wing
K.I. Sawyer AFB, MI

■ A reserve C-7 Caribou with a seasoned crew turned onto final at an Army airfield in Oklahoma. One mile short of the runway, they crashed into the ground. The youngest crewmember on board was a major with "umpteen jillion" flight hours.

In another case, a B-52 flown by a stan/eval crew made a slow, constant descent into a deep, smoking hole 2 miles short of the runway in upper Michigan.

In both cases, the aircraft were in good condition, and mechanical failures were not a factor. The crew apparently just flew the aircraft into the ground.

Why does an experienced pilot fly a perfectly good airplane into the ground? Why do other experienced crewmembers on that plane let the pilot fly it into the ground? Often, the reasons proposed by the investigating authorities include fatigue, self medication, poor diet, lack of attention, channelized attention, or internal/external distractions that interrupt our habitual flying patterns.

But every now and then, we see a case where none of these factors seemed to be involved, and even if they were present, it is my belief those factors only make the crewmembers more susceptible to what I call the "Command Syndrome."

This syndrome is a factor rarely considered in past mishap investigations, but has always been well known to the instructor cadre in our profession. Instructor pilot (IP) candidates at Flight Instructor School are constantly warned of this hazardous tendency.

This tendency, which we've all fallen victim to, simply stated, is our habit of blindly following the directions of more senior, respected crewmembers. When there is an instructor present, the pilot/aircraft commander often subconsciously relinquishes command to the instructor.

With all due respect for senior authority and experience, nobody ever outranks the AC in responsibility for the aircraft and crew. Never lose sight of that fact.

Let me relate an incident that happened to me many years ago where this syndrome played an active role. The mission that day was a short one for a tanker crew — air refuel on a local track, nav leg, and two instrument approaches. Both my copilot and I were quite new to the job, and my nav was getting a check ride. To top off the crew list, the IP was our squadron commander. The mission was a simple one, but very time compressed.

Because of the fuel crunch, we had to compress our mission, "maximizing training while saving time and fuel." Well, my nav took this to heart and planned his nav leg to end quite close to our descent point. We knew we would have to begin our descent immediately after completing the nav leg.

The flight went smoothly through refueling and the nav leg. We had only minor maintenance problems to report to the command post. The squadron commander wanted to see the copilot fly a high penetration since he was new to the unit. This would have been fine, but he didn't bring it up until shortly before the completion of the nav leg. So, while I began a descent to FL 250, the copilot reviewed his approach.

At the same time, the squadron commander was talking to the boom operator and the nav about our maintenance writeups. As the nav began calling the writeups in to the command post (at the suggestion of the squadron commander), the commander got on the other radio to request landing weather.

From the beginning of our descent, there was constant chatter over the interphone, both radios, and across the cockpit. Needless to say, my mind was on something other than altitude when we busted FL 250.

At the same time the evaluating navigator called "altitude!," I began an immediate pullup. I only overshot by 500 feet, and we all lived through it.

It could have been worse, though. We could have been descending from the final approach fix, 1,500 feet above the ground. We could have flown the airplane into the ground or, just as bad, into another airplane.

Why did it happen? We could blame many things: Command pressure to compress our missions, task saturation for me as the new aircraft commander (AC), distractions in the cockpit at a critical phase of flight. But in retrospect, I was cognizant of each of these problems at the time. Why didn't I just say "Time out! Everybody pipe down until I get into holding airspace. We'll take care of everything then."

I didn't say it because I was a victim of the Command Syndrome. I didn't feel right about everything going on, but the squadron commander was involved with it all. *Surely the IP wouldn't let things get out of hand*. With that last statement, I summed up the problem. I had already relinquished command to the IP. Why does this happen?

Well, if I knew the answer to that I would be a millionaire. What I suspect is the following: Most of us, to some degree or another, have people with certain leadership qualities we admire and respect. Now, in every country I can think of, when we meet that respected person, we tend to defer to them. It's the old "pecking order" thing we learned about while studying chimps and apes in the wild. We spend our entire lives learning the pecking order in our families, workplace, and society. The Air Force has a very clear pecking order. Its existence implies new guys don't know much of anything and old heads know just about everything.

So how does this affect our well-trained aviator? Let's take a look. The AC is the top dog on the aircraft until the aged and wisened instructor or squadron commander comes on board. During training, the budding new AC is taught that no matter who is on board, the AC is the one in charge. The safety of the aircraft and crew is solely the AC's responsibility.

How long does this training last? Officially, only 8 weeks and, unofficially, the AC will get a smattering here and there throughout a flying career. I find it very difficult to believe that 8 weeks of training is going to override something learned over the past 25 years.

This social pecking order is now a permanently ingrained part of the AC's character. The AC may be able to override that social training with conscious thought and reason, but when things get tight and unconscious reflexes come into play, the AC will fall back to that socially learned behavior every time.

So, who's really in charge? We all know what the book says. But, when push comes to shove, a person's behavior, learned over a 25-year lifespan, is mighty hard to overcome.

What can we do about this? I think just knowing the problem exists is a big help. It's up to us as instructors to keep putting the word out about it.

An idea worth considering is prebriefing the AC you are about to fly with. Say you are only there to help in training, not to make decisions. If there is a tough decision to make, the AC will have to make it. Then, once on the aircraft, practice it.

Only intervene when you feel safety is in jeopardy. If the AC makes some technique errors, correct them on the ground. Correcting them in the air turns the AC into a student again. I believe this is where most instructors fail. They often take command by just trying to help. The AC may not want your help at the moment, but due to the "Command Syndrome," will let you continue. Also, the AC may not agree with your advice but will follow it because you're the instructor — by definition (in the AC's eyes), an expert.

As instructors, we are all respected by the noninstructor crew force. It's a heavy responsibility. If that respect is abused or allowed to interfere with the safe operation of our aircraft, the consequences can be deadly. ■

A MYTH DIES SLOWLY

LT COL WILLIAM R. ERCOLINE
USAF Instrument Flight Center
Randolph AFB, TX

■ The first instrument ever used on an airplane was invented by Wilbur and Orville Wright and consisted of a piece of string about 8-inches long placed in the air stream directly in front of the pilot. When the string was extended straight back toward them, they knew the plane was in level flight. A deflection to the right or left, or upward or downward, indicated the plane was skidding or slipping or diving or climbing. The Wrights were the first to recognize the importance of instruments.

All the early Wright machines were equipped with this string device, and pilots training on these machines learned to place confidence in it. However, since flying was done only in clear weather and many pilots were becoming experienced in developing a "feel of the ship," instructors taught their students to disregard the strings entirely and trust their senses. Hence, the myth of the pilot's "flying instinct" sprang up. This attitude persisted into World War I and with the need to fly into fog, many good pilots met a tragic end.

In the early 1920s, some pilots began to doubt the "flying instinct" myth. One of them was Major John A. Macready. His opinion was best expressed in the report of his nonstop flight across the continent in 1924 with Lieutenant Oakley G. Kelly. He stated: "Few persons realize that flying is virtually impossi-

Though now called the Father of Instrument Flight, it wasn't always so for Colonel Ocker. He was initially branded a crackpot and even sent to the hospital for psychiatric evaluations.

ble unless there is some exterior fixed point that the pilot may use to obtain a sense of balance or position. If there is no horizon, no light, or any fixed object, a pilot cannot tell the position that the plane is in except from the instruments in the cockpit. I personally believe that if there is no fixed point or horizon, no one can tell his position, whether upside down, straight up, or crosswise, except when the force of gravity pulls him away from or toward the plane."

Macready flew that famous flight in a T-2 Fokker and was the chief test pilot at McCook Field. He was considered by many as the best. All the pilots at McCook Field were confused with this strange phenomenon they would encounter when flying in fog or conditions of obscure visibility. The instruments always seemed to go bad. A pilot who had fallen out of a fog insisted that his bank and turn indicator be returned to the factory to be checked. Even when the factory returned the indicator saying it was in perfect condition, he was unconvinced. The equipment only worked when the weather was clear.

In 1925, the state-of-the-art airplane was the new Curtiss Hawk P1-A. The instrument panel had a complete set of all the necessary gauges. The magnetic compass was mounted on the floor between the rudder pedals and located on top of the compass was the bank and turn indicator. No one believed in these instruments, which explains their somewhat inconspicuous location. As a matter of fact, some squadron commanders ordered the gauges covered because they wanted their pilots to fly with a natural feel for the ship. A turn and bank indicator would do nothing more than add confusion to an already busy pilot.

This was the thinking at the time. Many pilots experienced disorientation while flying in fog, but would not admit it for fear of ridicule. Most had been tested in a Ruggie's Orientator before flight school to ensure they had that innate ability to remain oriented.

During the early and middle 1920s, an Air Service pilot was

The Air Force Instrument Flight Center at Randolph AFB, Texas, was dedicated to Col Ocker's memory in 1984. His needle, ball, and airspeed flying procedures are the basis for today's sophisticated instrument flying.

struggling with this problem of spatial disorientation. This pilot, William C. Ocker, carried aboard his aircraft one of the first turn and bank indicators designed by Elmer Sperry. He would mount it on his aircraft religiously, but usually felt it was malfunctioning when he entered weather. He did this for 8 years before he discovered the real problem.

While on duty at Crissy Field, San Francisco, in 1926, Ocker was given his regular physical examination for pilots by David Myers, the flight surgeon at the field. As part of the examination, he introduced a new twist to an old test; he turned Ocker blindfolded in a revolving chair and asked which way he was turning. Ocker was invariably wrong. No one is really certain what triggered the next event, but the following chain of events changed the way we fly airplanes forever.

Ocker recalled an experience he had in 1919 with Brigadier General William Mitchell, Assistant Chief of the Air Service. They were testing a new plane near Washington, DC, and while Mitchell was making a turn to the right, Ocker bent over to wipe some oil from his shoe. He could not see out of the cockpit, but after a few moments, he had the im-

continued

Early aircraft were fitted with a minium of instruments. The turn and bank indicator either wasn't included or was mounted in an out-of-the-way location that made it almost useless.

A MYTH DIES SLOWLY

continued

The early aircraft such as this Curtiss had no instruments. The need for instruments had not surfaced. The pilots did all their flying during daylight hours in good weather. As they developed a feel for flying, the "flying instinct" myth was born.

pression of first straightening out, then of turning to the left. He was surprised when he looked up and found they were not turning to the left but were on a straight course.

With this incident in mind, Ocker momentarily departed Major Myer's office to improvise a light-tight box in which he mounted his turn and bank indicator, a magnetic compass, and a flashlight. He returned to Major Myer's office to repeat the test. This time he looked into the box instead of being blindfolded. He could tell at all times in which direction he was turning. Ocker had solved the puzzle! This was the first, international, never challenged discovery that a pilot's equilibrium depends not on the semicircular canals of the inner ear and the muscular sense, but on the visual sense.

Major Ocker triggered much debate and criticism. Pilots were still reluctant to believe. The US Government Patent Office believed it and awarded Ocker with $1,000 (a first) for his invention called the "Vertigo Stopper Box." Forty years later, the Federal Aviation Administration Agency decided it was a good idea and instructed their field inspectors to demonstrate this phenomenon to other pilots.

Major Ocker became obsessed with the need to tell pilots of the problem — a monumental undertaking. His efforts eventually proved to be damaging. He was shunned by many of his fellow officers, and twice his commanding officer sent him to Letterman General Hospital for psychiatric evaluation. Later in his life, Ocker would joke as to how he was the only officer in the Air Corps with two letters verifying he was sane. His frustration even led to the humiliation of a court martial, but the evidence was questionable; Ocker was acquitted in a matter of minutes.

Ocker had the good fortune of meeting the ever curious Carl Crane in 1929. Crane, having experienced an in-flight disorientation situation which nearly cost himself and a passenger their lives, was searching for answers. Ocker provided those answers, and the two became lifelong friends and associates. Their accomplishments were many, and perhaps their work culminated when they co-authored a book titled "Blind Flight in Theory and Practice." The book was published in 1932 by the Naylor Printing Company in San Antonio, Texas. It was a first of its kind and sold well to just about everyone interested in flying except the US military. The Soviet Union even had it translated for their flight training programs.

As Ocker was a man of uncommon talent, Crane was a man of uncommon vision. He saw the need and potential for instrument flight training. Crane's mind conjured up many possibilities; from methods to enhance flight training to equipment to reduce the pilot workload. He designed and patented the first instrument simulator ever used with radio guidance features. He claimed the idea came from the work being done by two scientists — Diamond and Dunsmore — who were developing the model airways.

Crane later learned that his instrument simulator patent interfaced with another by Ed Link. The subsequent investigation revealed Crane was 2 years ahead of Link's idea, and Link would have to take a license under Crane's patent. This was the genesis of the simulators we have today. When you stop and think about how much of aviation relies upon these simulators, you can begin to appreciate Crane's monumental contribution to safe instrument flight.

In 1929, Jimmie Doolittle made the first blind landing at Mitchell Field under the jurisdiction of the Guggenheim Fund . . . with three brand new instruments: An artificial horizon, a directional gyro, and the Kollsman altimeter. This was the first official blind flight from takeoff to landing. The cockpit display for attitude instrument flying was born.

Instrument flying needs for the military were slowly beginning to be accepted. In 1930, General Lahm, with the encouragement of Ocker and Crane, ordered the graduating class of pilots held over for 4 hours of instrument training. This first step eventually (13 years later) led to the formation of a specific instrument training school. The end result of that school, which is now mainly administrative, is located at Randolph AFB, Texas, and is called the USAF Instrument Flight Center. ■

IS A TEAM EFFORT

PEGGY E. HODGE
Assistant Editor

■ The Air Force's safety success story continues as we recorded in 1985 the lowest ever Class A mishap rate. Our mishap records prove our major commands are doing a good job. Let's take a look at one of our major commands — the Military Airlift Command (MAC) — to see how one command's mission is accomplished safely.

As the first jet aircraft designed to meet military airlift needs for a troop and cargo carrier, the C-141 Starlifter transport provides long-range airlift in support of MAC's mission.

I recently had the opportunity to obtain some firsthand experience on a MAC C-141 mission — the 807. The mission originated at Norton AFB, California, and was further routed to Hawaii and various Far East bases. I gained some insight into MAC's mission, what the MAC crews' profession demands, and the importance of crew coordination.

MAC is the single manager operating agency for airlift service. From its headquarters at Scott AFB, Illinois, MAC directs more than 94,000 active-duty military and civilians and more than 1,000 aircraft from more than 340 locations in 25 countries. The command operates 14 CONUS and 2 overseas bases.

Its overall mission is to maintain the military airlift system in a constant state of readiness. MAC is also responsible for strategic and tactical airlift, special operations forces, the Aerospace Audiovisual Service, and the Air Weather Service. The command is responsible for performing airlift missions during exercises, crises, and wartime. MAC is responsible for all tactical airlift within

continued

THE MAC PROFESSIONALS

It is very important we "get the word out" on safety and our flying activity to aircrews. It was HQ MAC's approval of mission essential ground personnel (MEGP) status and the dedicated and helpful crew that made this trip possible. MEGP status allowed access to the cockpit where I gained valuable insight by talking with the crew and observing the mission activity of each aircrew position.

Thanks to this crew's time, expert ability, and know-how, I now have a good idea of what our MAC crews deal with and what crew life is like "on the road." — Ed.

SAFETY IS A TEAM EFFORT

continued

the CONUS and overseas tactical airlift resources.

In support of MAC's mission, the C-141 Starlifter transport provides long-range airlift. It was the first jet aircraft designed to meet military airlift needs for a troop and cargo carrier. The Starlifter has been the workhorse of the military airlift forces since it joined the Air Force in 1965.

The C-141 can airlift combat forces, equipment, and supplies and deliver them on the ground or by airdrop. It can also be used for low-altitude delivery of paratroops.

To expand its capabilities, all C-141A models were modified to lengthen the fuselage, thus increasing cargo capacity by 30 percent. Additionally, in-flight refueling was added, thus reducing dependence on overseas airfields as well as permitting longer non-stop flights with increased payloads. The Air Force received the first production C-141B in December 1979. Conversion of MAC's 267 C-141s from A to B models was completed in 1982.

As *Flying Safety* magazine reported last month, "The C-141 is the safest aircraft ever to have flown in the United States Air Force. With over 7,400,000 flying hours to its credit, it has had 28 Class A mishaps for a truly remarkable rate of 0.377 mishaps per 100,000 flying hours. It has carried more goods around the world than any previous military aircraft. The C-141 is performing its role as both a strategic airlifter and a tactical airdropper while using its air refueling capability with unsurpassed success. This airplane for all missions and all seasons continues to lead the MAC fleet." In addition, "In 1985, the C-141 had zero Class A or Class B mishaps, a first since 1972." And, the overall C-141 reliability rate is 93 percent with a home station rate of 97 percent.

A very important mission, a very responsive aircraft — it takes a hard-working, dedicated, and well-coordinated crew to bring it all together — safely!

Our MAC teams keep the Starlifter moving. The minimum crew for C-141 flights is two pilots, two flight engineers, and one loadmaster (required if passengers or cargo are carried). A navigator is required during airdrop missions. The assigned crewmembers must complete each respective assigned task efficiently and safely before, during, and after each leg.

The C-141 can airlift combat forces, equipment, and supplies and deliver them on the ground or by airdrop. This cargo capacity was increased by 30 percent when all C-141A models were modified to lengthen the fuselage.

Each crewmember is responsible for many tasks throughout each leg of a mission. The proper execution of these tasks demands constant vigilance, cross-checking, and sharing of information. The safe accomplishment of a mission is a team effort — every crewmember must be aware of where the aircraft is going and what it is doing. This all adds up to a requirement for effective crew coordination.

Let's look at a couple of mishaps where lack of proper crew coordination was a contributing factor.

■ The mishap aircraft was scheduled for an airlift mission. While the aircraft was being taxied for takeoff, the main gear folded, and the aircraft settled to the taxiway. The engines were shut down, and the crew and passenger deplaned, uninjured. The aircraft sustained substantial damage. It seems while taxiing, the pilot inadvertently bumped the landing gear lever to the "up" position when he attempted to reposition the brake selector switch from the emergency to the normal position. *Impatience and inadequate crew coordination contributed to this error.*

■ The mission was a tactical CDS airdrop. The mishap aircraft was approximately 10 NM from destination, 4 NM prior to slowdown, when an attacking aggressor was sighted, and *its presence called over the interphone*. As the mishap aircraft was crossing a ridgeline, an evasive maneuver was accomplished. The maneuver was not particularly aggressive, but it was magnified by turbulence. During the maneuver, the loadmaster was preparing for the slowdown check. He was just forward of the left troop door and wore a restraint harness. He was maintaining his position by gripping the frame of the troop door — *he was not on interphone*. During

Crew coordination cannot be emphasized enough. A multicrewmember aircraft involves more than running checklists, systems knowledge, and good piloting technique. It requires clear, concise communication and effective group interaction.

the evasive maneuver, he lost his grip and fell injuring his neck, right shoulder, and right wrist incapacitating him. The Aircraft Commander (AC) was *not* aware that the loadmaster was *not* on the interphone. *The pilot did not establish complete coordination procedures with crewmembers prior to flight, nor did the loadmaster inform the pilot when the other loadmaster was off the interphone and unsecure.*

It is evident crew coordination cannot be emphasized enough. As a direct result of the limitations and imperfections of individuals, multicrewmember aircraft cockpits were, and are designed to ensure needed redundancy. Yet, this system of redundancy has failed in many cases. It has failed because crewmembers have not heeded the warnings of other crewmembers or because crewmembers who possessed adequate information have, for some reasons, not provided it to others.

As I learned from flying with this 807 crew, a multicrewmember aircraft involves more than running checklists, systems knowledge, and good piloting technique. It requires clear, concise communication and effective group interaction.

To facilitate this activity, MAC is training its crewmembers in aircrew coordination. Perhaps one of the newest innovations in crew coordination training is that of cockpit resource management (CRM) training. This involves crewmembers working together in a problem solving environment such that their combined efforts yield a result that is better than what one crewmember can do individually . . . "synergy." By doing this, they more effectively use their experience and training.

In April 1983, a proposal was made to implement CRM training to improve upon the dynamics of crew coordination. Formal human factors or CRM training does exist in MAC currently at Little Rock AFB, Arkansas, and Kirtland AFB, New Mexico.

MAC benefits from CRM training for many reasons. In addition to flying with different crewmembers every day, the demands upon the AC are compounded by the worldwide nature of missions and their duration. The CRM concept in MAC is called Aircrew Coordination Training (ACT).*

The objective of the ACT is to improve intercockpit communication and coordination to produce a synergistic effect in crew operations. With the exception of only two aircraft, all C-141s involved in fatal mishaps were fully mission capable when they impacted the ground. So, failure to achieve optimum crew coordination in the cockpit has been painfully apparent in far too many mishaps.

It is important to note that although crew coordination is the responsibility of *all* crewmembers, it is, of course, the ultimate responsibility of the AC. Today's AC is often young — not only in years, but in flying time. AC candidates develop leadership style on the job by adopting successful styles they have seen.

Global airlift is the vital component of rapid mobility to our fighting forces. To ensure a constant state of readiness, MAC maintains a worldwide airlift system of aircraft, maintenance units, air terminals, and supplies essential to the movement of troops and their equipment across oceans and within combat theaters. MAC crews must be ready to deliver large numbers of combat troops and their equipment anywhere in the world — and be able to do it quickly, efficiently, and safely. Only through professional crew coordination can MAC crews accomplish their mission without needless loss! ■

*All MAC pilots and engineers are required to complete ACT as part of their semiannual simulator requirement.

Murphy Again

LT COL JIMMIE D. MARTIN
Editor

■ Sometimes it seems we have so many laws it does no good to get upset over any one of them. But, there is one law I'm sure everyone wants repealed, yet Congress hasn't held any hearings on it. That law is Murphy's Law. I'm sure you know all about Murphy and his law — "If anything can go wrong, it will." As if the basic law wasn't enough, there are many corollaries to worry about. The following true story is a good example of Murphy's Law and its corollaries at work.

As the C-130 reached the computed takeoff speed, the aircraft commander (AC) rotated the aircraft to takeoff attitude. While pulling back on the yoke, he felt more than the normal resistance to control movement and added noseup trim. The aircraft lifted off the runway and continued to accelerate properly, but the control pressures were still heavy. The AC added more "noseup" trim, and the nose abruptly pitched down.

The Hercules was about 40 feet above the runway at this time, and faced with an unknown control problem, the AC decided this airplane belonged on the ground. There was approximately 6,000 feet of runway left, so he set it back down. The landing was firm and the aircraft bounced twice, but otherwise it was uneventful.

Maintenance inspected the aircraft and found no damage. While looking for the source of the control problem, they found the trim tab control switch on the pilot's yoke had been installed backward. The C-130's elevator trim tab switch on both the pilot's and copilot's control yoke can be physically installed backward just as easily as in the correct position. There are no visible indicators on the switch to show which is forward or backward.

Obviously, the designer was ignorant of one of the corollaries of Murphy's Law. "If a part can be installed incorrectly, it will be."

How did this happen? Couldn't we prevent this with our technical data? Yes, if used properly. But, while the technician who installed the trim switch used the proper wiring diagram, he didn't use the Technical Order containing the step-by-step installation procedures. Another corollary of Murphy's Law was at work here, "Nothing is as easy as it looks."

Isn't there an operational check of the system? Yes, there is, and the technician performed one. During the operational check, a spotter confirmed the elevator trim tab moved when the trim switch was activated by the technician. The technician also noted the trim indicator moved when the trim switch was activated. But the check was ineffective because the technician and spotter didn't use headsets. So, they were unable to confirm the correct *direction* of movement of the trim tabs as the switch was activated. Also, the technician didn't notice which way the trim indicator moved when the switch was activated. He only looked for movement.

With the check "complete," the technician entered the operational check in the AFTO 781A and signed off the discrepancy. He didn't know removal of the trim switch required upgrading the aircraft status from a red diagonal to a red X in the Form 781A. Had the red X been entered

in the 781A, he could not have signed off the form. The red X would have required clearance by a maintenance supervisor who might have discovered the incorrect installation. Murphy strikes again, "Left to themselves, things tend to go from bad to worse."

Isn't trim operation checked on preflight? Yes. In fact, this aircraft was checked twice. The aircraft was scheduled as a spare a few days after being repaired. A flight engineer (FE) gave the C-130 a Dash One preflight inspection. The FE failed to note the incorrect movement of the trim indicator and the elevator trim tab when the trim switch was activated. The FE also failed to notice trim movement didn't stop when opposite trim was simultaneously applied to the copilot's trim switch.

The next day another FE gave the aircraft a Dash One preflight just prior to the mishap flight. The FE checked the trim system from the copilot's seat and it operated normally. But, the FE failed to notice trim movement didn't stop when opposite trim was applied to the pilot's trim switch.

In effect, both FEs merely checked the trim switches were operative. The trim check is very plain and easy to understand, but it was consistently done incorrectly. Murphy has a corollary for this one too. "By making things absolutely clear, people will become confused."

Once again, we see a hazardous situation develop from a series of relatively minor human errors. Each of us can learn some valuable lessons that apply to us regardless of our particular specialty. I'm not going to spell them out for you. You're intelligent enough to do that for yourself. I'll just list a few questions for you to consider. I'm sure you can think of more.

- How long has the design deficiency existed?
- Had the technician received adequate training in the task to be performed?
- Did the spotter know what to look for?
- Was the technical data available?
- If so, why wasn't it used?
- Had the FEs done the preflights so many times they were just going through the steps without really watching what was happening (complacency)?
- How many tasks are being done in this way?
- Do you see yourself here?

The start of this incident was a design deficiency. A better design would have prevented problems. Right? Maybe, but, before we delude ourselves into thinking we can design foolproof systems, remember this corollary: "It's impossible to make anything foolproof, because fools are so ingenious." Common sense, adherence to technical data, and attention to detail could have interrupted this chain of events at any point and prevented this incident. Obviously, the answer is with you and me — the aviation professionals.

Remember, despite repeated efforts to repeal Murphy's Law, it's still on the books. Mr Murphy has a powerful lobby group and many unwitting cohorts who frequently invoke his law. And, as your local law enforcement officer will tell you, ignorance of the law is no excuse. Don't fall victim to Murphy's Law. ■

Dodging Feathered Bullets

CAPTAIN RUSSELL P. DeFUSCO
Bird-Aircraft Strike Hazard Team
HQ AFESC
Tyndall AFB, FL
CAPTAIN RUSSELL A. TURNER, MC, FS
Chief, Flight Medicine
USAF Hospital
Tyndall AFB, FL

■ A recent mishap investigation board determined that the loss of an A-10 was partially a result of improper pilot response in an attempt to avoid hitting a flock of birds. The pilot pulled his aircraft down and away from the birds, striking high tension lines. The pilot later lost control of the aircraft during recovery for landing. Fortunately, he escaped without injury.

The question many of you have is "What *is* a proper pilot response for avoiding birds?" The question is much more complicated than it may appear on the surface, and specific guidance has not been available.

The bird strike problem is a serious one, costing the Air Force approximately $20 million per year. Each year, 2,300 bird strikes are reported to the Bird-Aircraft Strike Hazard (BASH) Team. While many of these strikes are unavoidable, a reduction in the hazard is possible by a variety of means; not the least of which is pilot response to an imminent strike. The effectiveness of a maneuver to avoid birds is contingent on a number of factors including human physiology, the decision process, and aircraft response to pilot inputs.

Studies conducted on pilots gives an indication of the amount of time required to maneuver to avoid colliding with birds and must be recognized in determining proper pilot response. The average pilot tested required 0.10 seconds for sensation of an image to travel from the eye to the brain. Focusing on the sensed object required an additional 0.29 seconds. Perception, or recognition of the object, took another 0.65 seconds for the average pilot.

Each of the above factors will vary between individuals and in differing situations. Object size, relative motion, object color, background color and composition, contrast, and light intensity level, among other factors, greatly influence the amount of time required to perceive an object to be avoided.

The problem doesn't end there though, as the average pilot required 2.0 seconds to decide to act on the perceived situation. Decision time varies with experience, level of concentration, and situation awareness, and is significant in all cases. Once the decision to react is made, 0.4 seconds are required to operate the flight controls (i.e., pull back on the stick).

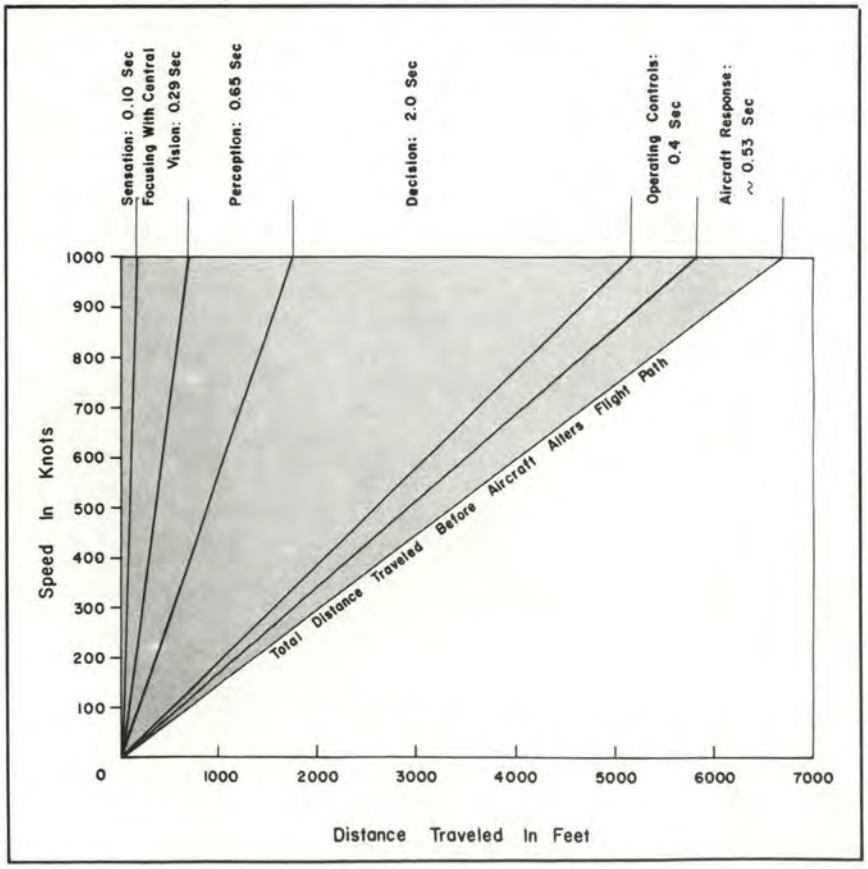
The response of the aircraft to control inputs varies greatly among aircraft. Larger aircraft generally require significantly more time to react to control inputs than smaller aircraft. For example, we'll use the F-15. This aircraft is capable of an instantaneous pitch rate of 22 degrees per second with maximum control deflection. Assuming a 0.5-second aircraft response to control inputs

Large flocks of birds are usually visible enough to be seen early and easily avoided. Not so with a single bird or a few scattered ones. Then you must be able to react quickly and correctly.

and a 5,000-foot turning radius at 450 knots, 0.52 seconds are required to move the aircraft 20 feet to avoid a bird strike. At 300 knots, 0.53 seconds are required for the same 20-foot movement in the airspace.

Totaling all this up, we see it requires approximately 4 seconds from the time of initial object sensation until the aircraft has moved sufficiently to avoid a bird strike. In other words, at 500 knots, a bird must be sensed from a distance of at least 3,342 feet/0.63 miles to avoid colliding with it (see figure).

Oftentimes, it is not possible to maneuver to avoid birds, and the strike is inevitable due to the birds' proximity. A recent F-111 Class B investigation board found that, "When one considers mental reaction time and the time that it takes for a control stick input to actually move the aircraft, it is unreasonable to assume that the pilot could have avoided hitting the bird." In situations like this (i.e., when the bird is within the grey region of the figure), it is best to remain level, possibly duck your head, and take the strike. Maneuvering within this region may only create additional problems such as pilot disorientation, unusual aircraft attitude, or increased damages following the bird strike.



When birds are perceived outside the grey area of the figure, maneuvering the aircraft to avoid the birds may prevent a strike. In most cases, birds will tuck their wings and dive if they perceive the oncoming aircraft as a threat. We've all observed this behavior at times. There are exceptions however. Gulls, for instance, often turn and attempt to outrun the oncoming threat and are often struck from the rear as a result. Some birds maneuver laterally to avoid danger, but it is the very rare bird that climbs to avoid danger. From this, we can conclude that in the vast majority of cases, a climb should be initiated if bird strikes are to be avoided.

Most pilots queried have an intuitive feeling that a climb is best to avoid birds, but written guidance has not been available. The BASH Team would highly recommend this maneuver to avoid birds for a number of reasons. Since most birds tuck and dive from danger, pulling up is best; also by pulling up, the pilot may be able to protect the canopy or engines by taking a strike on the hard undersurface of the aircraft. Lastly, the possibility of collision with the ground or other structures is greatly reduced.

Since bird avoidance is rarely a practiced maneuver, you, as pilots, should have an idea of what to do before you encounter a "feathered bullet" in your airspace. Ideally, this avoidance maneuver should be practiced in the simulator so that it becomes an automatic response. Remember, however, that there are times when a bird is too close to avoid. Remaining straight and level and protecting your face in this situation is best. When you can respond, pull up to avoid damage to your aircraft and possible injury to yourself.

For more information on the bird-aircraft strike hazard problem, contact the BASH Team at AUTOVON 970-6240/42/43. Personal experiences or comments will be appreciated. ■

OPS TOPICS

What Next?

■ It seems the birds aren't satisfied with trying to destroy aircraft by hitting the engines, canopies, wings, etc. Now they have added a new twist — aircraft ordnance.

An A-10 was unable to drop 6 practice bombs (BDU 33s) due to weather on the range. After the Thunderbolt landed, and during dearming, ground crews found the spotting charge in one of the BDU-33s had been fired. Traces of bird remains showed that at some time during the flight a small bird hit the firing mechanism of the BDU-33 causing it to discharge.

You just never know what new tactics those birds are going to come up with in their battle for air supremacy.

Just One Look

A C-141B was participating in an airshow. After completing a high speed flyby, the aircraft started a 2- to 2.5-G pullup for another pass. During the flyby, a student flight engineer left his seat and went back to the left troop door to look out the window. As the aircraft pulled up, he lost his footing and fell, hitting his head on the cargo compartment floor. The student engineer was knocked unconscious for several minutes.

The aircraft commander had briefed the crew on the entire airshow sequence including the 2- to 2.5-G pullup. The student engineer either forgot or disregarded safety briefing precautions and failed to remain seated or secured. He is fortunate he wasn't killed or more seriously injured. As it is, he is permanently grounded.

Bad Blinker

The T-33 pilot checked his oxygen system as he passed 5,000 feet on climbout. The system checked good. A few minutes later passing 18,000 feet, he rechecked the system and noticed the oxygen blinker was stuck open. Since he felt fine, he elected to continue the climb. But shortly after passing 20,000 feet, he noticed his hypoxia symptoms.

The cabin pressure altitude was 15,000 feet. The pilot selected 100-percent oxygen, and his symptoms immediately cleared up. He then returned for a straight-in landing and was met by life support personnel.

The obvious lesson here is to not ignore oxygen system malfunctions. Add some other aircraft malfunctions or other distractions and you may not recognize the onset of hypoxia until it's too late.

"Press"

- Tailors do.
- Weight lifters do.
- Pilots who want to be around for a while *don't!*

As military pilots, we are tasked to accomplish our missions in a professional and safe manner. At times, we abandon sound judgment and press aircraft limits, operating regulations, or personal limits in our misguided zeal to accomplish the mission.

Most mishap reports cite pilot error as the "cause" factor, and when we "monday morning quarterback" the mishap, we all stand up in unison and say, "That was dumb or how could they have done that?"

Keep in mind, mishap reports aren't all seeing/all knowing. You had to have been there. However, we can build a fairly clear picture of the sequence of events and see how the "little" things add up resulting in death and destroyed aircraft.

In the air, we operate by the golden rule: "Maintain aircraft control, analyze the situation, etc., etc." Maybe we should expand the golden rule to include "Maintain a professional attitude" before we even strap the jet on.

- Have you ever flown feeling less than 100 percent? Why?
- Have you ever pressed the weather? Why?
- Have you ever flown a jet with required systems not fully operational? Why?
- Do you ever exceed specified ops limits? Why?
- Do you attempt maneuvers not in the syllabus? Why?
- Do you press minimum altitudes? Why?

I'm sure most of us can answer yes to one or more of these questions with a weak excuse to follow. Probably (like myself) you are a better pilot than the regs were written for. However, we are (and are *expected* to be) *professional* military pilots.

- Know the rules.
- Know the aircraft.
- Know yourself.
- DON'T PRESS. ■

— Courtesy Capt Ken Belt, ATC *Approach To Safety*, Dec 85.

MAIL CALL

EDITOR
FLYING SAFETY MAGAZINE
AFISC/SEDF
NORTON AFB, CA 92409-7001

"50 Years of Aviation Fame"

■ After reading your publication for years and learning many things, I feel there is a need for a clarification once and for all. This is in reference to the "50 Years of Aviation Fame" article January, 1986, pertaining to the AC-47 Gunship.

My information and background with the aircraft has always led me to know "Puff the Magic Dragon" as a single minigun, door mounted and swingable configured aircraft with "Puff the Magic Dragon" painted on the fuselage. In Southeast Asia, this one aircraft received large amounts of press coverage.

Were they not in reality known as "Dragon Ships?" The three-gunned version that I was associated with in Udorn, Thailand, 1969, were always referred to as "Spookys." I have always been interested in the "Gunships" having worked the AC-47, AC-119 Shadow, AC-130A, and AC-130E Specter. I even messed around a little with a version of the OV-10 converted to a gunship. If wrong, I stand corrected.

MSgt Norman E. Faith, Jr
97 FMS/MAFFS
Blytheville AFB, Arkansas

In trying to answer this question, I used the book, Development and Employment of Fixed-Wing Gunships 1962-1972 *by Jack S. Ballard published by the Office of Air Force History. On Page 22, the author said "Stories differ on the nickname's origin. Captain Terry* believed it derived from a mix: 1964 being the Chinese Year of the Dragon, stories from captured enemy prisoners about tongues of fire from the gunship, and recollections of the fairy tale,* Puff the Magic Dragon. *Others trace its origin to the children's song, popular in late 1964, regarding a magic dragon."*

Many names were used for the gunships. On Page 37 of the same book, the author noted, "The designations of the AC-47 gunship, 'Spooky,' 'Puff,' and 'Dragonship' are used interchangeably in this chapter. Puff was once used as a call sign when the 1st Air Commando Squadron had the first of the gunships. The 4th Air Commando Squadron began using Spooky as their radio call sign, based on their night flying in camouflaged aircraft."

All AC-47s were configured with three miniguns on fixed mountings. However, when the 4th Air Commando Squadron first deployed to Vietnam in November 1965 with 20 AC-47s, the guns were removed to save weight for the long overwater flights. The guns were slow in arriving, and many of the aircraft flew missions with only one or two miniguns installed.

I hope this information helps clear up the confusion. Thanks for your letter. —Ed.

*Captain Terry was Chief Test Pilot for the AC-47 Program.

"ARSA"

In the December 1985 issue of *Flying Safety* (Page 22), the horizontal dimension of the inner core of an

continued

MAIL CALL

EDITOR
FLYING SAFETY MAGAZINE
AFISC/SEDF
NORTON AFB, CA 92409-7001

continued

ARSA was listed incorrectly as being "5 nautical miles (NMs) in diameter from the primary airport." This figure disagrees with Figure 2 (Page 23) which shows the inner core as being a cylinder of 5 NM *radius* from the primary airport (rather than a cylinder of 5 NM *diameter* as in the text).

Except for the small discrepancy, thanks for the informative and timely article. I enjoy the magazine very much and feel it makes a significant contribution to my safety as an aircrew member. Keep up the good work.

Bryan E. Hubbell
Flight Simulation Engineer, NASA
Lyndon B. Johnson Space Center
Houston, Texas

Thanks for your letter. You're correct in pointing out the horizontal dimension of the ARSA inner core is 5 NM in radius. Figure 2 is correct. We missed the mistake in the text on Page 22. —Ed.

"Gooney Bird"

I enjoyed your Gooney Bird article in the January 1986 *Flying Safety* magazine.

Until we put a man on the moon, I had always known the vehicle for the task would be a C-47. I have many hours in the Bird. I snatched CG-15 Gliders, worked on skis out of Goose Bay, and flew 52 passengers on one flight. They were Arab kids of assorted sizes.

Now I have one more designation for you — a C-53. It had a plush interior with steam heat. It had needle props, was a real speedster, floated terribly on landing, and was tricky on short fields. I ferried the Gooney from Pisa AB in Italy to Oberfaffenhoffen AB in Germany on 10 July 1947. I believe this aircraft had been the personal aircraft of General Blood. The pilot at this time was his son, Lieutenant Blood.

Thanks for the memories.

Raymond Randt, Col, USAF (Ret)
Tucson, Arizona

"Don't Get Hammered," Aug 85, *Flying Safety*

The subject article, page 6, second column, attributes the hazardous lightning strike zone to be at or near the freezing level. It further implies that this information is supported by the NASA Storm Hazards Program. As Program Manager for the NASA Storm Hazards Program, I must correct that implication.

In the enclosed paper on recent NASA storm hazards lightning research, NASA and industry researchers have concluded the direct strikes to the NASA F-106 aircraft in a thunderstorm are most probably ". . . where the ambient temperature was colder than -40°C and where the relative turbulence and precipitation intensities were characterized as negligible to light."

Figure 5 of that paper shows 2 strikes per minute at an altitude of 11 to 12 km, and no strikes below the freezing level. The view that is evolving here is that above the freezing level, the aircraft triggers the strikes due to large electric fields set up by the charge separation mechanism in the ice phase processes; below the freezing level there are no such large electric fields, and strikes occur when the aircraft occasionally blunders into a naturally occurring cloud-to-ground strike. Of course, airliners usually deviate around well developed cumulus buildups en route at 30-40 Kft. Down low, on departure or approach to airports, deviations are restricted, and they occasionally encounter lightning, often in nonconvective clouds. My estimate is that airliners averaging one strike per year fly about 10-20 hours per year in the region 10-15 Kft in weather; whereas, the anvil tops of many thunderstorms produce conditions in which an aircraft can experience up to 9 strikes per minute. Thus, lightning avoidance procedures should include avoidance of thunderstorm tops, too, particularly those that have anvil tops.

A US Air Force Air Weather Service Forecaster Memo, AWS/FM-83/008, dated August 1983, also treats this subject. I believe this information should be widely disseminated to all Air Force, Navy, Marine, and Army pilots and flight crews. I request your support in making these facts better known.

Norman L. Crabill
Head, Special Projects Office
Low-Speed Aerodynamics Division
NASA, Langley Research Center
Hampton, Virginia

We regret the inference that the NASA Storm Hazards Program supports the conclusion that the hazardous lightning strike zone is at or near the freezing level. This is a commonly accepted view based on various studies over the years. However, as you pointed out, the NASA research showed completely different results.

All the research comes to one conclusion that needs continual emphasis. Aircraft have experienced lightning strikes at virtually all altitudes and temperatures. So, anyone flying in or near thunderstorms should expect lightning strikes. There is no safe zone in thunderstorms.

Thank you for your letter and your interest in getting the facts to our fliers. ■

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UNITED STATES AIR FORCE

Well Done Award

Presented for

outstanding airmanship

and professional

performance during

a hazardous situation

and for a

significant contribution

to the

United States Air Force

Mishap Prevention

Program.

This is all that remained of the left horizontal tail of the T-38.

CAPTAIN

Alan T. Martin

47th Flying Training Wing
Laughlin Air Force Base, Texas

■ On 14 May 1985, Captain Martin was flying a flight control profile on a T-38A functional check flight when a catastrophic failure of the left horizontal tail occurred. Approximately 5 minutes into the flight at 10,000 feet MSL and 500 knots, Captain Martin began a gentle 2-G pullup. The aircraft immediately began violent pitch oscillations with instantaneous negative 1½ to positive 7 Gs. He regained control of the aircraft, pulled the throttles out of afterburner, slowed to 240 knots, and leveled off at 17,000 feet. At this time, the aircraft flew relatively stable, and he attempted to determine the malfunction. Scanning the tail section in his mirrors, he saw the right horizontal tail but was unable to see the left. Several minutes later, a chase ship arrived and confirmed approximately 95 percent of the left horizontal tail was missing. Upon the recommendation of aeronautical experts at San Antonio Air Logistics Center, he lowered the flaps using aux flaps in 10 percent increments and determined that 40 percent flaps at minimum controllable airspeed of 170 knots would be his best configuration. To compensate for the loss of the left tail and counter the asymmetrical force from the right tail, he used full back stick trim and an abnormal amount of left aileron trim to control the aircraft. Captain Martin then flew a flawless straight-in approach maintaining 20 knots above the minimum controllable airspeed. The aircraft crossed the threshold at approximately 180 knots and touched down within the first 1,000 feet. Never before has a T-38 been successfully landed with so much damage to the horizontal tail. Captain Martin handled the catastrophic loss of a vital flight control surface with a great deal of professionalism and airmanship. His superior flying skills and calm demeanor while handling the crippled aircraft led to a safe recovery and landing without further damage. WELL DONE! ■

SAFETY AWARDS

THE SICOFAA

FLIGHT SAFETY AWARD FOR 1985

At the Conference of the Chiefs of the American Air Forces (CONJEFAMER) in May 1986, the Chiefs approved establishing the System of Cooperation Among the American Air Forces (SICOFAA) Flight Safety Award to recognize aircraft mishap prevention achievements. Each Air Force determines its own criteria and annually grants this award to one of its units.

355TH TACTICAL TRAINING WING

Davis-Monthan AFB AZ

The 355 TTW flew 35,700 hours in A-10 aircraft during 1985 without a Class A/B aircraft mishap. The Wing logged more than 17,650 sorties in early model A-10A aircraft while training 206 A-10 pilots. All missions were flown single-seat, and over 79 percent of the missions flown involved demanding low-altitude operations and weapons deployment on gunnery ranges.

The Wing participated in 15 exercises and deployments during 1985 including RED FLAG, AIR WARRIOR, CASCADE HOG, GUNSMOKE, and 5 joint air attack team/CAS exercises. The Wing planned and hosted CACTUS ARIZONA, a composite force training exercise, involving 20 aircraft types and 15 units flying a total of 791 sorties without incident.

The Wing performed the largest ordnance expenditure program in the Tactical Air Command (TAC). They expended 1,283,981 rounds of 30 mm ammunition; dropped 75,000 practice bombs, 1,842 inert bombs, 872 live bombs, 2,400 rockets, 1,403 flares; and fired 10 Maverick missiles. Gun effectiveness rate was 99.96 percent, and weapons release effectiveness was better than 99.3 percent. During 1985, the Wing completed a 6-month period in which they fired 650,000 rounds of 30 mm ammunition without a single in-flight gun malfunction.

The maintenance of the 355 TTW was equally important to the Wing's outstanding record. The improved maintenance production and performance in virtually every measured area throughout the year and quality maintenance contributed directly to the flying safety program.

The Wing also formed "Tiger Thunderbolt" teams consisting of flight line and shop technicians, maintenance analysts, and supply liaison people that focused on components of high failure items that were causing in-flight fires, aborts, and maintenance nondeliveries. These efforts were instrumental in improving engine life and reducing catastrophic failures.

The air discipline and professionalism of aircrews, the excellence of aircraft maintenance, the realistic tactical training environment, the effective safety program management, and the outstanding mishap prevention accomplishments of the 355 TTW fully met the high standards established for the SICOFAA Flight Safety Award.