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GENERAL MICHAEL E. RYAN
Chief of Staff, USAF

MAJ GEN FRANCIS C. GIDEON, JR.
Chief of Safety, USAF

GERALD C. STRATTON
Acting Chief, Safety Education and Media Division
DSN 246-0936

PEGGY E. HODGE
Managing Editor
DSN 246-0950

CMSGT MIKE BAKER
Technical Editor
DSN 246-0972

DOROTHY SCHUL
Editorial Assistant
DSN 246-1983

DAVE RIDER
Electronic Design Director
DSN 246-0932

MSGT PERRY J. HEIMER
Photojournalist
DSN 246-0986

Web page address for the Air Force Safety Center:
http://www-afsc.saia.af.mil
Then click on Safety Magazines.

Commercial Prefix (505) 846-XXXX
E-Mail — hodgep@smtps.saia.af.mil

24 hour fax: DSN 246-0931
Commercial: 505-846-0931

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FSM notams

Did You Say What I Heard?

The following communication problems reported in NASA's *Callback* highlight a potential problem for Air Force aircrew also.

Mandatory readback of certain parts of clearances provides a mechanism to reduce misunderstandings between ATC and flightcrews. An ATC supervisor reports on a readback error that slipped by both him and an ATC trainee, with a potentially hazardous result.

Aircraft A was given a descent from 8,000 feet to only 7,000 feet (6,000 feet would be the norm on this route). Pilot read back 6,000 feet, which was not caught by either of us. We tried to get him back to 7,000 feet, but he went to 6,500 before he climbed back. Aircraft B was 1 mile in trail at 6,000 feet, same speed.

A contributing factor was my overreliance on the trainee, who is fairly well along in training. I was assuming he would catch the problem, so I was not listening as intently. Also, the [typical] descent from 8,000 to 6,000 feet probably had the pilot expecting to hear 6,000. Only goes to prove the importance of readbacks being heard and understood.

Another controller reports that even when the readback of the clearance is correct, sometimes it's the wrong aircraft doing the reading back.

ATC was holding about five aircraft. All were within 5 minutes of EFC (Expect Further Clearance) times. Air carrier flight ABC checked in on the frequency approaching the holding fix. ATC cleared [same company] flight BCD via the STAR. The readback sounded correct. Flight BCD then asked if that clearance was for him. ATC stated affirmative. Flight ABC was approaching EFC time and mistakenly took BCD's clearance. Flight ABC was given a safe altitude to maintain and reissued holding instructions. Flight BCD did the "heads up," requested clarification, and kept ATC from having a very serious situation develop very quickly.

We all get hurried on occasion. Kudos to the pilots out there for whom safety, not time, is the No. 1 priority.

Careful readbacks—and additional clarification, if necessary—are especially important for both pilots *and* controllers when aircraft with similar-sounding call signs are on the frequency. ✈

UNDERWAT

CDR RUSSELL G. PEARSON, USN (RET)
Approach, Jul-Aug 95

Very early on the morning of 10 June 1969, I launched in my A-7 Corsair II from USS *Constellation*. I was in the final stage of training as a fleet-replacement pilot with VA-122. It was the end of a very long training period, right after my first night carrier landing.

The voice of the ship's final-approach controller came through the headset loud and clear.

"Corsair two zero two is on course, on glideslope at three-quarters of a mile. Call the ball."

"Two zero two, Corsair, ball, fuel state 4.0," I replied as my eyes shifted from the instrument panel to the ball of orange light on the flight deck.

For months, I'd listened to sea stories about night carrier landings "separating the men from the boys." Finally, it was my turn. It didn't matter that this milestone was scheduled at the end of a marathon day. Tonight was the big "graduation exercise" before moving up to an operational fleet squadron. In a few months, I'd be flying combat missions from a carrier in the Gulf of Tonkin. My adrenaline was pumping.

"Roger, ball, Corsair, keep it coming," the LSO acknowledged from the platform.

During the final 15 seconds of the approach, my eyes remained firmly fixed on the ball. Suddenly, my body was jolted by the hard, driving impact of the 25,000-pound Corsair, coming down at 700 feet per minute, colliding with the ship's steel deck at 135 knots.

"Piece of cake," I thought, "only five more and you're on your way to the fleet." The tailhook had engaged the 3-wire—normally the sign of a good pass. But, as the plane decelerated down the angle deck, I realized I had a lineup problem.

The marathon day had taken its toll. Twenty-three hours, three flights, 7-day traps, and one canceled night launch had passed since my 0300 wakeup call back home in Lemoore. The nonstop schedule had been grueling, but that was expected—this was the Navy, not the airlines. The squadron was behind schedule "pumping out" combat replacement pilots for the fleet, and the pressure was on to hurry up and catch up.

As the plane rolled out right to left down the angled deck, it skirted the deck edge like a tightrope walker on a high-wire and then stopped uncomfortably close to the catwalk. There was a jolt as the port main-mount slipped off the flight deck. This protective steel scupper plate that borders the deck had been removed during a recent shipyard visit and had not yet been replaced. In less than a heartbeat, the aircraft was perched precariously on the deck edge, still rolling.

With no horizon on this overcast, dark, and drizzly night, I couldn't determine the aircraft's exact orientation. I knew it had to be at least 60 degrees left-wing-down. To eject now would be suicide. The seat would skip across the water like a flat rock. As long as the hook held the wire, the situation was still salvageable.

As the magnitude of the moment sank in, my mind shifted into slow motion. Strangely enough, my thoughts were surprisingly calm and clear. Instinctively, I shut down the engine. If the hook released the arresting gear cable and the aircraft went over the side, the prospect of cool Pacific water being sucked into the Corsair's hot, turning turbine was a recipe for an even more explosive situation. I didn't need the engine now, anyway.

The aircraft suddenly lunged forward as the tailhook spit out the arresting-gear cable. With nothing to hold it on deck, the plane plunged 60 feet into the water. It was like falling into a black hole.

During training, we had been told that a ditched aircraft normally sinks about 10 feet per second, and once it reaches 100 feet, crew survival is unlikely.

I had to do something. The ejection seat was the only chance, albeit a slim one. Since ejection seats were first installed in Navy jets, only a handful of pilots had survived an underwater ejection. It was theoretically possible in the A-7, but no one had yet tested it.

As the aircraft entered the water, I couldn't tell how the cockpit was turned relative to the ship. There was a chance that I would eject directly into the ship's steel hull or even worse, into one of its huge propellers. The survival odds were getting worse with each passing second.

I delayed the inevitable for a moment to allow the ship to pass well clear. I closed my eyes, reached between my knees, and found the ejection seat's alternate handle, the one we'd been trained to use when time is the most critical factor. Images of my wife and son waiting for me at home flashed through my mind. As I realized they might be my final thought, I firmly grasped the handle and, expecting the worst, pulled it straight up. Nothing happened.

Time seemed to stand still. It may have been only a millisecond delay, but it seemed much longer. I had already decided that the ejection seat was not going to work. I visualized sinking slowly to the bottom of the ocean where I would drown or be crushed by the overwhelming pressure of the Pacific.

The sudden, blinding blast of brilliant light startled me. Following a built-in sequencing delay, the seat's rocket motor had fired. The next thing I knew, I was out of the cockpit and clear of the seat, submerged in the cold, dark Pacific.

I couldn't breathe. The water had forced the oxygen mask down around my chin, making the seat's emergency-bailout oxygen bottle useless. For the first time, panic began to set in and to make matters worse, I was totally disoriented. It was as if my body had been shot from a high-powered cannon into a giant pool of black ink.

Just then, I saw lights, strange little lights bobbing up and down on the surface. The flight-deck directors had tossed their flashlight wands over the side marking the point of impact for the rescue helicopter and destroyer escort. The lights provided a sense of direction, and I instinctively swam toward them.

The feeling of relief was overwhelming as I broke the surface and drew that first lungful of fresh sea air. But that breath was accompanied by an excruciating pain, like a butcher's knife midway between my shoulder blades. Something was seriously wrong.

The altitude-sensing device that automatically deploys the parachute had worked. The bad news was that the chute's silk canopy was not streaming behind, threatening to overpower me as I struggled to keep my head above water. I had to get rid of the parachute.

I grabbed for the lanyards that inflate the left and right lobes of the Mk-3C flotation device, but they weren't where they should have been. Time was running out, and the parachute was winning. It took every ounce of strength I could muster just to stay afloat. I was about to be dragged under.

Something brushed against my feet and legs. I was

R EJECTION

much relieved to realize it was the plane's tail section, not a shark. The A-7 had slipped into the water with only minimal impact and had survived virtually intact. With its wing fuel bladders and half of the fuselage fuel bladders filled only with air, the Corsair was now floating upside down just beneath the surface, still undulating from *Connie*'s wake. I had surfaced next to the aircraft's tail.

Planting my flight boots firmly on the Corsair's horizontal tail, I stood on the stabilator just long enough to find and pull the Mk-3C's inflation lanyards. During the ejection, water resistance had wrenched the survival vest around to my right side.

I pulled the lanyards, and the side- and neck-collar lobes inflated instantly. But the parachute was still a problem. It was streaming out like a large sea anchor. Once it filled with water, even the inflated Mk-3C wouldn't help.

Recalling lessons learned in water survival, I rolled over onto my back and reached my arms up past my ears until I found the parachute risers. Running my hands upward along the straps, I found the koch fittings that connected the harness to the parachute. In an instant, the parachute was gone.

Moments later, I was in the center of a large beam of light shining down from the most beautiful helicopter I had ever seen. The destroyer escort had yielded and waved-off to starboard.

A minute or so later, a rescue swimmer was in the water next to me.

"Are you okay, sir?" he yelled over the din of the helo.

"Yeah, but it hurts to breathe," I responded. It also hurt to yell.

"Just hang on, sir," the swimmer shouted. "All we've got is a 'horse collar,' but we'll get you out of here."

As the hoist took up the slack and the cable began to slowly lift us both out of the water, my body dangled helplessly from the horse collar like a wet dishrag. Weighed down by my soaking flight gear and heavy, steel-toed boots, and whipped about by the helo's turbulent down-draft, the pain became unbearable. The next thing I knew, I was on the deck of the helo's cargo cabin, vomiting salt water.

The alternate ejection handle may have expedited my exit from an inverted, submerged cockpit, but it carried a painful price. Bending over and down between my knees to grasp the lower, secondary handle placed my upper body in a dangerously curved position, and the brutal force of the seat firing had broken my back.

I was hospitalized temporarily in *Connie*'s sick bay. Three days later, the ship's senior medical officer and a ship's corpsman were to accompany me on a medevac flight to Balboa Naval Hospital. By coincidence, the flight was aboard the same helo and with the same crew that had rescued me earlier.

Minutes before the helo's scheduled departure, a serious casualty occurred on the flight deck, creating an unexpected dilemma. The helo had been configured to carry only one patient. The doc had to make a command decision, and he chose to take the less serious but more recently injured chief. I was not happy that my name had been scratched from the medevac manifest.

Close to an hour had passed when a corpsman came running into the ward. His face was pale, and he was out of breath. Even before he spoke, I knew something terrible had happened.

"Somebody must be looking after you, Lt Pearson. You've cheated death twice now in 3 days," he said. "The word just came down from Air Ops that the medevac flight lost an engine and went down about halfway to the beach. The pilot got off a mayday, and our SAR helo has found the wreckage, but there were no survivors."

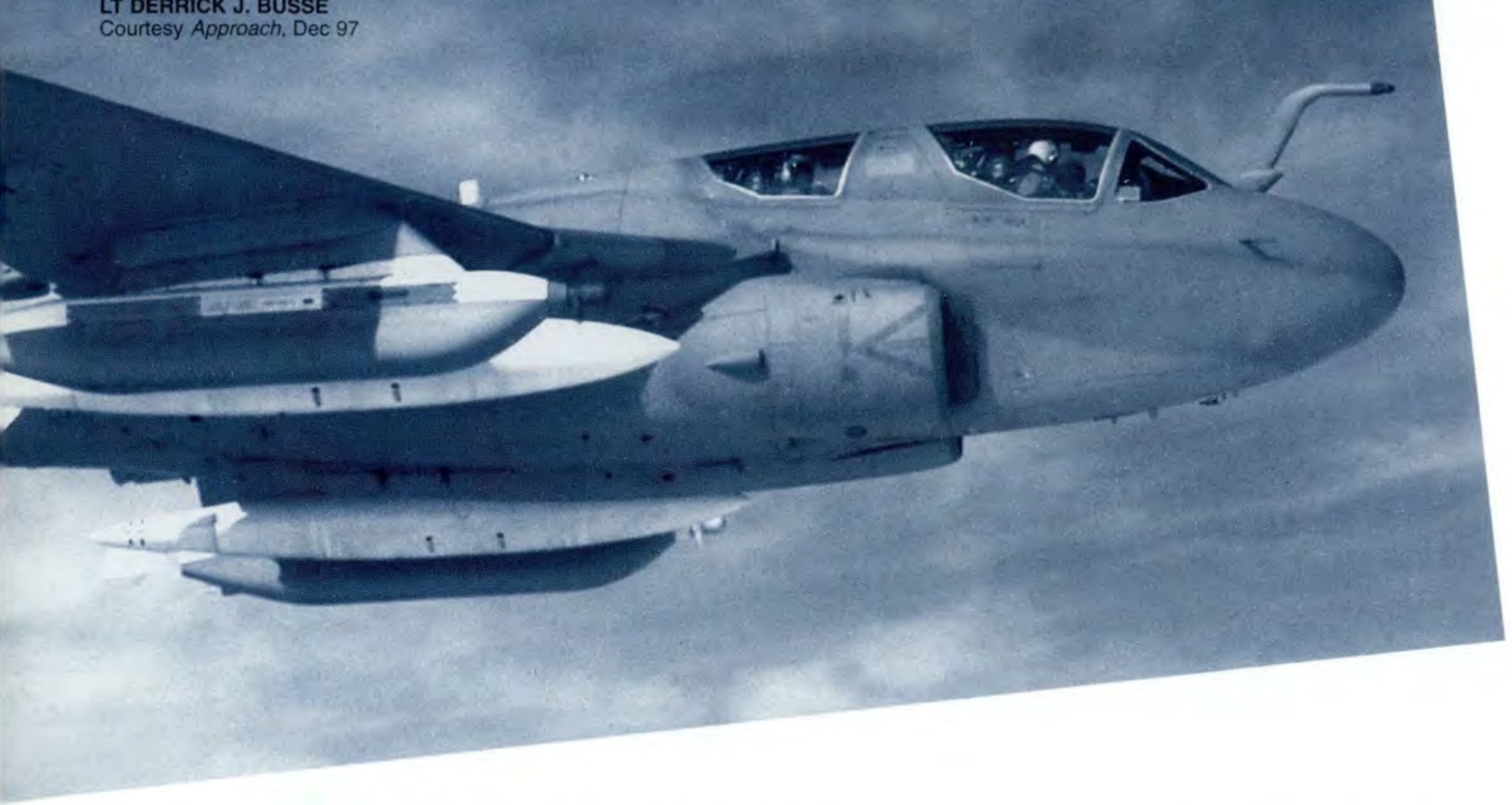
I remained in sick bay and rode the ship back into port at North Island a few days later. Shortly after *Connie* tied up at the pier, I was carried ashore on a stretcher and transported the short distance to Balboa Naval Hospital by ambulance.

I spent the rest of the summer in a semi-private room on the hospital's sixth floor. The 6 weeks in the hospital and 4 weeks of convalescent leave gave me plenty of time to dream about flying again and to think about all the things I would do differently next time at the boat. But more than anything else, it gave me time to be thankful and to reflect on the significance of my survival. ✈

Cdr Pearson flew two extended combat deployments in Vietnam with VA-195. He later commanded VA-105 and is now retired.

Surviving a High

LT DERRICK J. BUSSE
Courtesy *Approach*, Dec 97



The water temperature was 61°F which, combined with loss of blood and the shock from our severe injuries, was quickly working to incapacitate us.

We punched out of the jet at about 550 KIAS, in a 50-degree dive, below 4,000 feet. I was unconscious for a few seconds and don't remember the ejection. I came to just after hitting the water. My SEAWARS and FLU-8 worked as well as the Martin-Baker GRU-EA7 seat.

At first I had no idea where I was or what was happening. It was like being in a bad dream. Finally I realized what had just happened. At the same time, I started going through survival-training procedures. I made sure I was separated from my chute and was not entangled in the lines. I saw that my lobes had inflated. I realized my raft had not deployed, so I began hauling the lanyard up to manually deploy it.

When my left arm didn't respond, I noticed I had a few joints in it that hadn't been there a few minutes ago. My left hand, arm, and shoulder blade were broken in six places and were numb. My body had temporarily shut down all sensation from the arm. I began pulling my raft and seat pan up with my good arm and my legs. I was also starting to realize I was in the ocean after ejecting.

Before I had the seat pan up, I heard someone crying out in pain. I looked around and saw one of the other crewmembers about 50 yards away. I yelled back that I was alive and my arm was broken. He reported his left leg and arm were broken and his right arm was injured. He looked like he was struggling to stay up and was beginning to panic.

I told him to stay calm and I would swim to him. I used my good arm and legs to sidestroke through the 5-foot-plus seas. When I got to him, I saw that two of his lobes hadn't inflated. He was still thrashing about and wasn't really aware of what had happened either. I made sure he was free from all his parachute lines, and I tried to inflate his SV-2, but the CO_2 bottles had already discharged.

I propped up my left side against his deflated side to keep him afloat. Treading water, I tried to haul up our rafts and keep us together for warmth. The water temperature was 61°F which, combined with loss of blood and the shock from our severe injuries, was quickly working to incapacitate us.

About this time, I saw and heard our wingman circling overhead. I was never more glad to see a Prowler in my life. I used my good arm to splash water to get the crew's attention. The Prowler circled directly over us, so I assumed they had seen

ı-Speed Ejection

us. Shortly thereafter, I heard, then saw, the helo. I realized the swimmer would get to us before I could have done anything with the rafts with only one arm, so I gave up on that plan. I splashed water again.

The swimmer was in the water shortly. When he got to us he checked that we were clear of our shroud lines. I told him our condition and told him to take my crewmate first as he was more badly injured, more unsettled, and less able to stay afloat by himself. The swimmer told me to let go and give him some clearance. I had to use my good arm to pull my bad one from my squadronmate. Because of the cold, the good arm had lost a lot of dexterity. I also didn't want to let go of the other man until I was sure the swimmer had him.

After I had separated from him, the swimmer told me to stay away, so I tucked myself into a ball to conserve heat. It seemed forever before the swimmer returned. I was feeling the effects of hypothermia. Remaining conscious took all my energy and determination. The swimmer confirmed my left arm was injured and told me to let him do the work. He then quickly stripped my seat pan, hooked us to the J-hook, and took me up the hoist. It was a quick ride to mother where I was stabilized, then a long ride to Balboa.

A lot of things helped keep the two of us alive that day. There are several things I should have done to help prolong my survival time. The only signaling I did was splashing water. At first I couldn't find my flares or strobes (our SV-2s were pretty badly shredded by the wind), and I stopped looking when I assumed both my wingman and the helicopter crew had seen us.

Our jet had disturbed the water quite a bit, but because of the dive angle, the slick from the oil and wreckage was small, maybe 300 yards in diameter.

Our helmets came off in the ejection but were nearby, and one of the sea-dye markers had deployed. If it had been night, our odds of survival would have been much smaller.

A strobe is visible even during the day. Helmets and day-side smoke are also useful. I should have kept searching until I had found another signaling device. I was in the water for 35 minutes. When I reached medical on the boat, my core temperature was 85°F; a few degrees cooler and I would have been a goner. I was wearing thermal socks and long underwear but not my anti-exposure suit. The air temperature that day was 75°F, and the water 61°F, well above the region where anti-exposure suits are required, but those tables do not take into account injury, dehydration, or shock.

We always brief getting into our rafts quickly, especially in cold water. Have you ever practiced getting into a raft without the use of one or more of your limbs? How about manually inflating it in case of a low-altitude ejection? How about helping an incapacitated crewmate into a raft?

Have you ever practiced getting into a raft without the use of one or more of your limbs? How about manually inflating it in case of a low-altitude ejection?

The training scenarios we go through at water survival every 3 or 4 years are sterile and don't really consider ejection injury, shock and disorientation, rough seas, or the loss of survival equipment during ejection.

Next time you're in survival training, try doing some different activities while simulating an injury, or at least think about how you would go about doing so.✈

The ACES II Seat

As the ACES II ejection seat commemorates 20 years in the Air Force inventory, we take a look at the seat that has saved so many aircrew lives. The following background is provided by McDonnell Douglas' brochure* ACES II—Advanced Concept Ejection Seat *and the Department of Commerce's* National Security Assessment of the Emergency Aircraft Ejection Seat Sector. *—Ed.

The Seat

Flying Safety magazine reported 20 years ago this month:

ACES II is here—the Air Force's newest and best ejection seat, ACES II, is now operational. At times an elusive dream to those of us in the emergency escape business, it has at long last become a reality. It has been in the making for over 11 years, and there were times when it appeared as if it would never get here. But it is indeed here now!!

A sampling of its advanced technology subsystems includes:

- *Three operating modes to provide optimum performance over the complete 0 to 600 knots equivalent airspeed escape envelope.*
- *It uses a seat-installed sensing system for recovery mode selection.*
- *It uses an electronic sequencer with redundant circuitry to provide optimum sequencing and timing for each mode.*
- *It uses a gyro-controlled vernier rocket to stabilize the seat/man combination in pitch at low speeds.*
- *It uses a hemisflow drogue parachute to stabilize and decelerate the seat/man combination at high speeds.*
- *The personnel parachute is deployed by a mortar for consistent operation.*
- *It has personnel parachute canopy reefing capability to permit high speed deployment without excessive onset of forces on the crewman.*

For 20 years, these advanced-technology subsystems have continued to provide Air Force aircrews with a seat that is rugged, lightweight, and easy to maintain. A look at the ACES II success story shows us just how well it has done.

The Success Story

ACES II has increased the survival rate on ejections to over 90 percent. The seat's performance is a significant improvement over its predecessors.

As of January 1998, there had been 463 ejections worldwide using the ACES II system. Over 90 percent—421—survived and 42 were fatal. Out-of-envelope ejections, drowning due to flailing injuries, and aircraft sequencing system failures before the seat catapult fired caused the majority of fatalities. The single-engine F-16 is the most numerous aircraft flying with the ACES II system. There have been 338 ejections from the F-16 (total USAF and foreign countries) with a survival rate of over 92 percent (312 survived).

Aircraft engine failure is the most common malfunction in which ejection seats are used in peacetime, followed by pilot error.

From 1978 to 15 January 1998, the total amount of Air Force ejections using the ACES II system was 314. Over 90 percent—288 survived and 26 were fatal.

The Expanding Pilot Population

The ACES II was originally designed, tested, and qualified for an all-male aircrew population ranging in weight from 140 to 211 pounds. The recent introduction of women into combat aircrew positions changed the picture. It is clear the majority of potential female aircrew members will weigh less than the minimum of 140 pounds. "The majority of the DoD female population and many male aircrew members of countries that buy foreign military sales aircraft equipped with the ACES II ejection seat weigh less than 140 pounds," said Andrew S. Kididis, Project Engineer of the Light Occupant Weight Ejection Seat Test Program (LOWEST), Aeronautical Systems Center's (ASC) Crew Systems Engineering Branch. "In fact, current screening criteria will allow female aircrew members as low as 103 pounds," he said.

Computer models have suggested there is a higher risk of injury due to ejection forces for these lightweight occupants. "The LOWEST Program collected data on ejection forces and accelerations imposed on a lightweight occupant during an ACES II ejection event and validated this fact," said Robert Billings, ASC's Crew Systems Engineering Branch Chief. Because of this increased risk, the Crew Systems Engineering Branch initiated and managed a program to conduct dynamic sled testing of the ACES II seat with lightweight manikins to verify and quantify this increased injury risk.

To test at the lightweight condition, small female Hybrid III automotive test manikins were modified to reduce their weight to 103 pounds. "LOIS" (Lightest Occupant in Service) was ejected from an F-16 forebody in an F-16/ACES II configuration seat. Eight ejections were conducted at a speed of 600 knots, and one test was conducted at a speed of 450 knots with the forebody in a 5-degree yaw attitude. Tests were conducted at the high speed test track at Holloman AFB, New Mexico. "When 'LOIS' is ejected from the test sled at Holloman AFB, moving at 600 knots, her body is subjected to a pressure at approximately 1,200 pounds per square foot," said Mr. Billings.

The Upgrade

Lessons learned from the LOWEST test program have led to a planned upgrade program for the ACES II fleet. The upgrade, which is being planned as a cooperative effort between the Human Systems Center (HSC, the ACES II manager) and the Japanese government, will develop seat modifications which will reduce risk of high speed injury to smaller, lightweight occupants, as well as increasing protection to the overall population as well. The program will also address ways to better accommodate a larger aircrew population ranging in weight from 103 pounds to 245 pounds. "Active protection and restraint of the arms and legs, increased high speed seat stability, and better accommodation of the new expanded aircrew population are the goals of the ACES II upgrade program," said Mr. Billings, whose office will be supporting HSC during the upgrade program. If the upgrade program goes as planned, in a few years ACES II seats operating out in the field will be modified to reduce the injury risk potential to crewmembers ejecting at high speeds.

The Future

The ACES II was the last new ejection seat developed in the United States. It evolved following nearly 8 years of intense research and development. Conceptual analysis is ongoing for more advanced seats to be used in future aircraft such as the Joint Strike Fighter. Advanced propulsion stabilization systems have been demonstrated in recent testing by Air Force Research Laboratory (AFRL). New variants of existing seats, both foreign and domestic designs, are being considered for the future. What will the next generation of Air Force ejection seats look like? Only time will tell. One thing that is for sure, the ACES II will continue to save lives well into the next century. ✈

Mishap Investigation of Korean Air Flight 801— A Team Effort

MAJ STANLEY J. BUELT
Chief of Safety, 36th Air Base Wing
Andersen AFB, Guam

Preparing for a major aircraft mishap is like preparing for combat. You never know when you'll be called to serve, and you've got to be trained and ready when you are. The irony in both experiences is the sense of sadness over the terrible destruction and the coexisting sense of pride in knowing you've met the challenge and made people's lives better.

In the tragedy of Korean Air Flight 801, I was provided a great opportunity to apply what I had learned in safety training and to assist and learn from the members of the National Transportation Safety Board (NTSB). Despite the large number of people who worked at the crash site (many working under those conditions for the first time), the injury rate was exceptionally low. Four people were treated for dehydration—two people at the scene and two at the hospital—and only one Air Force member required minor medical treatment for a cut.

In this article, I've described my involvement in the aftermath of the mishap. My story is only one of hundreds that could be told—this was a team effort. The airmen, sailors, soldiers, marines, coast guardsmen, and civilians involved in the search, rescue, recovery, and investigation performed in an outstanding manner, and many are true heroes.

Hopefully, our experiences will help the next group of people faced with a task of this magnitude. More than likely, we will soon know why this *mishap occurred, and we can use this tragedy for future benefit. Mr. George Black, Jr., National Transportation Safety Board (NTSB), said that mishap investigators had the noble mission of turning something bad into something good. I believe that's why safety professionals, regardless of who they work for, continue to investigate, continue to ask why, and continue on the quest to achieve that elusive goal of zero mishaps.*

The phone rang at 0400 on 6 August, waking me from a deep sleep. When you're the Chief of Safety, an early morning phone call is usually not a good thing. The sergeant from the Command Post said a Korean Air 747 had crashed near Piti. Korean Air Flight 801 (KE 801) had crashed about 0140, 3 miles short of A.B. Won Pat Guam International Air Terminal's Runway 06L. During the first meeting with the Battle Staff, Col William W. Hodges, 36th Air Base Wing Commander, appointed me the liaison to the NTSB. I thought I would be spending all day at the Command Post coordinating for their arrival. A civilian airliner crashing near a civilian airport was the purview of the local authorities and the NTSB.

At the Crash Site

Around 0800, the on-scene commander requested photographers, videographers, and flight safety personnel be flown to the mishap site by helicopter to document and preserve evidence. Maj Richard (Rick) Gindhart, 13th Air Force Director of Safety, Lt Commander Sally deGozzaldi, Helicopter Combat Support Squadron Five Safety Officer, and I made the trip. When we arrived at the site, the middle fuselage section was still putting up a plume of smoke, but there wasn't much fire.

Control and "ownership" of the site was not as simple as it would have been for a military aircraft crashing on a military base. The search and rescue effort, controlled by Guam Civil Defense, was comprised of first responders from many civilian and military units.

Normally, the local coroner is in charge of the recovery of the victims' remains. Due to the magnitude of the effort, and because KE 801 landed on federal property, Rear Admiral Martin Janczak, Commander of U.S. Naval Forces Marianas, was responsible for the recovery effort.

The FBI considers the wreckage a crime scene until proven otherwise. After the FBI determines the crash was not likely caused by a criminal act, it turns the site over to the NTSB. When the NTSB is done with the wreckage and the coroner declares the search for remains complete, the air carrier is responsible for salvage operations.

Our first job at the site was to form a team of flight safety officers, FBI agents, photographers, and videographers to document the scene before it could be further contaminated by search, rescue, or recovery efforts. A narrow paved road ran east to west near the crash site. A pipeline on the south side of the road

had been severed by the aircraft's landing gear. As we walked along the road, we saw parts of trailing edge flaps, an engine cowling, an engine tail cone, and an HF antenna. A small mound on the north side of the road ripped the No. 1 engine from the wing. The No. 2 engine struck an abandoned ordnance storage bunker but was found near the main concentration of wreckage.

The tops of several trees had been clipped by the wings and fuselage. It appeared that the aircraft was lined up on final when it contacted the ground. As we continued our walk, we saw pieces of engine cowling and trailing edge flaps, and we discovered the No. 1 engine. Farther down the hill, we found most of the aircraft's 16 main landing gear scattered about. Halfway between the initial impact point and the main wreckage, we found cargo (mostly undamaged) from what we thought was the aft cargo bay.

The aircraft had traveled (flown is probably not the right term) along a path just above the down-sloping terrain until it met a significant rise.

continued on next page

The aircraft had traveled (flown is probably not the right term) along a path just above the down-sloping terrain until it met a significant rise. The front part of the fuselage, including the flight deck and the first class section of the main cabin, broke from the rest of the fuselage and came to rest upside down on the other side of the rise. Many of the survivors came from this section since there was no fire there.

The flight deck was accessible, and we could see some of the copilot's flight instruments. We found the dispatch bag and what appeared to be one of the flightcrew's publications bags.

We hiked to the other side of the rise. Control cables and wire bundles still connected the flight deck and first class section to the rest of the wreckage. The flight deck was accessible, and we could see some of the copilot's flight instruments. We could also see the two pilots still strapped in their seats. Rick peered into the hole in the wreckage to read the information from the flight instruments to me while I repeated the data into a tape recorder. We found the dispatch bag and what appeared to be one of the flightcrew's publications bags.

Search and Recovery

The search and recovery team (SRT) is formed to identify, document, and remove remains of the victims from the site. Diligence and attention to detail are essential to help identify the victims, and for this mishap it was a monumental feat. Some SRT members had received extensive training or had previous experience. Others were volunteers who had never worked around airplanes, much less one that was in thousands of pieces.

On the first day, the SRT combed a wide area to search for any additional survivors. As time passed, and they worked closer to the heart of the wreckage, the work became more difficult. It would take more and more effort just to get to the remains, and the condition of the remains would deteriorate.

During the first several days, Rick, Sally, or I briefed each SRT on the hazards of the site and the need to preserve evidence. Recovery of remains is the higher priority, but we wanted to avoid needless loss of evidence. We told SRT members to document the position of the piece of wreckage on film or video before they moved it. In fact, any significant movement of the wreckage was continuously documented on videotape. We warned them of the hazards associated with oxygen cylinders and compressed air cylinders. A Navy explosive ordnance disposal team removed the cylinders as they were found.

The work of search and recovery was broken up into roughly four specialized tasks. Firefighters or Seabees would do the heaviest work with machines and tools—cutting, pulling, chopping, chiseling, moving, and lifting. A second group of "laborers" did lighter work by hand—hauling mostly.

Once these first two groups uncovered remains, then the next two groups would move in. The third group identified, photographed, marked, and tagged the remains. A plotter would mark the position of the remains on a master map. Then the team placed the remains in a body bag, ensuring the remains and the bag were both tagged with a unique reference number. A fourth group carried the remains on stretchers from the wreckage to an ambulance and brought in supplies to the center of operations.

Recovering the remains was a huge undertaking. In addition to the people just described working in the heart of the wreckage, there were people providing security, communications, field morgue teams, food and drink service, chaplain support, supply, command and control, transportation, and public affairs. A team of surveyors from the 36th Civil Engineering Squadron set up a grid system for the recovery effort. The position of the wreckage and the remains would be plotted on paper at the site and then fed into a computer-aided design program at the end of each day. The position of the remains would help in identification efforts down the road. The system worked great and received a lot of praise.

The NTSB Field Investigation

The NTSB team arrived at Andersen AFB about 28 hours after the mishap. Two members drove immediately to the site, surveyed the situation, and told us to keep doing what we'd been doing. For most Air Force flight safety officers, work at a major mishap site is a once-or-twice-in-a-career event. The NTSB investigators I talked to said they go to about five per year. At all times, there is a current "go-team" roster, and these people have 2 hours to get to the airport with bags packed. The work starts at the mishap location, but the teams travel if necessary. After the field work is complete, they head back to their offices.

The length of stay at the crash location and the makeup of the team is dependent on the nature of the mishap. In the case of KE 801, Mr. Black, Board Member of the NTSB, and Mr. Ron Schleede, Deputy Director of the Office of Aviation Safety, came to Guam. Mr. Black received his first mishap investigation experience by serving on two USAF investigation boards during the early 1970s as an aircraft maintenance officer. The Investigator in Charge (IIC) was Mr. Greg Feith. Other people from the NTSB came to serve as leaders for the structure, systems, power plants, operations, air traffic control, weather, survival factors, human performance, and aircraft performance teams. Most teams included a Korean Air representative. The structures and systems teams included representatives from Boeing. Pratt and Whitney had two representatives on the power plants team.

The NTSB held daily progress meetings that started with some general information from the IIC and reports from all of the team leaders. Questions and closing comments from Mr. Black concluded the meeting. Mr. Black diligently took notes because shortly after the progress meeting he faced the media. In fact, the press received information just 30 to 60 minutes after the information was shared in the progress meeting. Without the safety privilege that the Air Force enjoys, the NTSB report is both a safety mishap report and a source of public information. About the only thing that is not revealed is the actual recording or verbatim transcript of the cockpit voice recorder.

Although the KE 801 mishap appeared to be a classic case of controlled flight into terrain, each team worked to find contributing factors in their area. While the news media were quickly coming to their own conclusions, the field work continued. The structures team analyzed the wreckage to make sure that major portions of the aircraft were not missing and that the aircraft came apart in a logical way. The human performance team interviewed members of the flight crew's families. The powerplants team determined the engines were operating at the time of impact. The aircraft performance team used data from the air traffic control radar to reconstruct a flight path in the vertical and horizontal planes. The operations team, headed by a former commercial airline pilot, interviewed the crews of the aircraft that landed just before the mishap and just after the mishap. Much of my involvement was with the survival factors team which interviewed survivors and rescue workers.

Final Observations

The high quality of the Air Force's Flight Safety Officer Course was certainly confirmed by my experience with this mishap. Words of wisdom from Mr. Mike Hannah, my primary mishap investigation instructor, kept popping into my head. Remember the basic investigation techniques. Preserve, collect, and analyze evidence. Ask questions. Don't jump to conclusions. Develop theories. And document, document, document.

At the mishap site, keep your eyes open for the safety of others. No one wants to add an unnecessary ground mishap to an already tragic situation. Don't hesitate to request ground safety, public health, fire prevention, and bioenvironmental engineering personnel to evaluate the mishap site. Watch for signs of exhaustion, environmentally induced health disorders, and psychological stress. Working at a major mishap site is mentally and physically demanding.

All work at a mishap site must be a team effort, especially when the mishap investigation and the recovery of remains are conducted simultaneously. In the case of Korean Air Flight 801, teamwork was the key to effective operations. If you're a flight safety officer, be prepared—your involvement in a major aircraft mishap investigation may be only a phone call away. ✈

The work of search and recovery was broken up into roughly four specialized tasks. Firefighters or Seabees would do the heaviest work with machines and tools—cutting, pulling, chopping, chiseling, moving, and lifting. A second group of "laborers" did lighter work by hand—hauling mostly.

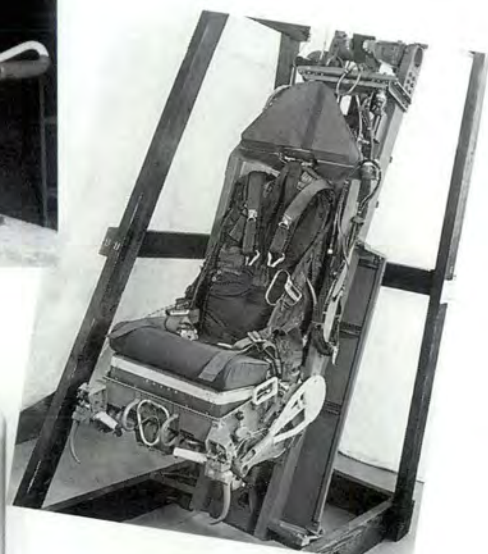
Ejection Seat History

A pictorial look at our ejection seat history shows us that we have come a very long way from that first human ejection test from a P-61B test aircraft in 1946. As the speed and altitude capability of aircraft steadily increased, engineers faced new problems. You can see here what some of these problems were and how the ACES II seat evolved.

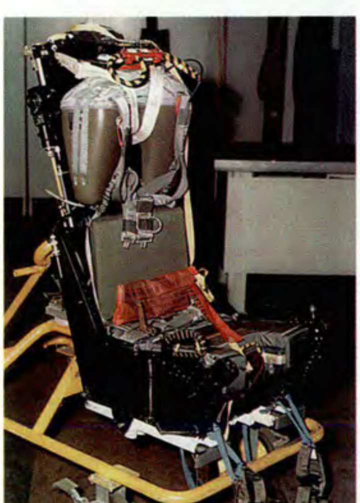
The He-219 Owl (upper left) and the He-162 (above) utilized an ejection seat system (of sorts) during World War II. The rear crewman's position in the HE-219 faced backwards. The seat traveled along curved rails, and occasionally jammed, thus putting observer and seat in great peril with the tail of the aircraft. The seat from a Heinkel He-162 (above) was sent to Wright Field in 1945 and became the basis of ejection seat development for the US Air Force. The XP-55 Curtis "Ascender" (humm), at left, boasted a "kick-off" device that jettisoned the prop in case of bailout. We wonder if that had anything to do with only three examples being built.

Looking rather like some sort of space capsule, the encapsulated seat to the left was used in the B-58 Hustler. Wonder if they had stereo in the headrest.
The seat shown below is the downward ejection seat from the B-52.

Above: An early prototype seat for use in the F-80.
Right: Ejection seat used in later F-84s and the F-105.



Stencel SIIIS ejection seat



Called "AWAY", the rather odd looking device above was a mobile aircrew escape system. Our staff decided we'd rather take the stairs. And if you ever crewed an F-4, the Martin-Baker Mk 7 seat at left will forever be a familiar sight.

The lucky chap at right is modelling a pilots' finest for exiting an F-104, circa 1956.

ESCAPAC ejection seat

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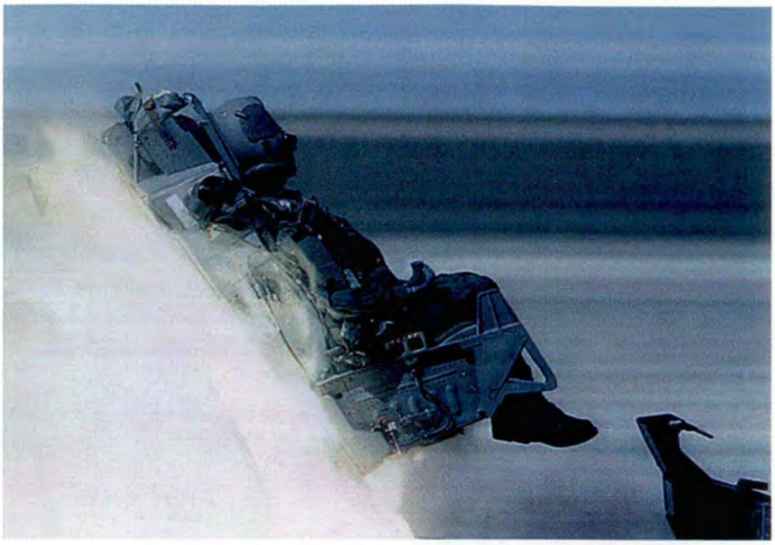
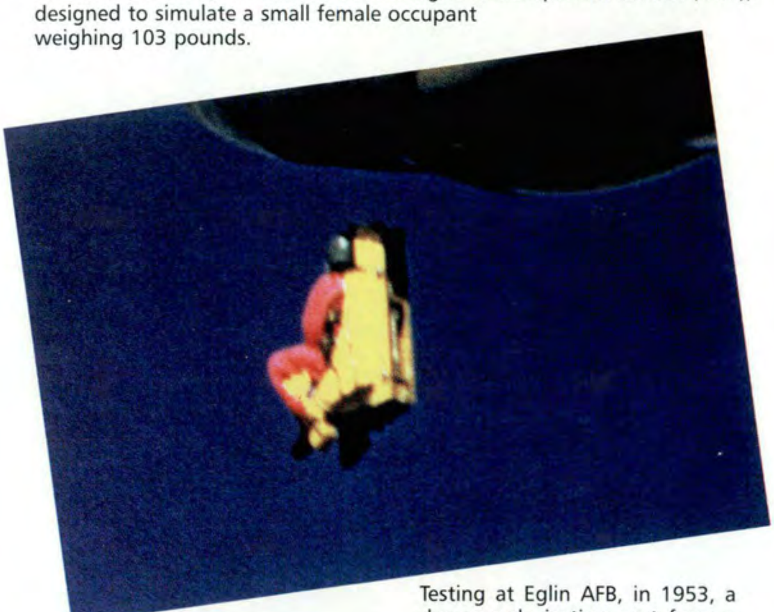
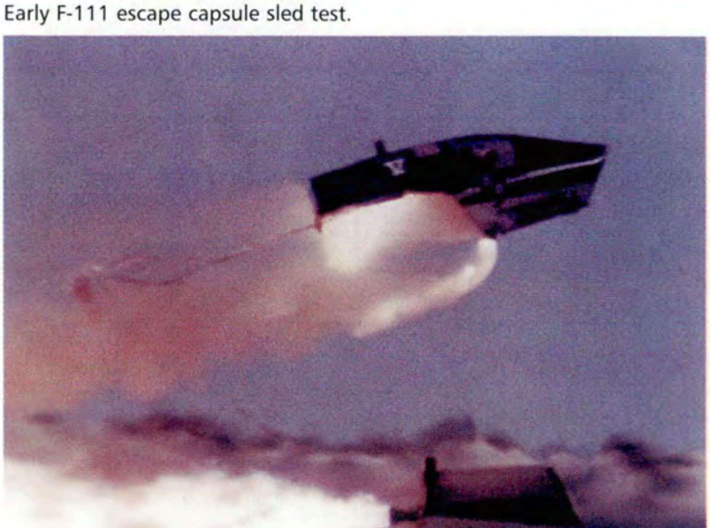


High speed tests at Holloman AFB NM of the Light Occupant Weight Ejection Seat Test (LOWEST). The manikin is the Lightest Occupant In Service (LOIS), designed to simulate a small female occupant weighing 103 pounds.



Testing at Eglin AFB, in 1953, a downward ejection seat from a B-47.

Early F-111 escape capsule sled test.

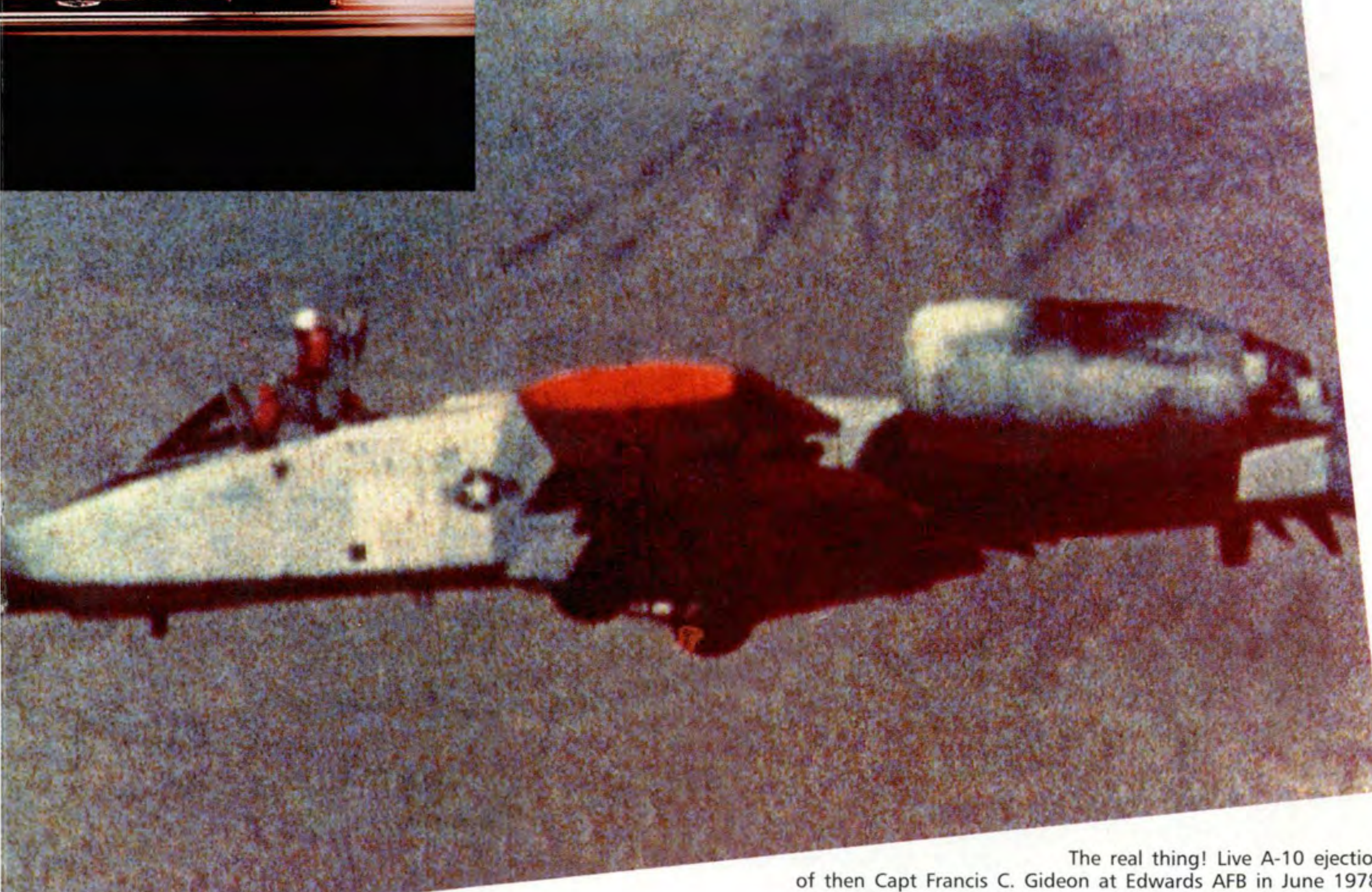


ACES II ejection seat in zero/zero F-15 testing.

The sled test at right is of an F-104 escape capsule.

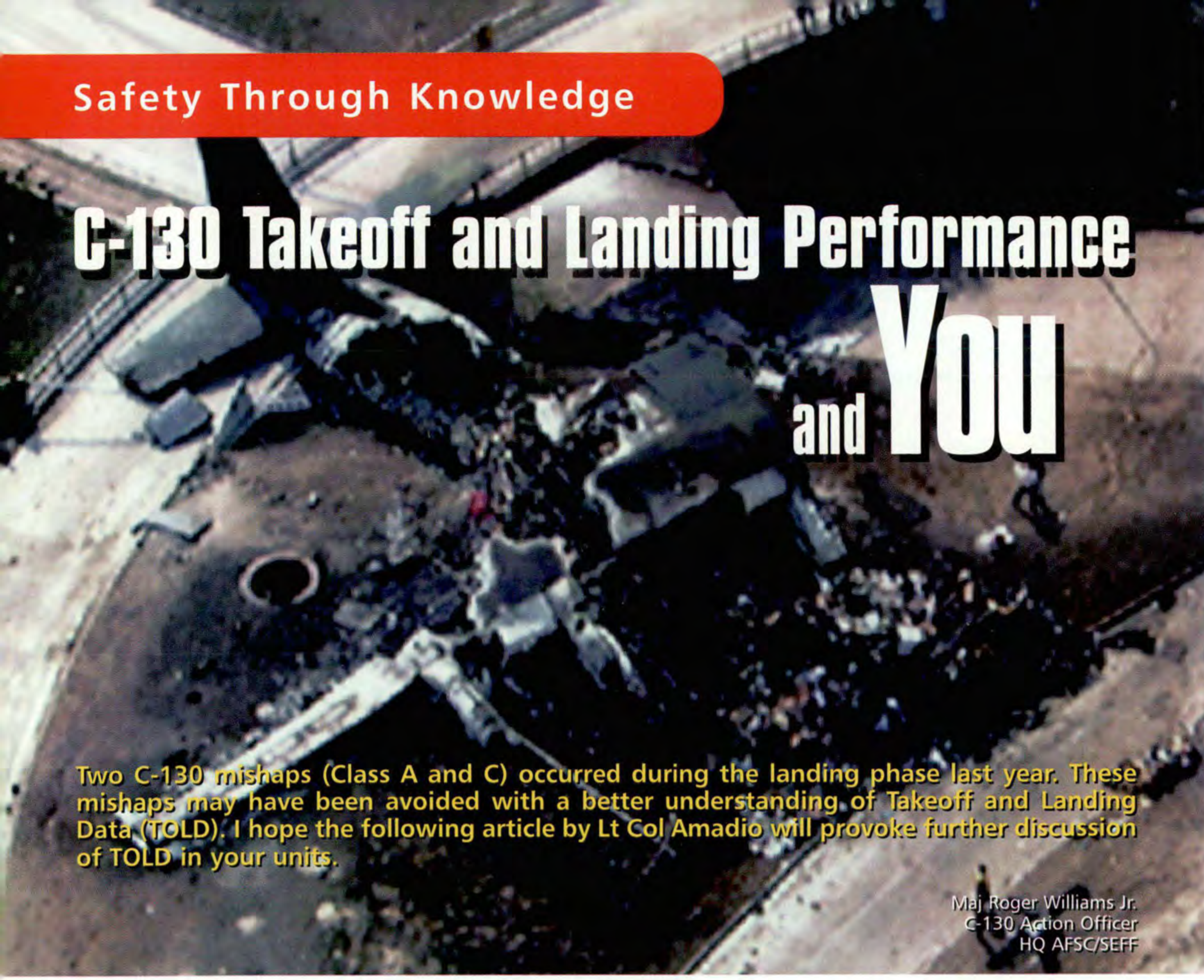
Below: Testing the RANGER extraction system, similar to the YANKEE system used on A-1 Skyraiders in Vietnam.

A view of the test sled and escape capsule for the B-1A.



The real thing! Live A-10 ejection of then Capt Francis C. Gideon at Edwards AFB in June 1978. Major General Gideon is the current USAF Chief of Safety and Commander of the Air Force Safety Center at Kirtland AFB NM.

Safety Through Knowledge



C-130 Takeoff and Landing Performance and You

Two C-130 mishaps (Class A and C) occurred during the landing phase last year. These mishaps may have been avoided with a better understanding of Takeoff and Landing Data (TOLD). I hope the following article by Lt Col Amadio will provoke further discussion of TOLD in your units.

Maj Roger Williams Jr.
C-130 Action Officer
HQ AFSC/SEFF

LT COL LOUIS AMADIO
913 AW Chief of Safety
Willow Grove ARS, Pennsylvania

with invaluable assistance from
ALAN D. WHEELER JR.
C-130 Pilot Instructor
HTI-LINK

and many others.

When you think about the expression "normal length runway," what impression do you get about the runway length? What procedures will you use? What safety factor can you count on? Basically, what expectation do you have as to the environment in which you will operate?

Now how about the expression "max effort runway length"? What impression do you get about this runway length? Will the procedures be the same? What safety factors are built in? What about this environment?

Typical answers to the first paragraph go like this: I can always make a safe takeoff or landing because I have plenty of runway. I don't have to do an acceleration check. If I lose an engine, I have time to decide what I will do. I can use the C-130 section three abort procedure (shutdown in FLIGHT IDLE). I can make right-seat takeoffs and landings. I can make a C-130 section two "normal takeoff" (rolling). I must wait for 115 KIAS prior to entering the ground range because runway length is not a factor. I can "pause" in ground idle to check for low-pitch stop retraction.

Typical answers to the second paragraph go like this: The landing runway is short, probably less than 3,500 feet. I can lose an engine on takeoff, but I may not be able to take off if I am past refusal speed. The closer I am to max effort takeoff speed, the more likely I can make a safe takeoff. If I can reach air minimum control speed, I can fly the airplane. I have to do an acceleration check. If I lose an engine, I have to use the C-130 section three abort procedure (shutdown in FLIGHT IDLE). I can make right-seat assault takeoffs and landings if I am an instructor. I can "pause" in ground idle to check for low-pitch stop retraction.

Here are three more expectations that keep cropping up when landing and aborting performance is discussed.

1. Brakes stop the airplane.
2. Reverse thrust contributes almost nothing to stopping the aircraft (only about 400 feet).
3. The brake pedals pulse when the antiskid is working. If they don't pulse, we either are not pressing hard enough or the antiskid is broken.

Are *any* of these expectations true?

Let's look at one possible scenario and check the numbers. We are taxiing out to a 7,000-foot runway with an intersection with 4,200 feet remaining. The pilot is in a hurry to get airborne for whatever reason (the weather, the dust, the boredom). He considers an intersection takeoff.

The pilot asks tower for the runway remaining from the intersection. The tower responds 4,200 feet. Being a firm advocate of CRM, he then asks the engineer for the Critical Field Length, this being the Minimum Field Length for a "normal takeoff." The engineer states 3,650 feet and hands him the BIG TOLD card. (Being an extremely competent flight engineer, he did prepare one in advance.)

The BIG TOLD card was computed for 7,000 feet. The numbers the pilot reviews look like this:

ACFT GROSS WT: 116,000
RWY: 7,000 FEET
PA: 1,050 MSL
OAT: + 15C
RCR: 23 (DRY)
TOF 1.85 (932 TIT)
$V_{Refusal}$: 99 KIAS
$V_{Crit\ Eng\ Fail\ Spd}$: 85 KIAS
$V_{1.1\ Takeoff}$: 99 KIAS
$V_{MCA\ 1\ IN}$: 94 KIAS
$V_{OBSTACLE\ CLR}$: 111 KIAS
$V_{MCA\ 1\ OUT}$: 98 KIAS
$V_{3\ CLIMB}$: 154 KIAS
$V_{MCA\ 2\ OUT}$: 135 KIAS
CFL: 3,650 FEET
GRND RUN: 2,450
$V_{MCG\ (BOOK)}$: 91 KIAS

(Use this number only if you KNOW that BOTH your outboard engines have the old-style mechanical prop governors.)

$V_{MCG\ (+\ 15\ knots\ corrected)}$: 106 KIAS

(Use THIS number if you don't know what type governor is installed on the outboards OR if you KNOW you have the newer type Servo governors.)

Can the crew make a safe intersection departure?

The initial portion of this discussion looks at the decision ONLY from a "length required" perspective. Critical Field Length MUST be adjusted for Vmcg. If Vmcg exceeds Vcefs, the actual CFL required MUST be "backed in" using Vmcg as the Critical Engine Failure speed, or the gross weight must be reduced to allow Vcefs to equal Vmcg for a successful takeoff to be made after engine loss.

Since the Minimum Field Length for a "normal takeoff" is CFL, it would help to know that CFL is the distance required to accelerate on FOUR (4) engines to V (CEFS), lose an engine (zero thrust) and either STOP or CONTINUE the takeoff (accelerating to V 1.1 stall speed power off — (takeoff speed) — on the remaining THREE (3) engines in the SAME distance. See figure 1.

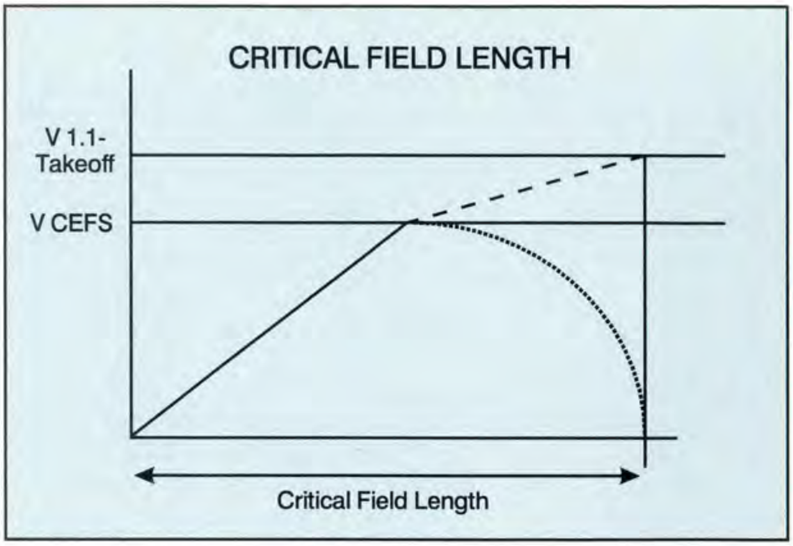


FIGURE 1

So given our TOLD card, we can accelerate to 85 KIAS, lose an engine, and STOP or accelerate to 99 KIAS within 3,650 feet (if we don't look at Vmcg).

Think about this, though.

WHEN was the last time you executed a four-engine takeoff roll, lost one, accelerated on three, and completed a three-engine liftoff?

What EXACTLY is required to make such a takeoff successful?

What EXACTLY is required to make an ABORTED takeoff successful?

We make no apologies for the length of this article. Its content and lessons makes it well worth the space.
Editor

CFL REQUIREMENTS C-130-1-1

START CONDITIONS:

1. Charted power MUST be set PRIOR to brake release. (NO ROLLING TAKEOFF.)

STOP: *Max effort required*

2. Two in reverse and two in GI initiated within 3 seconds of engine failure (zero thrust).
3. Max antiskid braking (if operative and

continued on next page

What EXACTLY is required to make an ABORTED takeoff successful?

charted) established within 3 seconds of engine failure (zero thrust).

4. Critical engine (No. 1) **windmilling on NTS** (flamed out) **NOT SHUTDOWN IAW Dash One Ch 3 ABORT PROCEDURE.**

TO GO:

1. **THREE ENGINES AT T/O POWER** (no power reduction on any engine).

2. Critical engine (No. 1) windmilling on NTS (flameout).

3. Without nosewheel steering.

(With NWS adds to critical engine failure speed and subtracts from Vmcg. BUT NWS is USELESS above 80 KIAS and will probably result in an uncontrollable aircraft due to oversteering.)

Notice that the No. 1 engine is not shut down on the abort IAW section 3 of the Dash One.

Why would the data be based on **not feathering the engine?**

First, there are only 3 seconds built into the charts from the point of engine failure to the establishment of MAX antiskid braking, identification of the malfunctioning (flamed out) engine, determine which two engines to reverse, and to get those two engines moving into max reverse.

Three seconds from failure to stop action.

How long does it take for the engineer to tell the pilot which engine has failed? The pilot may know which wing (the aircraft will veer into the dead engine) but not which engine. It may take more than 3 seconds to identify and communicate the engine (depends on the flight engineer—some are more outspoken then others, some may want to be SURE they are right!).

How long to coordinate a shutdown? Don't know! EVERYONE is different. How do YOU brief it?

If the decision is made to take off, the priority IAW the Dash One is to maintain direction control and get airborne.

Then: Gear up within 3 seconds and feather the engine within 6 seconds of ****liftoff****.

No correction for retarding the asymmetrical throttle for Vmcg or Vmca nor trying to feather the engine while making your run to takeoff speed. Why, do you think? How long does it take to coordinate that shutdown? Can we get all that done in even **6** seconds? Wow!

What about REFUSAL SPEED? Defined as the maximum speed an aircraft can accelerate to with all engines at takeoff settings and stop within the remaining runway.

What factors is IT based on?

START CONDITION:

1. Charted power set PRIOR to brake release. Again NOT a rolling takeoff IAW Chapter 2 of the Dash One.

STOP: Max effort required

1. Two in reverse and two in GI initiated within 3 seconds of engine failure (zero thrust).

2. Max antiskid braking (if operative and charted) within 3 seconds of engine failure.

3. Critical engine (No. 1) windmilling on NTS.

Again, NOT SHUT DOWN IAW DASH ONE ABORT PROCEDURE.

If runway available is EQUAL to CFL, refusal speed equals critical engine failure speed. In our case: 85 KIAS.

When we have a valid refusal speed, what ELSE do we need on our TOLD card?

Acceleration CHECK speed and time. Sounds an awful lot like a MAXIMUM EFFORT TAKEOFF, doesn't it?

It is NOT. Because we have CFL, we have enough runway for a SAFE takeoff condition, NOT a MAXIMUM EFFORT condition. See figure 2.

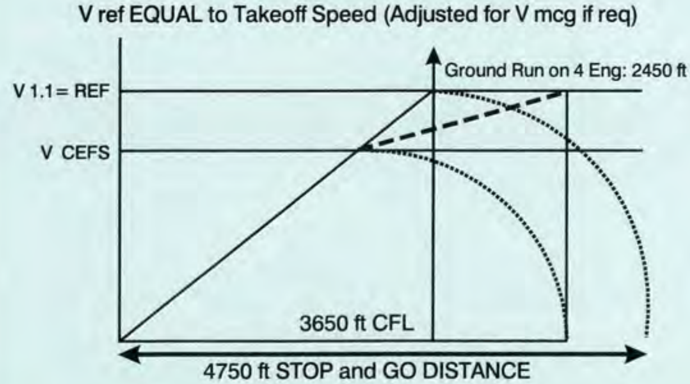
A bit of history: In 1992, AMC put out a message that increased the minimum runway for a NORMAL takeoff to be at least that required to make refusal speed and takeoff speed (adjusted for Vmcg if lower than takeoff speed) equal.

This was done primarily to remove Vmcg from the equation. Lockheed notified AMC that since Hamilton Standard changed the propeller governors to a servo-controlled type, the charted Vmcg in the book was too low—at least 15 knots too low. The servo gov-

FIGURE 2

31730Z DEC 1992 - AMC MESSAGE

Defined Min Field Length for NORMAL TAKEOFF
as the runway required to make:
V ref EQUAL to Takeoff Speed (Adjusted for V mcg if req)



V REF EQUALS V 1.1

ernor would slam the blades onto the low-pitch stop much faster than the old mechanical type, which resulted in a higher Vmcg. Lockheed suggested that the charts be redone to reflect the new speeds. AMC decided that the flight tests would cost too much and changed the way we computed min field length for a normal takeoff instead.

When we went to ACC, the former AMC C-130s changed their procedures to comply with ACC's regulations. The ACC C-130 types (primarily long runway denizens) felt that the min runway for normal operations had been CFL "for years." Why change something "that works"?

Now, BACK to CFL for minimum runway for normal takeoff!

If we do use STOP and GO distance (takeoff and refusal equal) as the minimum field length for NORMAL takeoff, what advantage do we enjoy?

1. With Vref = V1.1 (or Vmca 1 in ground effect) and Vmcg effectively removed, we can safely fly or stop the aircraft at decision speed!

2. We do not have to accelerate on three engines on the ground to attain flying speed.

Although a reject at takeoff speed still requires a max effort stop (3 seconds to ID the bad engine, initiate reverse on the good engines and full antiskid braking), WE DON'T HAVE TO…

You should be able to fly!
WHY IS THIS IMPORTANT?

Remember this chart (see figure 3). Below Vmcg it is IMPOSSIBLE to control the adverse yaw generated during the engine failure. In fact, the higher the airspeed, the more violent the onset of yaw. Test data shows that even at takeoff speed adjusted for Vmca and Vmcg, the failure is QUITE exciting.

Let's return to our original scenario. With CFL in their pockets, the intrepid aviators pull into the intersection and pour on the coals. At 94 KIAS, No. 1 engine ingests a bird and quits. Oh, what's a mother to do? See figure 4.

We are past refusal speed and do not have enough runway to stop. But can we continue the takeoff?

Logic says that since we are a lot closer to takeoff speed than the computed refusal speed, we should be able to get airborne in less distance than CFL. So NO SWEAT. RIGHT? LET'S SEE.

What was our computed Vmcg +15 knots for the new servo governor? (106 knots)

What is the definition of **Vmcg**?

The speed at which we can maintain 25 feet of runway centerline, No. 1 out on NTS, MAX power on the other three, normal bleed, half flaps and high boost, FULL rudder deflection (180 pounds pedal force), and wings level.

The Vmcg (with nosewheel steering) chart assumes continuous input to nosewheel steering and forward pressure on the yoke UNTIL reaching the Vmcg (without nosewheel steering speed). The Without chart assumes an icy or wet surface where nose steering is abandoned at minimum rudder effectiveness speed.

In order to maintain directional control, we would need to reduce power on the asymmetric engine. In this case, No. 4 would have to be pulled back about 6,000 inch-pounds (7,700 pounds about crossover) to go straight. How

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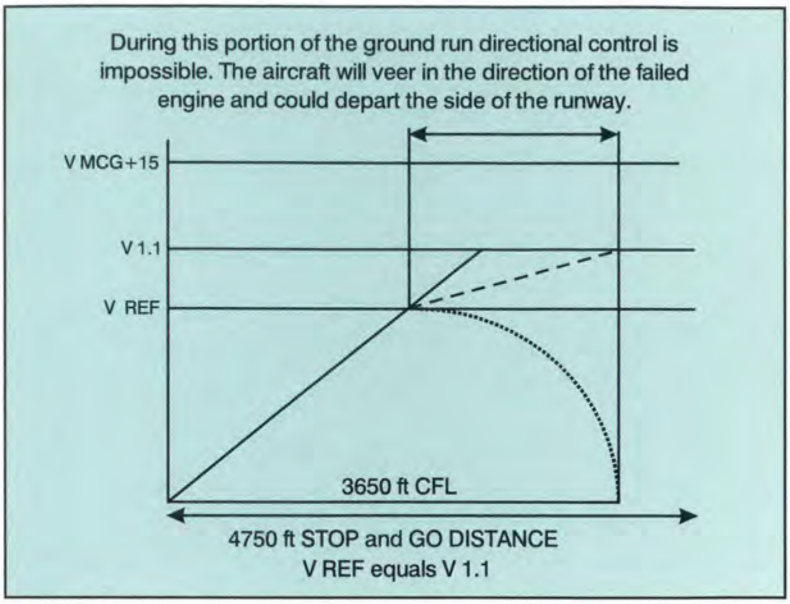


FIGURE 3

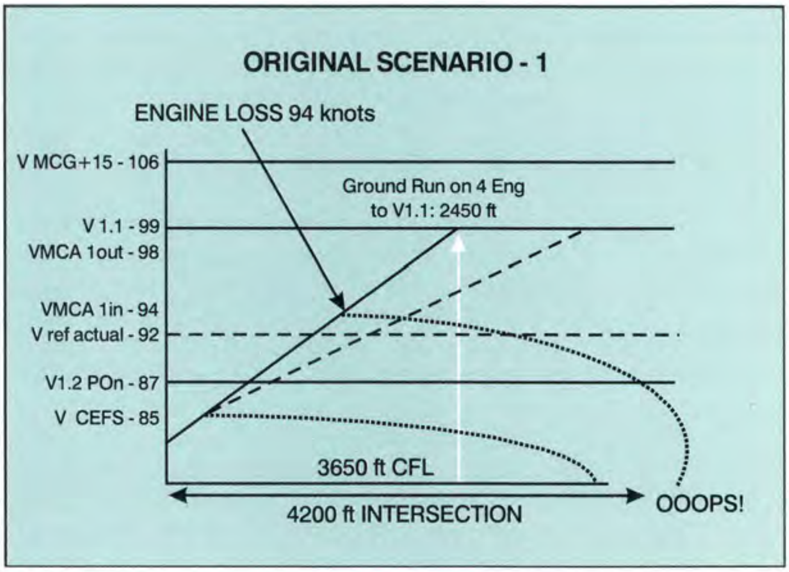


FIGURE 4

What about REFUSAL SPEED?

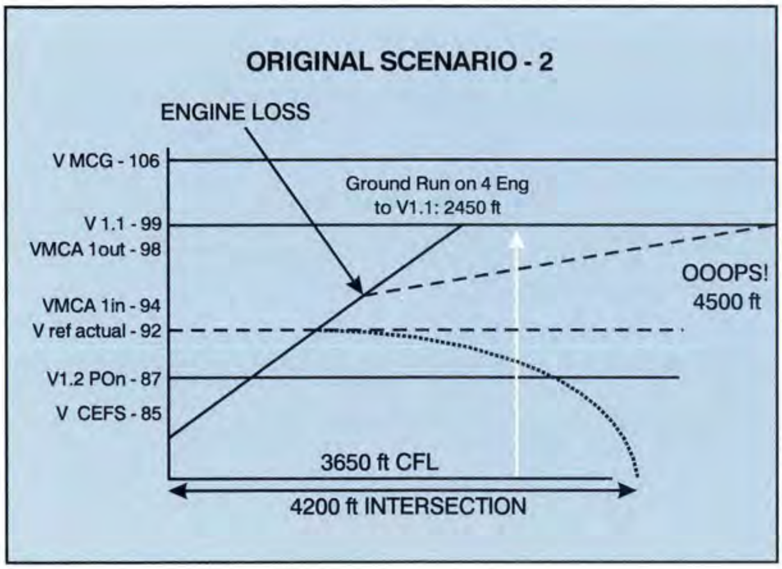


FIGURE 5

Many of us have placed ourselves in a similar situation and not realized it. The ONLY reason you are still here is that MURPHY did not trump your takeoff roll.

did this affect the takeoff? See figure 5.

NOT IN OUR FAVOR AT ALL!

Our true acceleration would look like this! The 5-knot run to takeoff speed requires more runway than remains. The 6,000-pound reduction prevents us from becoming a 116,000-pound lawnmower in 1 to 2 seconds on a 100-foot-wide runway.

We will need FURTHER power reduction to correct back to centerline with full rudder deflection. What would be the most probable PILOT response now?

GRAB THE NOSEWHEEL!

How much nosewheel correction is allowed at 94+ knots? Is overcontrol the nosewheel probable at this speed? (You bet!)

If you did not have the engineer recompute a new refusal speed, you might try to reject at the original 94 knots. What would happen? (Off the end.)

If we are "out of control" on the ground, then maybe by getting airborne we can fly this puppy out of trouble. After all, **we must be above max effort takeoff speed (V1.2 vs power on—87 knots) and above Vmca 1 in ground effect—94 KIAS). Right?**

For Vmca 1 in ground effect to be accurate, where must the flight controls be positioned **before** liftoff? Rudder—**RIGHT FULL RUDDER.**

Aileron FULL DEFLECTION to ensure liftoff with the required 5-degree bank—**FULL RIGHT YOKE.**

Have you EVER tried this in the simulator? If you got it right, you should be in the circus!

Most likely the best you got was wings level. The actual Vmca 1 is 104 (+10 knots). More likely you had some bank INTO the dead engine. Boosting Vmca 2 knots for EACH degree of unfavorable bank. These numbers are in the 1C-130B-1-1. Other models have MUCH higher adverse bank increases. See figure 6.

Is controlled flight MORE or LESS likely? (LESS.) Oh…for those of you betting on MAX EFFORT takeoff speed to fly, what is V(1.2 power on) METO speed based on?

Four engines and a fully blown wing.
NO ENGINES OUT!

What does closing the bleeds do for us in this situation? See figure 7. **By closing the bleeds, we have an increase in Vmca and Vmcg by approximately 3 KIAS.**

Thus our true Vmca 1 in and out of ground effect increase to 97 and 101 KIAS respectively and our Vmcg is increased to 94 and with the additional 15 knots is corrected to 109 KIAS.

Have we helped ourselves or hurt ourselves by closing the bleeds? HURT!!! What appears like a NORMAL takeoff is, in fact, far from it.

Many of us have placed ourselves in a similar situation and not realized it. The ONLY reason you are still here is that MURPHY did not trump your takeoff roll. If he had, you would face two VERY undesirable options: Reject into the overrun (if there IS one), and hope you can get it stopped before the grass, OR use the grass (if there IS any) on the side of the runway to take off where safe flight may not even be possible.

Well, now that we know about how NON-NORMAL a NORMAL takeoff can be, how bizarre are MAX EFFORT OPS?

The minimum runway for a max effort takeoff is defined as the runway length required to accelerate on four (4) engines to decision speed (refusal speed), lose an engine and STOP or CONTINUE to accelerate on THREE (3) engines to 1.2 $Vs_{Power\ On}$ (max effort takeoff speed) in the remaining runway.

Notice that when discussing max effort performance, Vmcg is NOT discussed. This is because in MAX EFFORT OPS, **ENGINE LOSS IS NOT CONSIDERED**—JUST the *ability of the aircraft to execute the takeoff and climb out on four (4) engines.* **Period.**

In peacetime, the 3,000-foot minimum runway requirement has saved many engine failures on assault strips. MORE SO is the fact that MOST assault strips are 3,500 feet. See figure 8.

At the gross weights we practice MAX effort takeoffs, we NORMALLY have CRITICAL FIELD LENGTH. As such, we can make a **SAFE** takeoff after engine loss EVEN FROM A DIRT RUNWAY as long as CFL (adjusted for Vmcg) is available.

In our example, EVEN on a 3,000-foot run-

way, it is not possible to get to safe flying speed after the charted refusal speed. MCR 55-130 defines TWO types of C-130 capability, "normal" and "max effort."** The implication is that we have one or the other.

Where:

NORMAL TAKEOFF

Min runway = critical field length

OR

MAX EFFORT TAKEOFF

Min runway = charted field length for METO—correct for Vmca if applicable—**MCR 55-130, para 5.20.4.**

Depending on mission requirements/environment—**MCR 55-130, para 5.20.4.1.**

Climb to clear REAL or SIMULATED obstacles at Vmca + 10 KIAS if Vmca used—**MCR 55-130, para 5.20.4.1.**

Climb at max effort obstacle clearance speed IF OBSTACLE IS A FACTOR (cannot be cleared using Vmca and Vmca + 10 knots) if METO used—**MCR 55-130, para 5.20.4.1.**

All this seems to imply that you can FLY at these speeds. As we have seen, *it ain't necessarily so.*

(Obstacle clearance is on FOUR engines—three-engine climb capability NOT addressed since it is not addressed in max effort takeoff performance.)

The pilot will make the ultimate decision on which to use—**MCR 55-130, para 5.20.4.3.**

If CFL is not available, it is UNLIKELY a successful takeoff could be made in EITHER case. C130-1-1, page 3-, 3-28, 3-29, and *FIVE WARNINGS!*

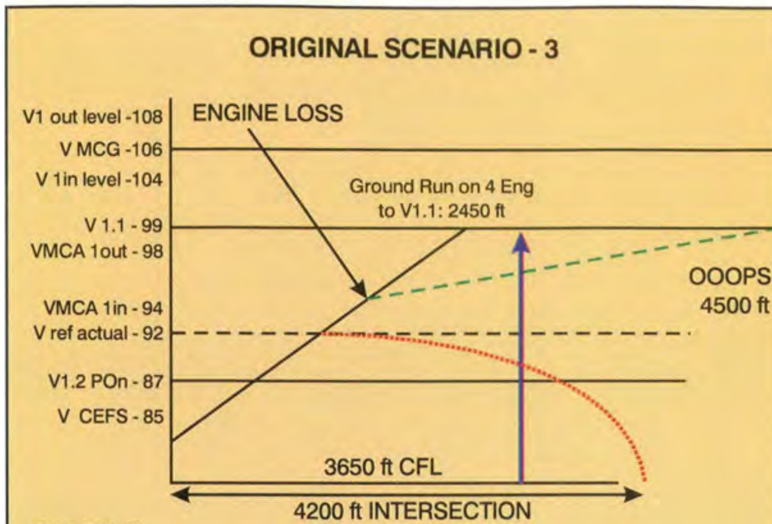


FIGURE 6

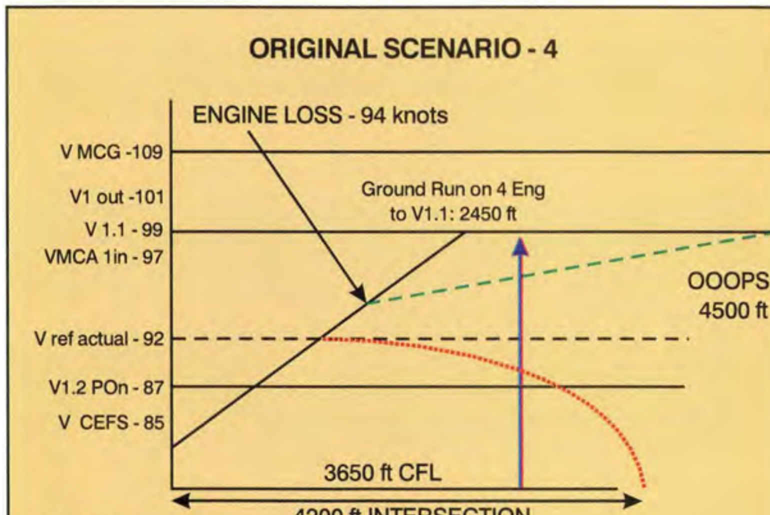


FIGURE 7

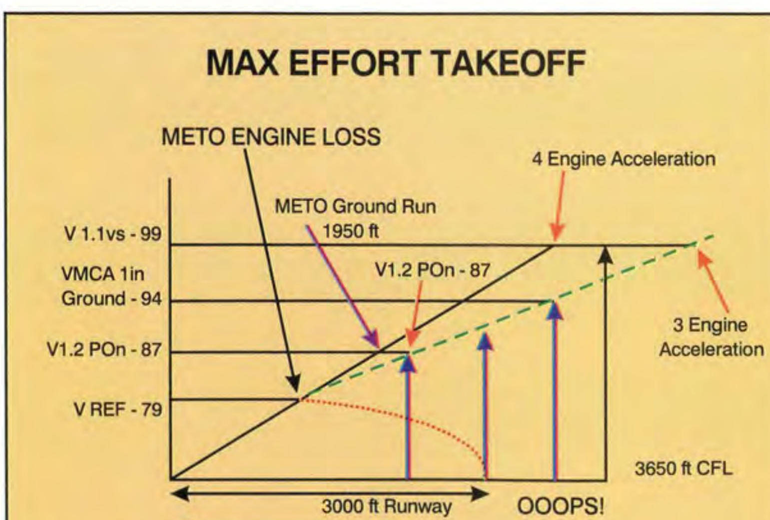


FIGURE 8

—FOOD FOR THOUGHT—
—Technique, Technique ONLY—

Since the next bit is "politically incorrect," take the following as an old guy's rambling. I suggest THREE categories of takeoff capability:

"NORMAL" TAKEOFF

Min runway = STOP AND GO DISTANCE or greater—Vref equal to or greater than 1.1Vs (takeoff speed) adjusted for Vmcg + 15 knots if required.

Restrictions:

RIGHT SEAT TAKEOFF—minimum runway (transfer command in flight idle? How long does THAT take? THEN try to shut down the engine?)

Possible FLIGHT IDLE shutdown of engine on ABORTED takeoff. (ACTUALLY DEPENDS ON <u>HOW MUCH</u> RUNWAY AVAILABLE EXCEEDS STOP AND GO DISTANCE.)

(A good WAG at 100 KIAS is *1* second for every 200 feet. How much time do **you** need

continued on next page

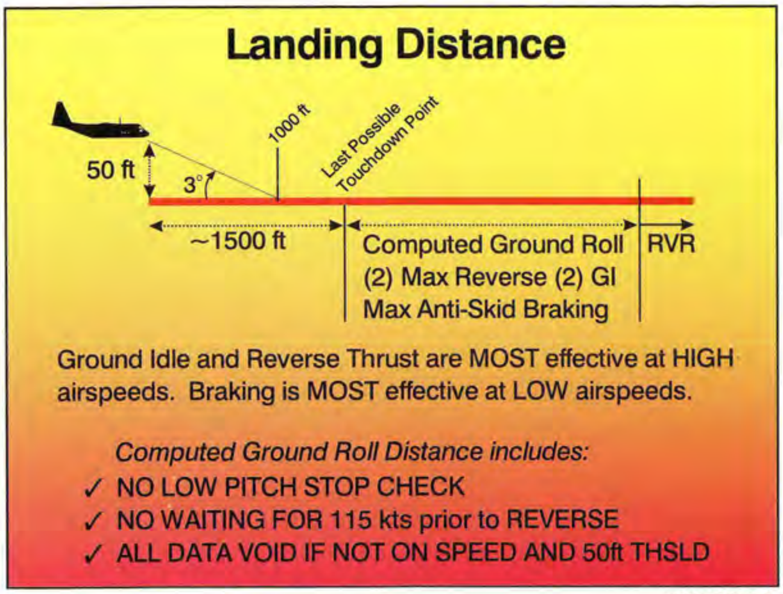


FIGURE 9

Critical field length is a good place to START but a LOUSY place to end your takeoff strategy.

for the task?)

Intersection takeoff now possible without NEW TOLD DATA.

NORMAL PROCEDURES can be used by the crew because *THIS IS* how we **NORMALLY** make "normal" takeoffs.

"SAFE" TAKEOFF (could be on a dirt or short or assault runway!)

Min runway = critical field length or greater (up to minimum normal length).

Vref equal to or greater than Vcefs adjusted for Vmcg + 15 knots, but LESS than above.

Restrictions:

1. Acceleration check required.
2. Max effort abort required.
3. NO Flight Idle shutdown during reject. **(If prop malfunctions, plan on runway departure either to side or off the end.)**
4. MAX ANTISKID BRAKING REQUIRED. **(IF HEAVY WEIGHT, PLAN ON EMERGENCY EGRESS DUE TO BRAKE OVERHEAT.)**

"UNSAFE" or "MAX EFFORT" TAKEOFF

Runway available is LESS than CFL but equal to or greater than field length for METO.

Three-engine capability MOST LIKELY NOT POSSIBLE.

Three-engine climb-out capability MOST LIKELY NOT POSSIBLE.

LEFT SEAT ONLY TAKEOFF.

ORM SHOULD REQUIRE AT LEAST WING COMMANDER OR HIGHER APPROVAL. THIS IS ONLY FAIR SINCE WHOEVER APPROVES THIS IS ACCEPTING A VIRTUALLY **CERTAIN CLASS A MISHAP IF AN ENGINE FAILS.**

(It REALLY SEEMS STUPID to let an aircraft commander make a decision like this yet REQUIRE him to call back if the weather is worse than it was when the ORM checklist was done. DUHHH…)

TAKEOFF LESSONS LEARNED

Critical field length is a good place to START but a LOUSY place to end your takeoff strategy.

Anytime you have less runway than that required to have takeoff speed and refusal speed be equal, you have a VALID refusal speed. An acceleration check is required and MANY other "non-normal" things have to be done and thought about IN ADVANCE before a successful takeoff can be made.

SO WHAT ABOUT LANDINGS?

I'm SO happy you asked.

MCR 55-130 defines the minimum runway for a "NORMAL" landing to be the charted landing distance for the desired flap setting PLUS an RVR correction. It also defines the minimum runway for a MAX effort landing to be GROUND ROLL PLUS the 500-foot touchdown zone.

Charted landing distance is based on:

1. Fifty feet over runway threshold AND ON-SPEED (additional height invalidates runway required to stop—LOTS MORE).
2. Normal glidepath to touchdown (3 degrees)—high school trig plots this aimpoint at 981 feet from TSHD.
3. Normal round out and flare to touchdown attitude.
4. BOTH main gear down within 1,400 to 1,500 feet from threshold.

GROUND ROLL STARTS HERE

STOP ACTION ACHIEVED IN ***1* SECOND.**

STOP ACTION DEFINED AS:

1. Transition to taxi attitude (nosewheel down).
2. MAX ANTISKID braking with cold brakes.
3. Selected power achieved upon reaching taxi attitude (two in reverse and two in GROUND IDLE).

ALL THIS IN ONE SECOND!

NO time built in for a PAUSE IN GROUND IDLE to check for LOW PITCH STOP retraction.

NO time built in to WAIT FOR 115 KIAS for GROUND IDLE or reverse.

"WAIT!" you say. "What about the RVR 'PAD'?"

"Well," says I… At about 100 KIAS, that works out to 2 *SECONDS* for 500 feet and *4 to 5 SECONDS* for 1,000 feet. Certainly lots of time to frolic here!

But why an RVR correction at all?

BECAUSE YOU NEED IT!!!!

Basic Instrument School teaches that in reduced visibility and/or nonprecision approaches the tendency is to (are you ready?) be HIGH ON FINAL and LAND LONG. Whoa!! These are BOTH bad things. THEY INVALIDATE LANDING DISTANCE! (C-130-1-1) See figure 9.

Exactly HOW different is NORMAL LANDING FROM ASSAULT LANDING?

Well, you get a "normal glidepath" to touchdown. AFTER THAT IT'S AN ASSAULT STOP!!! See figure 10.

On an assault landing height over the threshold is WHATEVER IT TAKES TO FLARE INTO THE MARKED TOUCHDOWN.

So how much EXTRA runway do you need to do a "normal" landing? How much "extra" do you need to check for low-pitch stop retraction?

How much "extra" do you need to "pause" in GROUND IDLE? How much "extra" runway do you need to transfer command back to the LEFT seat pilot? Remember—*1 SECOND* for *EVERY 200 FEET OF EXTRA RUNWAY.*

AND NOW FOR THE FINAL THREE MYTHS!

BRAKES STOP THIS AIRCRAFT!

A "mantra" in many units, the brakes are only ONE part of the stopping equation. Although up to 90 percent of the total aircraft energy is absorbed by the brakes in a performance (max effort) stop, many factors influence how much of that energy is actually left to be absorbed. The harder the touchdown, the more of the energy is absorbed by the struts. The sooner you get into GROUND IDLE (or below), the more energy is absorbed by drag deceleration.

Lockheed conducted a brake requalification test for the 3,000-PSI brake upgrade for C-130H. The test placed a wheel and tire assembly on a test jig. The jig was weighted to represent a 155,000-pound aircraft. The wheel was spun up to 139 knots at the start of the test. The ambient (room temperature) brakes were applied at 3,000 PSI in a maximum braked stop.

Initially **(from 139 knots to 120 knots),** a braking torque of **30,000 pounds** with "near vertical" deceleration was indicated.

However, from **120 knots to 80 knots,** a gradual decrease in braking torque (to a value of **20,000 pounds**) and resultant decrease in deceleration was experienced due in part to brake assembly heating.

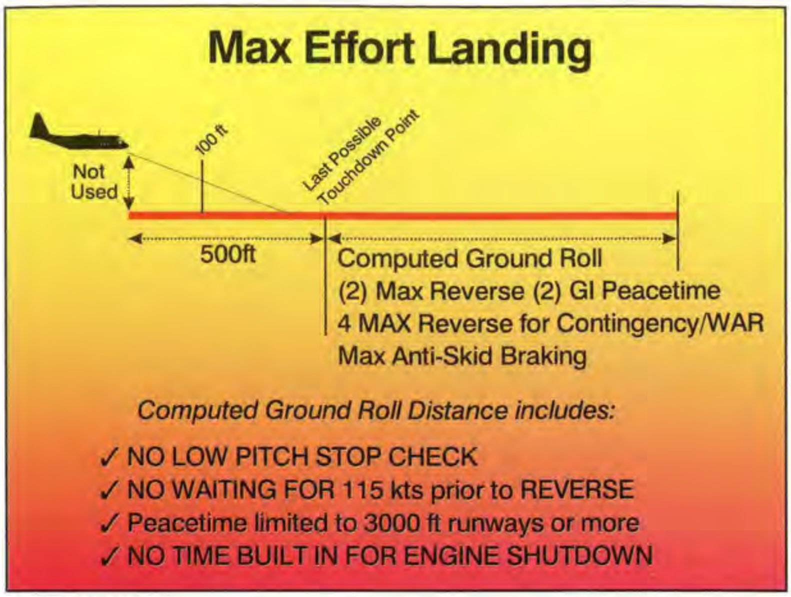


FIGURE 10

From **80 knots to 40 knots,** braking torque varies around **20,000 pounds** as heat energy is transferred to the wheel and tire assembly.

From **40 knots to 19.7 knots,** braking torque drops to **15,000 pounds and remains so until wheel stoppage.** This is about HALF of the initial stopping deceleration.

This performance IS built into the stopping charts! Pilots need to be aware of the "feel" of a properly decelerating aircraft.

THE AMOUNT OF FELT DECELERATION AVAILABLE IS A FUNCTION OF ENERGY ABSORPTION.

The faster AND heavier you are, the more energy is absorbed and the quicker the deceleration drops off. It is possible at high gross weights and airspeeds to EXCEED the maximum energy capability of the brake, wheel, and tire assembly BEFORE the aircraft stops. Brake fire and wheel deflation are NOT the worst things that can happen. Without VALID brake energy charts, the effect of no-flap heavy-weight landings on the ability of the aircraft to stop cannot be judged in advance. If you have to do a max braked landing, ASSUME HOT BRAKES and evacuate the aircraft!

If you have to do a max braked landing, ASSUME HOT BRAKES and evacuate the aircraft!

While we are talking about brakes, the antiskid system should be at LEAST mentioned. If you have EVER done a full FCF or a NO-S--- assault landing, you have felt the antiskid cycle. It "feels" like the brake pedals are vibrating against your feet. What you are "feeling" are the brake valves dumping pressure when the wheel transducers detect what the engineers call an "incipient skid" condition. Basically, one wheel is slowing down quicker than the other three. The antiskid ports the pressure

continued on next page

You would NOT be the FIRST pilot to assume that your antiskid has failed and TURN IT OFF just when you need it most.

off, and the wheel then spins up to the other three, and the pressure comes on again.

What is mentioned *ONLY IN THE ACCIDENT INVESTIGATION GUIDE* is the fact that at high gross weights and/or high airspeeds, the rolling torque of the wheel can (AND MANY TIMES DOES) exceed the braking torque of the wheel. THUS NO CYCLING until the aircraft slows down. You would NOT be the FIRST pilot to assume that your antiskid has failed and TURN IT OFF just when you need it most.

ENGINE PERFORMANCE ISSUES

This is the "OTHER" side of the aircraft-stopping equation.

Lockheed tests performed in May 1986 with the Dash 15 engine and charted thrust produced in GROUND IDLE and maximum reverse. Speeds up to **160 KIAS** were charted against braking thrust produced.

It should come as no surprise that the HIGHER the true airspeed, the MORE engine braking thrust was produced. Drag on a flat blade angle is higher than a positive blade angle. When the blade angle goes NEGATIVE, well!!

"But, Gee, Lou, the C130-1-1 landing charts show only an approximate 400-foot decrease when you adjust for max reverse. What's with that, eh?"

"Remember the base line," says I. The charts **compare the difference** between GROUND IDLE THRUST through MAX REVERSE THRUST. Therefore, it APPEARS that reverse only provides about 400 feet difference to landing distances. In reality, the contribution from **GROUND IDLE** (NOT FLIGHT IDLE!) is **so great** that the extra braking form reverse looks really bad.

The charts assume you are in AT LEAST GROUND IDLE within *1* SECOND OF MAIN GEAR TOUCHDOWN, REGARDLESS OF TOUCHDOWN AIRSPEED.

Also, the contribution from MAX REVERSE THRUST is negligible BELOW 60 knots. So you have to look at what speed are you touching down, AND how long is MAX reverse effective. Example: If your touchdown speed is 110 KIAS, MAX reverse is most effective for only about 50 knots. GUESS WHAT! YOU ARE ALSO USING MAX ANTISKID BRAKING! How much "extra" distance can you shave off in only 5 to 8 seconds? Conversely, try leaving the props at FLIGHT IDLE. A 10,000-foot runway may not be long enough.

THE FINAL MYTH: WHAT ABOUT BOGDOWN AT 115 KIAS?

This is the LAST point, I swear! Engine performance engineers explained "high-speed bogdown" this way:

"Bogdown occurs when the torque required to turn the propeller at a given blade angle exceeds the torque being produced by the engine."

Torque produced by the engine varies by the amount of fuel and air going into the burner cans. Being in reverse (or GROUND IDLE for that matter) disturbs the ram airflow going into the compressor. This results in LESS air. Less air means LESS fuel (function of fuel control). LESS FUEL AND AIR results in LESS power available to turn all that junk up front.

High density altitude results in less air for the engine to breathe (all other things being equal). High airspeed results in higher loading on the propeller and more torque required to keep that puppy spinning happily at 100 percent.

Compressor efficiency is THE NUMBER ONE FACTOR in the potential for engine bogdown since it is the single most important factor in engine torque production.

Since the prop is directly coupled to the engine, as engine power declines, the RPM of the prop will decay. As the prop RPM decays, the engine RPM decays.

At approximately 94 percent (could be as low as 89 percent, depending on several variables), the acceleration bleed valves may open. The operative word here is "may." The reason this is "may" and NOT "will" is because there is a one-way check valve in the fourteenth stage bleed air line that goes to the fifth and tenth stage valves.

At 94 percent, the pressure from the fourteenth stage is not sufficient to hold the valves closed against the tenth stage pressure. Initially, the check valve starts to open, bleeding off the pressure holding the valves closed. The rate of pressure bleed-off is determined by the condition of the one-way check valve. A dirty valve, one that has been exposed to sand or grit-filled air (since it comes from unfiltered tenth-stage air), releases the trapped air more slowly and thus will keep the acceleration valves closed LONGER than they are supposed to. The net result is a "flame-out" since the compressor cannot "unload" in order to keep running. Lots of dirt landings, or runway de-ice operations that use a grit and salt mix, are a prime cause of dirty check valves. The engine can run even if the acceleration bleeds open. It happens all the time in low-speed ground idle. In fact, the reason you guard the throttles when shifting to low speed is to shut down the engine if the bleeds do not open.

TORQUE AVAILABLE (Ta) vs. TORQUE REQUIRED (Tr) curves were provided to the Honduras mishap board. Due to the nature of the mishap, the engineers, assisted by extrapolated power, required curves up to 150 KIAS for MAX reverse at various engine efficiencies and temperatures. To give you some indication of the ranges we are talking about, these are some conditions and airspeeds that result in Tr exceeding Ta at NORMAL bleed in MAX REVERSE.

	95% Eng	**100% Eng**
120F	104 KIAS	109 KIAS
100F	112 KIAS	117 KIAS
90F	120 KIAS	128 KIAS
80F	130 KIAS	138 KIAS
75 F	135 KIAS	145 KIAS
70F	140 KIAS	150 KIAS
60F	153 KIAS	160 KIAS

Note that at these speeds, the engine does NOT "flame out." It will start to slow down. This point is **ESSENTIAL** to emphasize. The engine **STILL PRODUCES STOPPING THRUST EVEN THOUGH IT IS BOGGING DOWN!** The bogdown will raise turbine inlet temperature and strain the engine. This is NOT good and over time will hurt the engine's life. It "could" also damage the engine enough with one good "deep" bogdown to make the engine unsafe to use again. Maintenance must inspect the hot section to make sure you did not melt anything important. If the engine does "flame out," a flameout inspection must be performed prior to flight anyway. Because engine damage is the possible outcome of a "bogdown," we add a "NOTE" to the Dash One saying "DON'T DO THIS" unless you need to. Continued use of this technique or procedure will be bad. NOT engaging altitude hold with greater than 300 FPM is a "NOTE." Over time, the pressure controller will be broken and no longer work for the next pilot. This is a note because it's a BAD technique and will, over time, cause damage.

This is the final point. **WHEN IS PERFORMANCE CRITICAL?**

MCR 55-130 uses this term a lot. This is when a BIG TOLD card review is "required" by the pilot. HOW DO YOU KNOW IF YOU DON'T REVIEW THE BIG CARD? This is one of those circular logic bottles that mishap board investigators spend precious hours debating. The LAST thing we want is MORE stuff that is reactionary in the checklists and Dash One, BUT... This one is a real "GOTCHA."

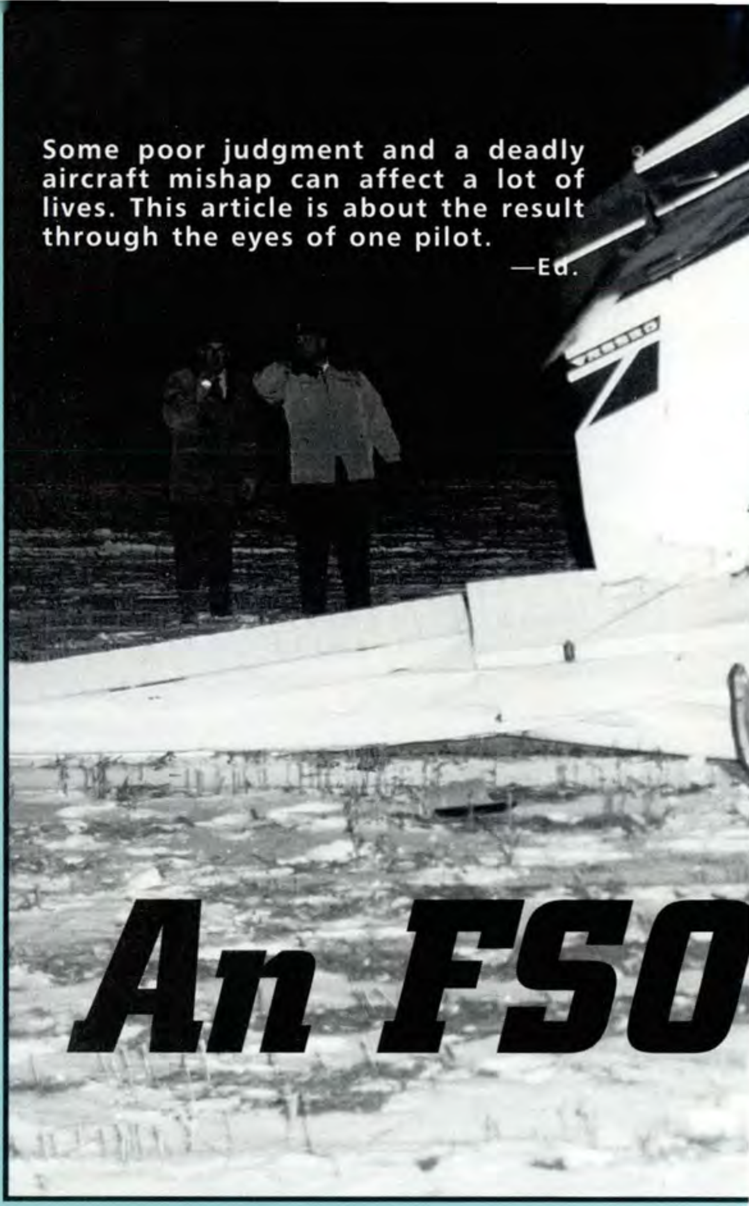
Knowing you can land a C-130 no-flap without normal brakes in a 7,000-foot runway by looking at the no-flap landing distance belies the difficulty of stopping on the runway without antiskid or nosewheel steering. I would call this "critical." But what about a runway that exceeds the 50 percent flap landing distance by 1,000 feet? Is that critical? What about 1,500 feet? Is that critical? What about 1,500 feet? What about 2,000 feet? Obviously, there is a criterion that will work for you if you convert distance into seconds and figure out what you can accomplish in that time. Anything less is "CRITICAL," and you need to be on your toes.

Well, there you are. Probably more BS on TOLD data than you have ever seen in one place before.

Well, there you are. Probably more BS on TOLD data than you have ever seen in one place before. I have been flying C-130E models since August 1974 and did not know HALF of this stuff in all those years. I hope, at the very least, it raises your awareness of the importance of TOLD and the hazards of writing changes to the Dash One without looking at the impact on OTHER publications and the underlying performance data. They told me that changing the Dash One would cost 1,100 dollars per page—"which pages do we need to 'revalidate'?"

If you look at the flight test dates on most of the charts, you will quickly realize that most of them need to be revalidated. So, since you are the final authority on whether you have enough runway to take off or land on, it would behoove you to have the "clue light" on as to how much that should be. ✈

MAJ MARK THOMPSON
CAP-USAF, Pacific Liaison Region
McClellan AFB, California



On 3 November 1997, the Civil Air Patrol lost a Cessna 182 along with two crewmembers dead and one seriously injured. The aircraft was on a search mission for another suspected downed aircraft in the Sierra Nevada Mountains south of Lake Tahoe. The aircraft struck trees and impacted the ground along the side of a mountain at approximately 8,700 feet elevation. A joint NTSB/CAP-USAF/CAP investigation is ongoing.

It reads just like a newspaper article or opening paragraph of a mishap report—sterile, distant, objective.

I don't know the men who died or why they died. However, I do know the shock and dismay that shook an office, a region, and state. I do know that tears were shed by those who knew them. I know they'll be missed by family, loved ones, and, of course, by their brother and sister CAP members.

A deadly aircraft mishap affects many lives. Family members and loved ones will grieve, coworkers will remember the time when..., witnesses will tell their story, and investigators will figure out what happened and report "why."

I used to be one of those fellows tasked with answering the "why" question. I've always held that if you're going to do a tour as a Flight Safety Officer (FSO), do it at an Undergraduate Pilot Training (UPT) base. That's where I cut my teeth. You're not for want of action—student pilots operating fast-moving aircraft all in close proximity to one another. Remarkably, the number of serious mishaps at UPT bases is considerably smaller than you might guess. The UPT environment is intense and disciplined, with good reason. The following is a true story featuring you in the FSO seat. Buckle up!

* * * * * * * * * *

"Sir, it's Frank. I'm at command post, and we're running checklists. Looks like we had a light aircraft accident about 10 miles east of the base, a Cessna 150 with two recent grads on board. Anyway, the convoy's getting ready to depart within the half hour, and the boss wants you as the lead IO."

"Is this an exercise?" you respond.

"No, it's for real," he replies.

You pull on some thermals, throw on your flight suit and winter jacket, and run out the door. It's a cold, overcast Sunday in the dead of winter in north central Oklahoma. On the ground is the last remnants of a light powdering of snow. The wind whips through the tree branches long since bare of leaves. That wind! Once you've lived in the Midwest, you never forget that wind. Whistling by the windows, it makes you yearn to stay close to the warmth of home.

Once in the command post, you receive a quick update briefing, and the wing commander hands you a couple of folders, then utters something to you. Two minutes later, you can't even remember what he said—your mind awash. You depart with a fellow FSO driving the packed truck with mishap investigation kits and a photographer in back. You now have time to review the two folders handed to you by the boss. Contained in each folder is information about the two pilots involved in the mishap—standard biographical stuff your class commander had you fill out on the first day of UPT. Also pictures—black and white, unflattering, the kind of picture you remember having taken in the third grade, the kind that upsets mom because it never captures her little boy's good looks.

The pictures—two kids from L Flight. You turn to your buddy FSO. "Larry, you're not going to believe this. Do you remember the two kids from L Flight we flew the night form ride with?"

"Yeah," he said. "They're the two?" he asks you in disbelief. "Damn!"

The crash site is easy to locate by simply watching the news helicopters overhead. At Flight Safety Officer School they try as best they can to prepare you for this day, but their preparation scratches only the surface. You expect the fire trucks and highway patrol cars with red

lights flashing and people milling about. You're not surprised to see some folks in a daze, others seeking information or wanting interviews, and some grieving. You are, however, taken aback by the battlefield quality of the scene and its surrealistic, foggy aura.

The FAA rep introduces himself and advises you that an NTSB investigator will be up from Dallas in the morning. Since the two individuals involved were recent UPT graduates, the Air Force was tossed the investigative baton and left with the scene.

The on-scene commander has holed up in the comm van. The mortuary affairs officer, a young, impetuous lieutenant, having heard you knew the two lads, entreats you to identify the bodies so he can release them to the county coroner. A farmer who'd witnessed the event is just completing an interview with a local news crew while a young woman, who apparently knew the pilots, is in hysterics behind you.

The woman's sobs crack the stoicism you've maintained, and the gravity of the moment comes crashing down on you. In the darkness of a windy, bitingly cold Oklahoma night, under a news cameraman's light, lies the smoldering wreck of a Cessna 150 and two lifeless bodies covered with white sheets. Someone calls from the distance, "I've found where the aircraft struck the trees."

Approximately 150 yards away stands a grove of defoliated scrub oak. You hike across the muddy patch of fallow field and down through a rain-swollen culvert. Pieces of wreckage, like bread crumbs, mark the way. Plexiglas™ and metal form a jagged line from the trees to where the aircraft came to rest. It's obvious where the aircraft's wing struck the uppermost branch. A 4- to 5-foot section of the right wing lies at the base of the tree along with 4 feet of the branch. Safety school doesn't teach much about general aviation investigations. You marvel at how easily and neatly the metal tore away from the wing.

"Four feet higher or five feet wider," you think, *"and no one would've been the wiser."* Of course, that's what mishaps are made of—those fellows who weren't 4 feet higher or 5 feet wider.

Later that evening, you identify one of the two victims. The other was so badly injured he was unrecognizable. Although you're prepared for this moment, you really had no true appreciation for what impact forces do to the human body until you see these broken lads, one of whom you knew but cannot recognize. You've never seen a person look like that before.

At the moment you stare down at the two poor souls, you think, *"My God! This is it! This is forever."* There's no turning back, no saying "I'm sorry." No promising it won't happen again. No "I was only joking and didn't really mean it." There will be no more Friday nights at the club; no more Christmases; no more homecomings; no more hugging a wife, or girlfriend, or kids; no more visiting mom and dad and friends. This is forever.

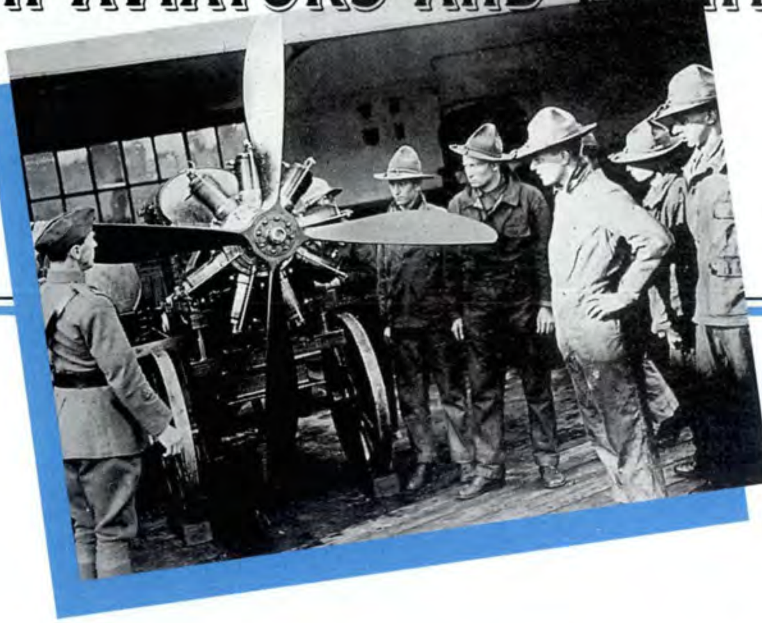
"Damn! Damn!" you murmur to yourself over and over in anger and frustration.

Toward the end of the investigation, the father of one of the dead pilots telephones. He is an ex-Air Force pilot who wants to share some thoughts. Not looking for information or attempting to influence the investigation, he merely seeks a kind ear to hear the other side of the story—his son Bill's story, and how his loss has affected family and friends. You listen attentively but can say little in response.

After the call, you think about his words and how the loss affected every person on base: the two pilots' classmates who, within 2 weeks of graduation, were left with the lingering thoughts of their group's first fatalities; the instructor pilots who feel sorry for the families and a bit let down, having spent a year dedicated to turning out the best, most talented and respected pilots in the world—all of which is now forgotten.

And finally, you—the FSO. After the report is written, your thoughts linger. You never forget that bitter, ill wind. And you forever retain a deep and abiding sense of the fragility of life that can, in one brief moment, be lost forever. ✈

ATTENTION AVIATORS AND MAINTAINERS !



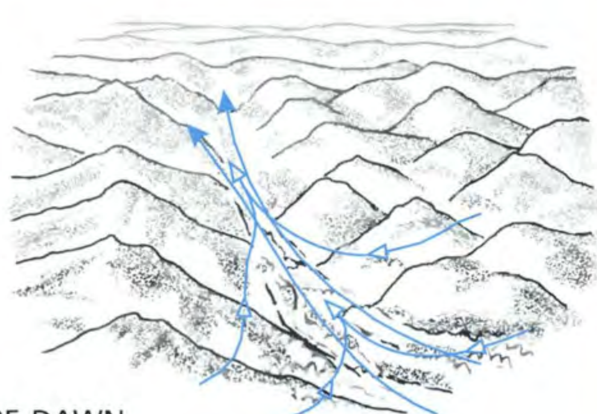
Flying Safety exists for one reason: to promote aircraft mishap prevention. We often do this by sharing lessons others have learned the hard way, so that all may benefit from their experience. We'd like to share the lessons **you've** learned, too.

Please send us your own "There I Was..." anecdotes, stories, and ideas for future *Flying Safety* articles which could serve to inform, advise, or stimulate a greater sense of safety awareness both in the air and on the ground.

Remember: Safety is an attitude!

ERRATUM

We are reprinting the corrected "Pre-Dawn winds" chart which first appeared (without the wind flow arrows) on page 11 in the February 98 issue of *Flying Safety*. We apologize for the wayward electrons in our desktop publishing program and any confusion that may have arisen from the omission.



PRE-DAWN

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WELL DONE AWARD
UNITED STATES AIR FORCE

THE Well Done AWARD

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

Captain **David A. Whitenight**, Aircraft Commander
Captain **Michael W. Ellicott**, Augmenting Pilot
First Lieutenant **John E. Lennon**, Copilot
Master Sergeant **Jeffrey A. Clarke**, Instructor Loadmaster
Master Sergeant **James H. Myhre**, Examiner Engineer
Technical Sergeant **Michael G. Weekley**, Flight Engineer
Staff Sergeant **Francis J. Barnes**, Scanner
Staff Sergeant **Kim R. Russell**, Loadmaster
Airman First Class **Brian K. Petro**, Student Loadmaster

Headquarters 446th Airlift Wing
McChord AFB, Washington

Capt Whitenight and his crew departed Skopje, Macedonia, in a C-141B containing United Nations troops, critical weapons, and time-sensitive blood supplies destined for Zagreb, Croatia, to support United Nations Operation Provide Promise. Shortly after takeoff, at 17,000 feet mean sea level (MSL), the aircraft experienced a differential fault on the No. 4 engine-driven generator. TSgt Weekley disconnected the No. 4 constant speed drive. Climbing through an altitude of 23,000 feet MSL, the No. 1 hydraulic system then failed completely. Capt Whitenight reset the associated hydraulic flight control switches as TSgt Weekley ran the No. 1 hydraulic system failure checklist. SSgt Barnes inspected the No. 1 hydraulic system and the Nos. 3 and 4 engines. Leveling off at 25,000 feet MSL, the right bleed duct overheat lights came on.

MSgt Myhre was quick to realize multiple, unrelated malfunctions on one side of one wing had all the markings of a fire. Capt Ellicott saw a golden glow through a rivet hole on top of the No. 4 engine pylon, possibly indicating a pylon fire. The hole was 60 feet from the copilot's window and very difficult to see even at night. First Lt Lennon positioned the No. 4 engine throttle to idle. The golden glow in the pylon flickered out and then returned. Capt Ellicott confirmed with Capt Whitenight that the golden glow was a fire. Capt Whitenight pulled the fire handle which had not indicated either a pylon or an engine fire, and the fire flickered out but then returned.

Capt Whitenight discharged the fire bottle into the No. 4 engine as SSgt Barnes suggested (the fire extinguishing system does not suppress fire in the pylon but the crew was unable to confirm exact fire location). The fire seen through the rivet hole on the pylon then extinguished; however, the right bleed duct overheat light remained on. Capt Whitenight assumed control of the aircraft and started emergency descent procedures. First Lt Lennon coordinated a clearance to the nearest airfield—Thessaloniki, Greece—10 miles away. The aircraft reached Vmax and a 20,000-feet-per-minute descent rate aiding in extinguishing any wing fire and minimizing flight time to 4 minutes.

Capt Ellicott aided Capt Whitenight and 1Lt Lennon in preparing for landing at Thessaloniki and worked with TSgt Weekley to finish all checklist items. Capt Whitenight flew a flawless three-engine visual approach and landing at an unfamiliar airport in a nonradar environment at night. TSgt Weekley, SSgt Russell, and A1C Petro ensured the safety of 16 passengers and successfully accomplished the ground evacuation in 15 seconds. The postflight inspection revealed an ignited misting hydraulic line was acting as a blowtorch on the $1^1/_2$-inch diameter main fuel line for the No. 4 engine. Fire had burnt through the metal outer casing and was working on the cloth underbundle. The intense heat of the fire caused the pylon to warp. The nature and location of this malfunction made this emergency extremely time critical.

A few seconds' delay identifying the problem or taking appropriate action could have resulted in a catastrophic tragedy. Knowledge, expertise, outstanding crew coordination, and timely action under pressure saved the lives of passengers and crewmembers as well as a valuable Air Force asset deserving of the USAF Well Done Award. ✈

AM I FIT TO FLY ?

I' **ILLNESS**
(no symptoms)

M **MEDICATION**
(no self-medication)

S **STRESS**
(no overstress; eg, worries, quarrels, etc)

A **ALCOHOL or DRUGS**
(not!)

F **FATIGUE**
(a good night's sleep)

E **EATING**
(sensible eating habits)

...YES, I'M SAFE TO FLY

Blatantly swiped from Directorate of Flying Safety,
Royal Australian Air Force, 1996
Original concept courtesy New Zealand CAA