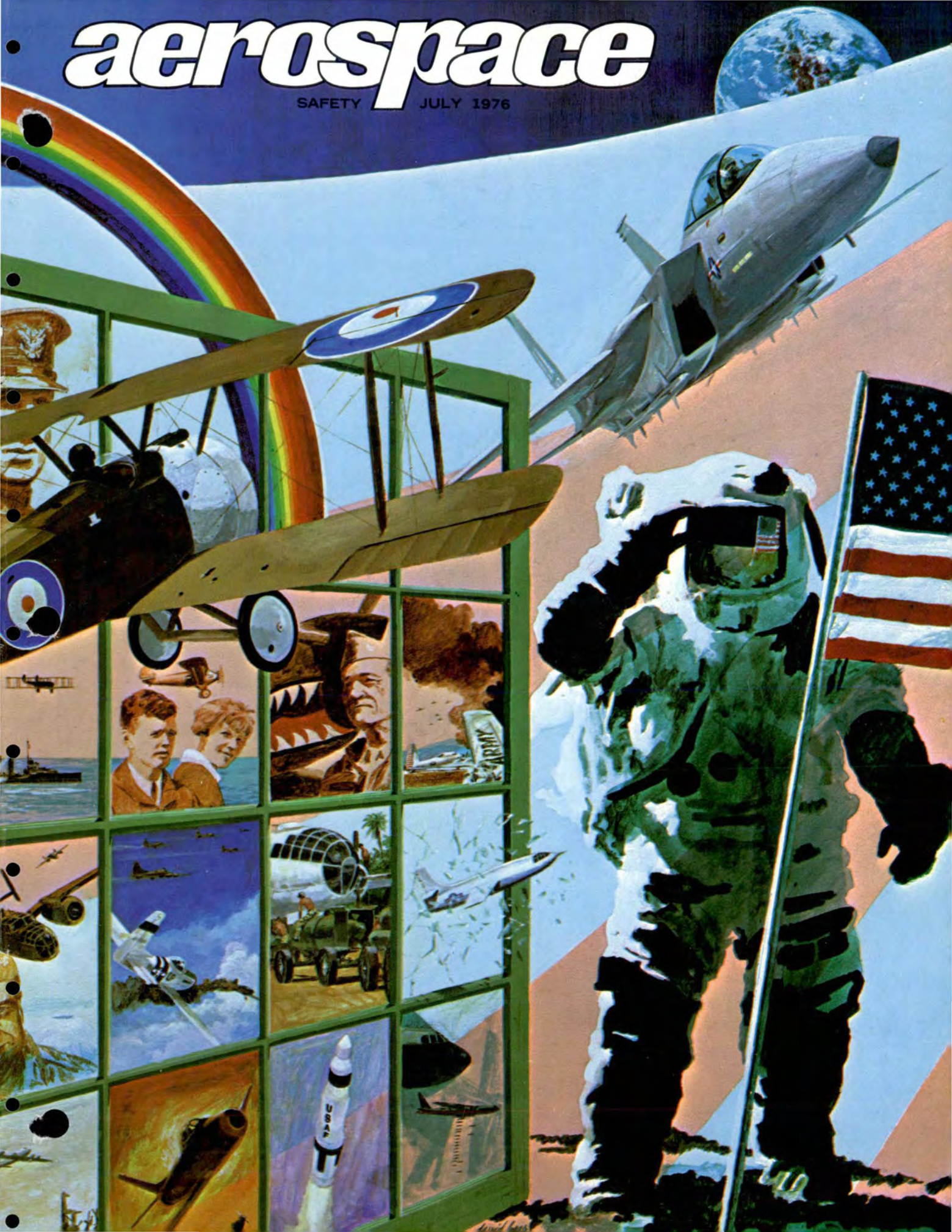
aerospace

SAFETY JULY 1976



This Bicentennial period should be a time of great pride and optimism for Air Force people. Although our service history covers only a small portion of the nation's two hundred years, the accomplishments of your fellow airmen since 1947 have been monumental. The Berlin Airlift, the Korean conflict, the Cuban crisis, and the Vietnam war have displayed the Air Force's resiliency, adaptability, and courage.

Today, as we face the beginning of our nation's third century, the Air Force remains in the forefront of our national destiny. Air Force people have never been more intelligent or better trained. The new weapon systems now in development and production will insure that our people are equipped to meet future challenges.

However, strong and scrupulous adherence to uncompromising safety techniques will remain a vital element in all that we hope to accomplish. With our active duty forces now at the smallest size since before the Korean war and with the cost of weapon systems climbing to unprecedented levels, safety becomes an even more serious consideration. The nation needs our best efforts to avoid the needless loss of lives and equipment. We cannot afford preventable accidents and incidents.

Honorable Thomas C. Reed
Secretary of the Air Force

As we proudly celebrate this 200th anniversary of the founding of our country, we know that if we are to maintain the freedom for which the United States stands, we must remain strong.

As the first line of defense for this country, the Air Force must be ready to respond to the call of our leaders anytime, anywhere. But just as a Minuteman's broken musket put him out of action, so we are weakened today when one of our people or one of our weapons is damaged or destroyed by an accident. If all of us perform our jobs to the best we will prevent those needless accidents that reduce our strength and jeopardize our ability to perform our mission.

I am proud of the Air Force's contributions to the freedom of our country as we keep the Air Force strong and always ready.

General David C. Jones
Chief of Staff, USAF

Life Support

DISCIPLINE

MAJOR WILLIAM D. HARRISON
Directorate of Aerospace Safety

If any of you fighter jocks (fighter-gators accepted) can remember your escapades during the SEA conflict, I would like for you to think back a minute. How many of you can remember leaving your G-suit in your locker when you went to fly that leisure mission to route PAC Six? How many of you pilots neglected to brief your GIB on ejection signals and procedures to follow if you had to get out of your aircraft in a hurry? I really don't think that any of you were guilty of these, or any such prior planning infractions, during the conflict, but what about now, when no one is shooting at us?

In 1975 we had our best ejection success rate yet, but a review of last year's ejection episodes indicates that many aircrews were very fortunate to survive their emergencies so successfully, since many of them were extremely ill prepared for their flight into the blue. Let's briefly take a look at a few of the predicaments some of our crews found themselves in.

- Pilot and WSO ejected into 50° water . . . no anti-exposure suits.
- Pilot lost electrical power on night mission . . . no flashlight.
- Pilot and WSO ejected successfully, but neither crew's survival radio carried in vest would function . . . malfunction would have been discovered if radio preflight had been accomplished.
- Pilot forced to eject over water . . . no life preserver worn.
- Aircrews on three separate occasions delayed inflating their life preservers until they were in the water . . . a violation of all training and good common sense.
- Three aircrews received damage to their anti-G suits . . . cause was unauthorized items carried in pockets.
- Two pilots unnecessarily extended their rescue and recovery time . . . locator beacons left on, thus blocking voice transmissions with rescue forces.

While it is true the aircrews involved in the above mishaps survived their episodes, they were extremely fortunate that all other factors were favorable. Change any of the ejection scenario and the results could have been drastically different.

Why don't aircrews take more interest in their life support squipment and training? The answer can have many facets. Some feel that such training is like "practice bleeding." Others feel that because they had it before there is no need to go through it again. But, most feel that accidents happen only to the other guy. Last year, 79 of those "other guys" were forced to eject; seven of them didn't make it. When one of the surviving crews was asked to explain the reason for his mistakes, he put it this way: "The aircrew will not seek this training or wear equipment that is forced upon him, and commanders are very reluctant to make these items mandatory."

Life support equipment and associated training is not "forced" on anyone. It is provided for only one purpose—to equip the aircrew for whatever unfortunate situation with which he may find himself confronted. Sometimes it is necessary for certain training and equipment to be a mandatory requirement, but this is done only when our "lessons learned" have pointed out the need for this action.

Most of the aircrews in favor of life support training and equipment are those who have found themselves in unfortunate situations and have put these items to good use. Now, who better to take our lead from than the guys who have been there?

Let's each of us life support types, officers and enlisted alike, look hard at what it takes to protect our aircrews and do all in our power to ensure their safe recovery from unpredictable situations. As aircrews, let's stand back and look realistically at what is provided for us. Life support equipment and training are our "insurance" and should not be taken lightly. We all pay into some sort of insurance programs, be it life, automobile, homeowners, or whatever. All are designed to provide one thing to the beneficiary—protection. Life support training does equally the same, and you can't beat the coverage or the premiums. ★

UNITED STATES AIR FORCE JULY 1976

AMERICAN REVOLUTION BICENTENNIAL 1776-1976

aerospace SAFETY

THE MISSION - - - - - - SAFELY!

SPECIAL FEATURES

REGULAR FEATURES

DEPARTMENT OF THE AIR FORCE • THE INSPECTOR GENERAL, USAF

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the DEPTHS of DISTRACTION

LT COL ROBERT J. BRUN
Directorate of Aerospace Safety

All of us have had some experience with distractions and most everyone encounters several types—pleasant, annoying, or whatever—in the course of a day. Although these changes in mood are typically short lived, they often produce disastrous and decidedly long term results. A headliner in this category is the distraction-induced aircraft accident.

One of the first jumbo airliner losses was largely due to the cockpit distraction associated with a landing gear indicator problem. While orbiting at low altitude to troubleshoot the system, the pilots became preoccupied with this task and failed to detect a gradual descent which culminated in a tragic accident and the loss of 101 lives. Darkness, sparsely settled terrain with few to no nighttime references all contributed but the basic cause was failure to maintain altitude control.

A few months later a military transport crew had a very similar accident, only in this case there was a cockpit discussion questioning the safety of a descent clearance which was issued just prior to the crash. The investigation disclosed that the ATC transmission was misunderstood and when the crew read back an altitude 2000 feet lower than assigned, their transmission was blocked and the controller was, therefore, unaware of the misunderstanding. Reportedly, the lights of the city were clearly visible ahead while the unlighted hills below were not. This hastened the end of the terrain clearance discussion and the dissenting crewmember was assured everything was fine. A few seconds later the aircraft struck the ground and disintegrated. From the evidence available, it was concluded that a fully operational aircraft was flown into the ground by a highly qualified aircrew simply because of insufficient attention to standard procedures and the distraction furnished by the lights of their destination. There was one survivor out of the 25 people on board.

In a more recent example, a night takeoff accident involving a tanker with a basic crew, there were no survivors available to report details but distraction was clearly evident, as the investigation showed. It was extremely cold and a series of ground delays added frustration to the already formidable discomfort of the crew. Shortly after liftoff they reported the landing gear wouldn't retract and requested a turn to downwind for a system checkout. The turn was never completed and it is doubtful if the aircraft even reached traffic pattern altitude. Contrary to longstanding procedures, and most probably as the result of undue attention to the gear problem, the flaps were brought up and the aircraft was flown into a power-on stall which terminated in a fiery crash. No evidence was found to indicate an in-flight causative factor other than inattention to basic pilot duties.

The experience levels of the pilots involved in these examples ranged from many thousands of hours to less than 1500 total hours so it *can* happen to anyone—anyone who will let it happen. To sloganize, "Distraction Invites Destruction," so don't let this be said of your crew . . . they "DID" themselves in. ★

THE AIR FORCE STORY

MSGT DAVE SYLVA
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We wish to gratefully acknowledge the assistance of the Air Force Museum at Wright-Patterson AFB and all other contributors for the photos used with this article.

The mission of the Air Force is to fly and fight—but its motto is "Aerospace Power for Peace." Today's Air Force—the B-1 bomber and the F-15 Eagle—sleek jets streaking through the stratosphere at twice the speed of sound—global airlift. The tip of the spear of America's triad of defense. One of the most powerful forces ever conceived for war or peace. But it was not always so.

For the story of the Air Force is a story of tragic victory—of fools, daredevils and geniuses—of sacrifice and apathy—triumph and defeat—faith and betrayal. A story of giants and deeds never dreamt of in myths.

It is the story of the bicycle boys from Dayton, of Luke, Rickenbacker, Mitchell, Doolittle, Bong, Gabreski, McConnell and DeBellevue. Of Arnold, Spaatz, Vandenberg and Lemay.

It's the 1st Aero Squadron and the 94th "Hat in the Ring." The Tokyo Raiders and Kinney's Kids. The mighty 8th and Lemay's 20th. The bloody One Hundredth and Zempke's Wolfpack. The Grim Reapers of the 13th Bomb and the Gunfighters of Danang.

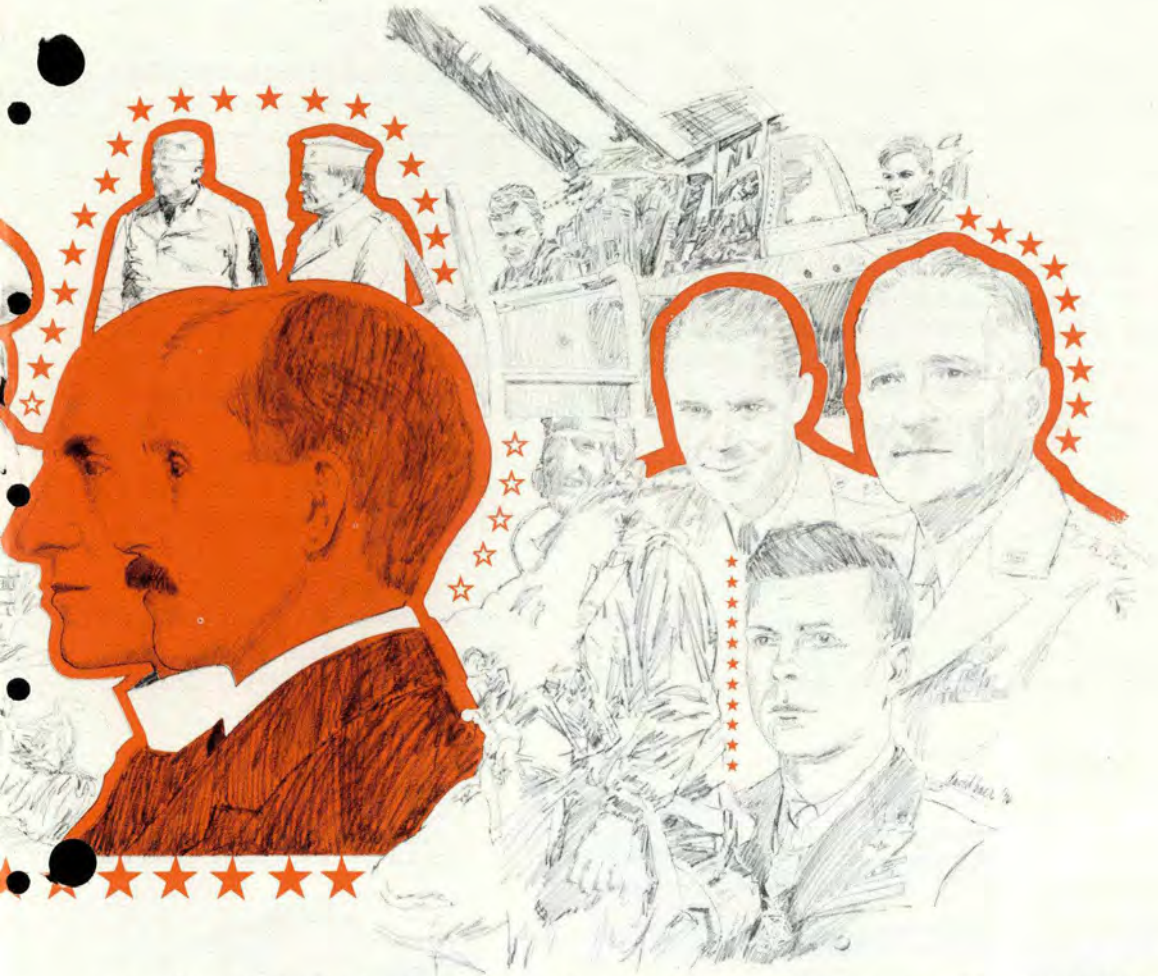
It's Kittyhawk, St. Mihiel, Kelly, Randolph and Clark Fields. The Bismarck Sea, Schweinfurt, Berlin and Tokyo, Templehof Tower, MIG Alley and the Red River Valley.

The story begins in 1903, on December 17th with the short hop of the Wright flyer from the sand dunes of Kittyhawk. Man's first powered flight, a feat that was acclaimed by all the world—except by the United States government.

Not until four years had passed were the first steps taken to catch up with the world. President Teddy Roosevelt ordered that an Aeronautical Division be created within the Signal Corps. Three men. Three men to staff the air arm.

When the first great World War began, the American air arm had 122 men in it and ranked 14th in world air power. But from the very beginning, it was clear that American flyers could hold their own. Men like Rosevear, Lambert and Gillete flew for the Royal Flying Corps. Lufberry, Baylies and Putnam saw combat with the French Lafayette Escadrille. Our own air service produced the "Balloon Buster from Arizona" Frank Luke, George Vaughn . . . and the first American flyer to earn the Medal of Honor, Captain Eddie Rickenbacker.

America's leader in the air war



was a dynamic, professional soldier: Brigadier General William Landrum Mitchell . . . "Billy" Mitchell.

After years of brutal trench warfare . . . after Verdun, Flanders and Ypres, Mitchell's tactics of massed air power in support of ground troops shattered the Hindenburg Line in the St. Mihiel and Meuse Argonne sectors. Within weeks of these staggering blows, Germany had signed an armistice ending the first World War.

America soon pulled back behind her oceans and demobilized. The air service was slashed by 95 percent.

America didn't want to listen to stories of her airmen flying to their deaths in flaming coffins, the lack of parachutes and of French guns that could not take British ammunition . . . of Americans fighting in French Nieuports and Spads, in British Sopwith Camels and Pups because America—the inventor of the airplane—had no combat planes of its own.

In addition to the famous battleship tests, Mitchell argued for a strong air arm until his dying day. He warned us of Japanese expansion and of the weakness of our Pacific defenses. He warned of the horror of future air war and begged for support of his airmen. He asked for a new military academy of the air and for a weather service for his pilots. He prophesized aerial torpedoes and airborne infantry. He spoke of inflatable rafts and of variable pitch propellers, of aircraft radios and of four engined bombers. But his strongest plea was for an independent and equal air force, commanded by flyers.

Ignored, he took more direct and more drastic steps. He attacked the Army and Navy staff planners in the press. For this he was court-martialled and forced from the service.

Other men, the Mitchell apostles, stayed and fought for air power within the system. They scouted for forest fires and flew the air mail. Eaker and Spaatz flew the great endurance flight of the Question Mark, while Hap Arnold forced through the all metal bomber and the B-17.

Billy Mitchell died before his prophecies came to pass. He didn't live to see the German Luftwaffe wage blitzkrieg war against Poland and France. He was gone before German paratroopers—airborne infantry—smashed the low countries. If he had lived, he would have cheered the British Royal Air Force protecting the Beach at Dunkirk and breaking the teeth of the German Air Force in the Battle of Britain.

He did not live to see the Japanese wreck the US Fleet at Pearl

Harbor and destroy the Far East Air Force on the ground in less than one hour.

Because of Japanese air power we lost the Pacific Fleet. Without the Fleet and without air power, the Army was lost.

Guam lasted 3 hours and 35 minutes . . . Wake Island two weeks. Hong Kong was lost on Christmas Day and Singapore surrendered in February. Java held out for only one week after the British Asiatic Fleet was destroyed by Japanese air power. Bataan fell in April and Corregidor finally hauled down the Stars and Stripes in May.

Japan had won the war she had set out to fight. We had lost the battle to that point . . . but the war we intended to fight was far from over.

Out of Australian bases the remnants of American air power, Kinney's kids, the forerunners of the 5th and 7th Air Forces, waged savage war in the Southwest Pacific holding the enemy at bay as America girded for war.

In the skies over Europe, the war was fought first by the heavies, the B-17s and the B-24s flying unescorted missions because America—the inventor of the airplane—had no long range fighters. Our air doctrine called for high altitude, daylight precision bombing of industrial Germany as the only way of defeating the German armed forces. The targets were vitally important to both the allies and the enemy . . . we had to take our losses . . . we had to hit the targets . . . and the Germans defended them accordingly.

In the worst air battles of history, the 8th and the 15th Air Forces staged raids over Europe. In freezing temperatures, on an oxygen bottle lifeline, thousands of flak fragments tearing the skins of both plane and man, enemy fighters coming in from all around the clock . . . control surfaces shot away . . . dead pilot at the controls of a plane screaming and spinning as it fell in protest to the earth and a 5 mile high jump to capture or death.

Schwienfurt . . . Regensburg . . . Ploesti . . . Hamburg . . . Stuttgart and Berlin all took their bloody toll. But there was no halting the bombing plan. New fighters—the Jug and the Mustang. Zempke and his Wolfpack, Davis and his Black Cats from Tuskeegee would sweep the skies of German planes . . . and without her Air Force, Germany was doomed. The retreat had become a rout. In her death throes, Germany produced the only operational jet fighters of the war, the V-1 and V-2 Rockets,

Nieuport 28s returning to base.

Dawn patrol—France 1918

The Canvas Hangar Base France 1917.

THE SPAD
This French designed aircraft was the favorite of American pilots. With twin Vickers machine guns it proved to be a deadly fighting mac

Brig Gen William (Billy) Mitchell

WORLD WAR I
Late to battle, the fledgling pilots flew the more sophisticated French and English aircraft against seasoned German pilots. Under Brig Gen Billy Mitchell's keen direction, the American acquitted themselves well. US air power was born.

The Handley—Page Bomber—the eye of the future.

THE FOKKER Dr I TRI-PLANE
The much dreaded symbol of Baron Von Richtoffen's Flying Circus was this small and highly maneuverable aircraft.

the 4 engined "New York Bomber," Tiger Tanks that spearheaded the Battle of the Bulge and were only months away from their own atomic bomb. The only weapon the Allies had that could meet these threats was air power. That weapon was used and German resistance was crushed.

At the same time, in the Pacific, first Doolittle's Tokyo Raiders then the Coral Sea, Midway and the Bismarck Sea proved to the enemy that we still had teeth.

Joint air, sea and ground operations against fierce opposition seized the Solomons, the Gilberts, the Carolines, the Marshalls and the Marianas. From each island group, strikes were launched against the next until the stepping stones had reached Japan. Transports flying the "Hump" brought men and supplies into China where Chennault's Flying Tigers of the 14th Air Force slashed at the Japanese without mercy. A ring of steel was forged around Japan by Allied air power and sea power but the invasion was yet to come. An invasion that would cost at least one million American casualties and possibly four million Japanese. Instead, the President ordered two B-29's the "Enola Gay" and "Boch's Car" to attack with atomic weapons. So ended World War II.

With victorious peace restored, America went back to the business of life. The armies went home and swords were beaten back into plowshares. But this time there was a difference. Most of Mitchell's prophecies had come to pass, and the nuclear age had begun. General of the Air Force Hap Arnold restated Mitchell's warning to America:

"There will come a time when there will no longer be any spot on earth and certainly not in America that is safe from attack by air. For our protection, we must have an Air Force second to none.

"For this, we need a great aviation industry, a great air transport system and a great body of trained personnel. But we'll need more than planes and pilots and mechanics . . . we'll need scientists and mathematicians and we'll need the full inventive genius of the American people.

"With these we can protect the future—ourselves and our allies—with the weapons of the future."

On September 18, 1947, the oath of office was administered to the first Secretary of the Air Force, W. Stuart Symington and to the first Chief of Staff, General Carl "Tooey"

THE 1920s
During the lean years of world disarmament following WWI only the most dedicated endured. It was a period of stunts and publicity, doing the most with the least, accidents and frustrations. In a struggle for mere survival, they perservered and made constant progress against all odds.

Martin MB-2s—they sank the Ostfriesland.

Looking over a Battleship.

Parachutists on Curtiss JN-4.

First Round The World flight 1924.

The spirited mechanics of Biggs Field, Texas.

LUCKY LINDBERG
No other single event ever had such far reaching impact upon aviation as did the Lindberg flight. It was the turning point that showed a shrinking world. Public awareness of the potential of air power zoomed. From this day on, there was a shift towards military appropriations for the Army Air Corps.

Martin B-10s.

THE 1930s
During the thirties the US aircraft industry began its climb towards a position of world leadership. As clouds of war loomed on the horizon, designs by the score emerged from the drawing boards—each better than its predecessor.

The B-19.

The first YB-17 at Langley Field.

Over battleship row.

The Flying Tigers' Curtiss P-40s.

Japanese Zero on aircraft carrier.

PEARL HARBOR
The disaster of Pearl Harbor brought with it the vivid lesson of the effects of air power. The shots shown here were taken by a Japanese bomber pilot during the attacks.

Spaatz. The 40 year ties to the Army were cut and a new era began in which air power was firmly established as the nation's first line of defense and its chief hope for peace. Mitchell's greatest dream had come true.

The young Air Force would be challenged before it was one year old. On June 22, 1948, the Russians blockaded Berlin in an attempt to force the allied powers from that city. If the Allies stayed, the city would starve. If the Allies withdrew, then Western Berlin would fall behind the Iron Curtain. The city was not abandoned. Berlin was saved by allied airlift. Pilots of the Air Transport Command flew a staggering 248,000 sorties into Templehof Field. Planes flew three minutes apart, around the clock, for nearly a year, averaging 7,000 tons of supplies daily until the blockade was lifted. Air power had saved Berlin and had given the Russians a stinging propaganda defeat.

By June 1950 a new and deadly challenge was hurled. The Republic of Korea was invaded from the North. When the United Nations took action to aid South Korea, our Air Force was its most powerful argument. Far East Air Force planes cut North Korean lines of communications, bombed forward positions and reduced the enemy's industrial base. Air power held the Pusan Perimeter and blasted the way open for the invasion of Inchon. But it was in the frozen skies over the Yalu River that the Air Force wrote a new and glorious page into its history, in a place called "MIG Alley."

From the beginning, the Air Force owned the skies of Korea, the only challenge came in the area just south of the Chinese border, in MIG Alley, where Chinese and Korean pilots engaged the American Sabre jets. The reds had every conceivable advantage. Their MIG-15 was faster, more maneuverable and could turn inside the Sabre. It could fly 5,000 feet higher than the Sabre. Red pilots flew across the Yalu to do battle when they wanted to and could streak for sanctuary when they were beaten. They fought over their own terrain without fear of capture, if forced down. No concern for anti-aircraft and no need for escape and evasion plans. With every advantage in their hands, we still got them 14 to 1!

It was American air power that neutralized Chinese superiority in manpower. It was finally the threat of American air power that brought them to negotiate a settlement of Panmunjom, ending the Korean action.

Even at the height of the Korean War, the Air Force had somehow found time to airlift 4,000 stranded Moslem pilgrims to their holy city of Mecca and to bring relief to the flood ravaged Netherlands.

Battleship row seen from Japanese bomber.

WORLD WAR II
For the first time in the history of warfare the theatre of battle was everywhere. Only through dominance in the air could a war be won. Air power had come of age.

Wheeler Field.

B-25 attack on Rabaul.

B-17s over Germany.

The "Jug"—P-47.

P-51 Mustang in England, 1944.

F-86's taking off for MIG Alley.

Introducing Choppers.

KOREA
In the great police action, the US Air Force acted for the first time as a separate military force. Again it tipped the scales in US favor.

VIETNAM
Restricted by political considerations, the USAF role was still the cutting edge.

The mighty B-52 strikes a Viet Cong stronghold.

Another of Mitchell's prophecies was coming true. The Air Force was more than a spear. It was also a shield. When the cold war heated up, America's powerful Strategic Air Command kept the peace by warning any aggressor that if he attacked the free world, he would have no home to go back to. Air Force communications across the frozen Arctic kept watch over North America and air defense fighters sat on alert, day and night, guarding a nation at peace.

More than a weapon of war, Air Force transports used air drop experience to feed cattle stranded by blizzards; hurricane hunters of Air Weather Service warned of impending disasters. And Air Rescue Service risked their lives daily, "That others may live."

In 1956, the Air Force was airlifting UN forces to Suez to enforce a cease fire there. In that same year, Operation Safe Haven saw 13,000 Hungarian refugees airlifted to safety.

In 1962, with the tension of the Cuban missile crisis threatening the world, Air Force planes were diverted to fly UN troops into the Congo and in 1964 went back to rescue the survivors of the Stanleyville Massacre.

The Vietnam war saw a new page added to the story.

The story of Major Bernie Fisher in the Ashau Valley; the Bird Dogs and the Sandies; Khe Sanh and An Loc; Thud Ridge and the Jolly Green Giant; the Gunfighters of Da Nang and Mu Gia pass and that tired old Gooney Bird that came back to fight as "Puff the Magic Dragon"; the Hanoi Hilton; the Son Tay Raid and hundreds of men still missing in action.

New pages are being written: "Nicklegrass," the airlift that saved Israel, and the SR-71 racing the sun across the Atlantic. New pages will be written as your Air Force meets new challenges with pride in the past and faith in the future.

The weapon is here. The tip of the spear and the shield of national defense. The weapon forged in blood, in sweat and in tears. With honor and with courage, the Air Force keeps faith with its motto: Aerospace power for peace, but telling the world boldly "Any time—any place—the mission of the United States Air Force is to fly and fight" . . . and don't you ever forget it! ! ! ! ! ★

ABOUT THE AUTHOR

MSgt Sylva, NCOIC of the Norton AFB Information Office was formerly an instructor in the NCO Leadership School systems of both MAC and TAC. Combining his duties with his strong interests in history, Sgt Sylva developed an Air Force History course unique in its presentation. Rather than point only to successes, the 26 year Air Force veteran addresses the problems and failures—not as a prophet of doom, rather to glorify the victories in light of the hardships that had to be overcome.

ESCAPE

LT COL CHARLES L. POCOCK, JR.
Directorate of Aerospace Safety

Escape denotes personal action on the part of the escapee. Obviously this is different from rescue which is assistance from someone else. If you are involved in an aircraft accident, your chances of escaping are much, much greater than being rescued. There are certain things you can do to enhance your chances of successful escape. Basically, they are the same for all aircraft, but since I'm not familiar with your aircraft and you may not be familiar with mine, let's apply some of the rules to commercial aircraft which we are all familiar with as passengers.

Assuming we can't avoid the trip and we have selected a route to avoid bad weather and congested airports, the next step applies to what we wear. Considering the ever present problem of fire in airplane accidents, cotton provides the best commercially available, aesthetically pleasing fire protection. Avoid such things as polyester, nylon or rayon shirts, socks, and under garments. Until such things as PBI and NOMEX are used commercially, pants and jackets with a high cotton content are best. The next step applies to the seat selection process. Window seats should be avoided because of the possibility of a window blowout. The center seat is better but the aisle seat is best because it also allows faster egress during ground emergencies. An aisle seat on an emergency exit row is better yet.

After boarding, start to formulate your escape plan. As you enter, get a good look at the door opening mechanism and type slide deployment system. After finding your seat, look around for the nearest exit. Remember that in the event of an emergency most people will

try to get out the same door they came in. This is seldom the best choice. Additionally, many successful escapes have been made by going over the tops of the seats rather than using the aisles and going against traffic.

Take out the emergency instruction card and check the location of the emergency exits and again check your relative position. Look at the instructions for opening the exits and the direction they open—in or out—upward or sideward. Check what kind of slides are installed and how they are deployed. Now imagine the lights are out and its dark or the cabin is filled with smoke. Do you think you can make it out?

Read the description of emergency oxygen equipment. Most commercial aircraft have four masks for each 3 seat sets. There are two reasons for this: First is the possibility of babe-in-arms cases where there are four people in three seats. Most importantly, though, is the possibility that the masks won't deploy as advertised. Remember, in the event of a rapid decompression there is an extra mask for the seat sets ahead and behind you.

In the center seats of the wide body aircraft the oxygen masks have to fall a long way. Yawing or deceleration of the aircraft may cause the masks to swing out of your seated reach. Be aware of this, too. Some aircraft have the masks in the back of the seat in front of you. Also, some aircraft have a manual capability to release the masks. Remember the configuration is not standard for all aircraft of the same type or are all aircraft belonging to one airline standard. Read the card each time.

Now, we have done about all the preplanning, so we can sit back and enjoy the trip. Keep your seat belt fastened though; several people are seriously injured each year in unexpected turbulence encounters.

Assuming that all didn't go well and either an aborted takeoff, overshoot, short landing or crash landing ensues, there are some positive things you can do to enhance your escape. First, it is absolutely essential to protect your arms and hands, legs and feet, and your head. Without full use of your means of locomotion, escape chances are significantly reduced. Obviously, your seat belt should be as tight as you can get it. Some emergency instruction cards show the feet straight down in a normal seated position while others show the feet extended under the seat in front. Both are bad. In the first case rapid deceleration forces can cause your feet and legs to go forward and upward. When this happens, shin bones get broken on the seat back in front of you, and if the seat collapses (which is a good thing for absorbing energy) your feet get pinned under the seat. The same reasoning applies to extending your legs. The best place for your feet is on your briefcase or on the lower horizontal bar across the back of the seat in front of you. This puts your knees up in a fetal position.

Your head should be down between your knees, lower than your shoulders if possible so that it doesn't get hit by any forward "flying objects." If possible, your arms should be folded across your stomach and held by your thighs. This prevents flailing. Next best would be around your legs in a "cannon ball position."

After impact don't be in a big hurry to get out of your position. Airplanes bounce occasionally and there may be several impacts. A good rule would be to slowly count to six after the last impact before getting up.

That's the last slow thing you should do. Speed should be the rule now—get up, get out, and get away in 30 seconds or less. Fire propagation takes time, but not much. Every second counts so make your way to an exit or fuselage break. If you can grab a pillow, blanket, or jacket on your way out to breath through, you may filter out some smoke and you will prevent a sudden gulp of superheated air. If you can think of it, especially at night, keep one eye closed so that a sudden flash of light or smoke won't blind both eyes.

Invariably there is a best egress side of the aircraft. Before you get out make sure you are going out the best side. Feel and look out the window before you open the hatch to make sure you're not opening a furnace door. The exit may be jammed so try the handle in both directions and pull hard before giving up, but don't hesitate too long.

It may sound elementary but make sure you have a good slide before using it. Strong winds or running engines blow slides sideways and under airplanes. Sometimes they don't inflate or get punctured. If the airplane rocks back on its tail the forward slides make a vertical line to the ground far below, and vice versa.

Once on the ground, get away from the aircraft at least a hundred yards, before stopping to look back.

These are a few ideas that have been common in hundreds of successful escapes from military and civil aircraft crashes. If you can do just some of these things your chances of escape are greatly increased. ★

By the USAF Instrument Flight Center
Randolph AFB, Texas 78148

THE IFC APPROACH

How many times have you heard the expression, "It's not what you know, but what you don't know that causes accidents?" At least once or twice I'm sure. The expression applies just as well to instrument approach charts as anything else. Not only can "what you don't know" cause accidents, it can ruin your whole day. Since everyone wants to have a safe flight and a smooth landing, we want to offer some food for thought concerning how to interpret the planview on Instrument Approach Procedure charts.

Q. What information is contained within the planview of an instrument approach procedure (IAP) and how is it normally depicted?

A. The planview of the instrument approach usually depicts such information as en route and feeder facilities, terminal routings, approach NAVAIDS, missed approach routing, holding patterns, significant obstacles, communications data, and in some cases topography.

Two basic formats are used to present this information. First, when all procedural and terminal information is to scale, as in Figure 1, the procedure will be printed without dashed concentric rings. The land/water contrast on the Quantico chart makes it easy to tell that everything, even the 363-foot obstacle Northwest of the field, is shown to scale.

The second format, such as the one shown in Figure 2, includes dashed concentric rings when the procedural and terminal route information cannot be depicted to scale. However, in either format, all information contained within the solid inner ring (normally 10 NM for low altitude, 20 NM high altitude, and 5 NM for "copter only") will always be depicted to scale.

When more than one dashed concentric ring is depicted, the inside dashed ring will show the feeder NAVAIDS/fixes used by air traffic control to transition aircraft from the en route structure (High or Low) to the initial approach fix or to the NAVAID (Figure 2). In a few cases (such as the HI-TACAN RWY 15 at Holloman AFB), transition routes to a holding fix are depicted. These feeder NAVAIDS/fixes are positioned so the magnetic bearing relationship is accurate. However, distances may not be to scale. The outer ring will show NAVAIDS, fixes, and intersections which are a part of the appropriate en route structure (high or low).

Normally, the terminal routings to low altitude IAF's will depict magnetic course, distance and minimum altitude. (Figure 3). High altitude Terminal routings, normally only show a course and distance. (Figure 2.) If an altitude is depicted, it should be considered the minimum IFR altitude for that route.

The terminal routings in Figure 3 give the course, distance and minimum altitude to the Compass locator at the outer marker (LOM). Although it is not labeled as such, it is considered an IAF since it is the facility on which the procedure turn is based and is coincident with the final approach fix.

The planview usually shows only those NAVAID facilities which are necessary to fly the approach or the terminal routings. Those facilities identified as feeder facilities will be shown with the name, frequency, and identifier of the navigational aid. En route facilities, unless they are used in a dual capacity (or e.g., transition facility, missed approach facility, etc.) will be identified by name only. (Figures 2 & 3).

FIG. 1

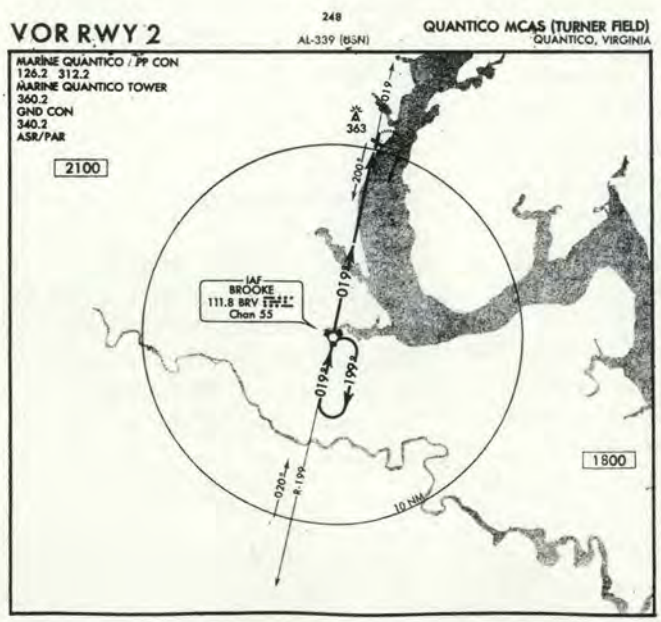
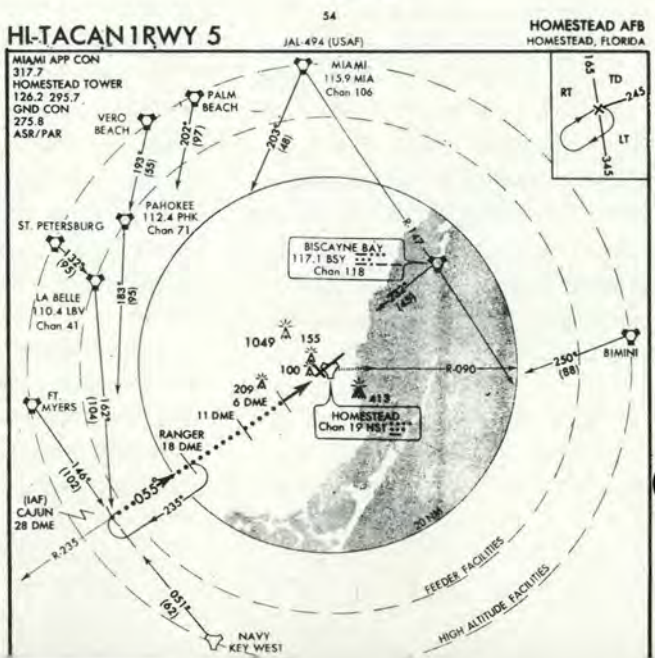


FIG. 2



the upper left corner of the approach chart, consists of the names and frequencies of the various air traffic control services available to the pilot. These services may include approach control, tower/ground control, and Automatic Terminal Information Service (ATIS). A star next to the tower's name indicates that it operates less than full time.

Immediately below the communications data, the availability of approach radar is listed. This is indicated by the applicable letters: ASR, PAR, or ASR/PAR. The appropriate radar minimums may be found under the aerodrome listing in the En route Supplement and in the minima data block on many high altitude approaches. (NOTE: Circling minima listed on high altitude IAP's do not apply to radar approaches.)

Another service sometimes advertised under the communications data is the phrase, RADAR VECTORING. This indicates the availability of radar vectoring service through any portion of the procedure except final approach. When *RADAR* is required for the execution of the procedure, the note "RADAR REQUIRED" will be shown. It is normally located in the lower left corner of the planview.

A careful and complete study of the legend which is located inside the front cover of each approach book will greatly enhance a pilot's ability to interpret the information contained on the planview.

RADIAL/DME DIRECT ROUTES

Q. May all Air Force pilots file routes or route segments from one radial/DME fix to another radial DME fix?

A. No. The only Air Force pilots authorized to define portions of their routing in accordance with degree-distance (Radial/DME) route definition are those engaged in one or more of the following missions:

a. Airborne radar navigation, radar bomb scoring (RBS), and airborne missile programming missions.

b. Celestial Navigation Missions.

c. Target aircraft operating in conjunction with ADC interceptors and ADC interceptors while en route to and from assigned airspace.

d. Missions conducted above Flight Level 450.

e. Aerial Refueling Missions.

This of course, does not preclude you from filing to a radial/DME initial approach fix or from filing RNAV routes (if authorized).

IFR CLEARANCE REQUESTS

Q. What information should be included in a request for an IFR clearance?

A. Air Traffic Control (ATC) needs the mission call sign, action requested, type flight plan, and destination airport on initial contact. EXAMPLE: "Travis Clearance Delivery, Post 11, clearance on request, IFR to Offutt."

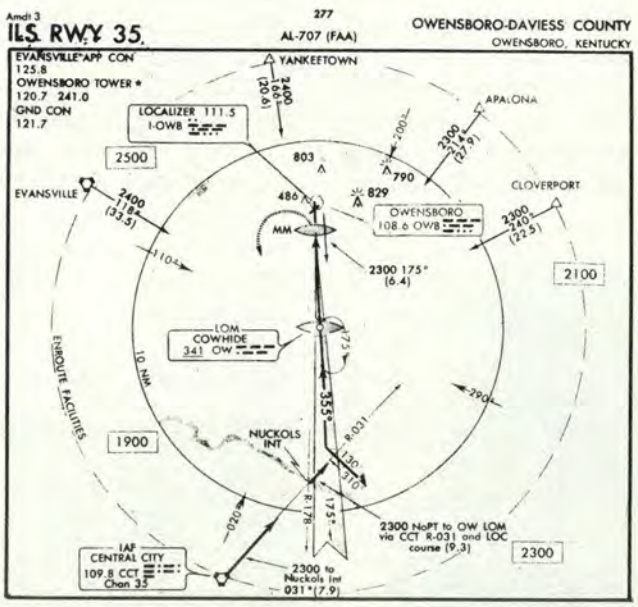
Q. Why do I need to state my destination on initial contact?

A. So ATC can ensure that you are receiving the proper clearance. Believe it or not, the following has happened: The pilot had filed a stopover flight plan from Base A to B to C to B to A. The crew landed fueled and was ready to depart for Base C. They called for their clearance but did not state "Base C" as the destination. The clearance read, "cleared as filed." Departure was normal until ATC queried "Where the !°*&$¢% are you going? If you hadn't guessed, the "cleared as filed" was for the leg from Base B to A and not the clearance for Base B to C.

If you have filed a stopover flight plan, there are additional ways to ensure that your desired flight plan is available when you are ready for departure. These are: (1) When requesting a Flight Service Station to activate the next leg of your flight plan, always include your proposed destination, and (2) advise ground control, after landing, of your proposed departure time and next destination. These methods should help ensure you have proper clearance when you depart for your destination.

If you have any questions or comments concerning an "IFC Approach" article or have a favorite subject you would like to see addressed in a future article, write or call USAFIFC/FSD, Randolph AFB, TX 78148, AUTOVON 487-4276/4884. ★

FIG. 3



a bird's eye view of hydroplaning

COLONEL WARREN J. HUNT, Directorate of Aerospace Safety

I recently went out of my way to discuss wet/slippery runway operations and the hydroplaning phenomenon with pilots of varied experience levels. These discussions revealed that many pilots are poorly educated on these subjects and are sometimes misled by the flight manual. NASA has conducted exhaustive research in this area and evaluated each of the many elements affecting runway traction. It is appropriate to acknowledge Mr. Walter B. Horne, manager of Special Projects (DLB) of the NASA Langley Research Center, for his superb contribution in this field. I will use a lot of his words of wisdom to define the types of hydroplaning.

Let's quickly discuss *dynamic, viscous* and *reverted rubber* hydroplaning and then get into the meat of this dissertation which involves the importance of a proper touchdown, crosswind effect on runway drainage, hydroplaning speed computations, braking techniques and the use of nose wheel steering.

Dynamic hydroplaning is a condition where the tires are separated from the runway surface by a fluid. Under conditions of total dynamic hydroplaning, the pressures between the tires and the runway lift the tires off the runway surface to the extent that a nonrotating tire, such as you have when landing, will not spin up after touchdown, or a rolling (unbraked) tire will slow in rotation and may actually come to a stop. Under those conditions, the coefficient of friction is reduced to zero, making wheel braking, tire cornering and nose wheel steering totally ineffective.

White streaks (arrows) are hydroplaning marks (right main gear) near Bak 9 pendant.

Viscous hydroplaning occurs only on runways that have a smooth surface texture or a runway surface made smooth by rubber deposits or paint. A tire on these surfaces can only partially displace the trapped water film. Even a light dew can produce viscous hydroplaning on a very smooth runway surface. Recovery of tire braking and cornering while viscous hydroplaning is speed-dependent and may not be achieved until the aircraft decelerates to a very low ground speed of about 40 or even 30 knots.

Reverted rubber hydroplaning occurs *only* if the wheels are locked and a prolonged skid develops. This is the worst of the three because extremely low traction can persist down to zero speed. More importantly, with the wheels locked, the tires lose all cornering capability and directional control is nil unless you get off the brakes and get the tires rotating again. Once they spin up, you will regain cornering capability and can effectively use nose wheel steering and/or aerodynamic controls. You will also want to start feeling out the brakes again to get the beast stopped. Excuse the brevi

ty, but you've all read hydroplaning articles before and I don't want to belabor the point.

Now, let's go out to the airplane and look at the tires. We can't expect to have new tires for every flight, but you should know that a new tire with full tread depth may require as much as 0.2 - 0.3-inch water depth to hydroplane, while tires with negligible tread require as little as 0.05 inches.

We're on final now with a left crosswind, wet runway, and facing the decision as to where to put this beauty down. Your flight manual tells you to be sure you are on speed, to put her down early, and touchdown firmly, but not many say whether to touchdown left of center, right of center or down the middle. You better believe them when they say to be on speed because if you are not, you probably won't get it on the ground either early or firmly. You may need every foot of the runway and any portion you leave behind because of excess speed is gone forever.

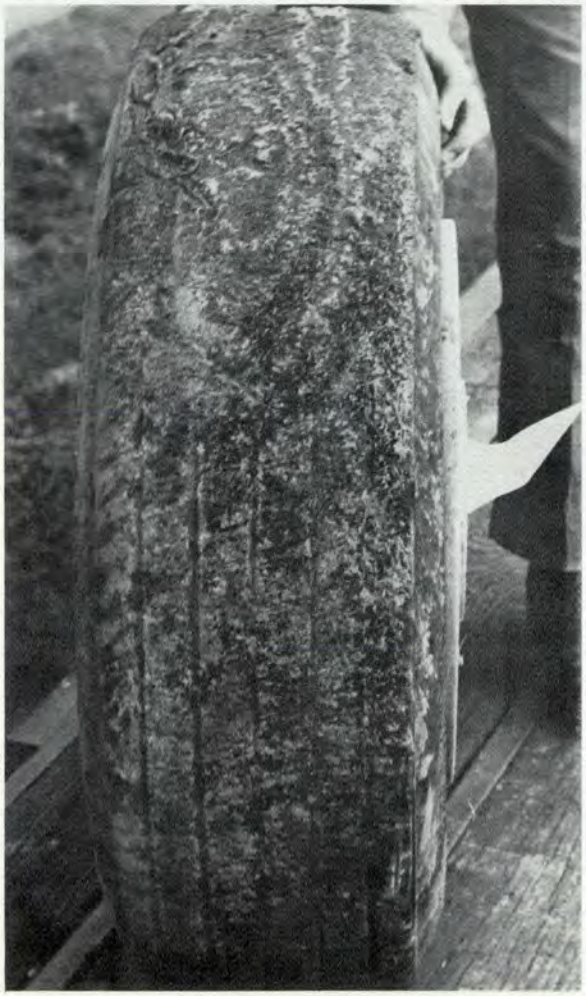
Heed the "firmly" advice, too, because that's the best way to break through the fluid and knock-off 10-15 knots extra. We all pride ourselves on "grease jobs" but it's best to swallow your pride in this situation.

If your flight manual says to land on the left, right or middle—do so—but if it says nothing, I would land on the crown. Why? Because obviously I don't want to land on the right because that's where the wind is pushing me and I may need that part of the runway to get out of a drift or skid. Why not the left side? Because the left crosswind is reducing the water drainage from the upwind side, which enhances water pooling, especially if the runway has a transverse slope of one percent or less. NASA research has proven this conclusively.

Now, at what speed would you expect to encounter dynamic hydroplaning? Some of the flight manuals tell you and others don't. Those that tell you may be misleading so read it carefully. Example: The T-39 book says you can expect total hydroplaning at approximately 78 knots for the nose tires and 121-124 knots for the main gear tires. The old formula of $9\sqrt{P}$ was used with nose tire pressures of 80 ± 5 and main tire pressures of 185 ± 5. These figures are correct, BUT only for tires that have already achieved spin-up speed. You fighter types look at your wingman's tires and you big guys look at your own during your next approach. Your tires will be stopped dead.

NASA research has proven the dynamic hydroplaning speed formula for nonrotating tires is $7.7\sqrt{P}$. It makes a big difference because the T-39 speeds would now read 67-71 knots for the nose tires and 103-106 for the mains. That's 18 knots lower for the mains. If your touchdown was computed as 115, you would feel secure using the flight manual info, but you are actually in the heart of the hydroplaning speed range. AFLC has been asked to look into this matter.

You're dynamic hydroplaning now and maybe your flight manual says don't pump the brakes, just apply an ever-increasing amount of pressure. Again, if it says that—do it. We've asked AFSC and AFLC to look at



Reverted rubber patch partially eroded due to scuffing which occurred as tire traveled with yaw angle.

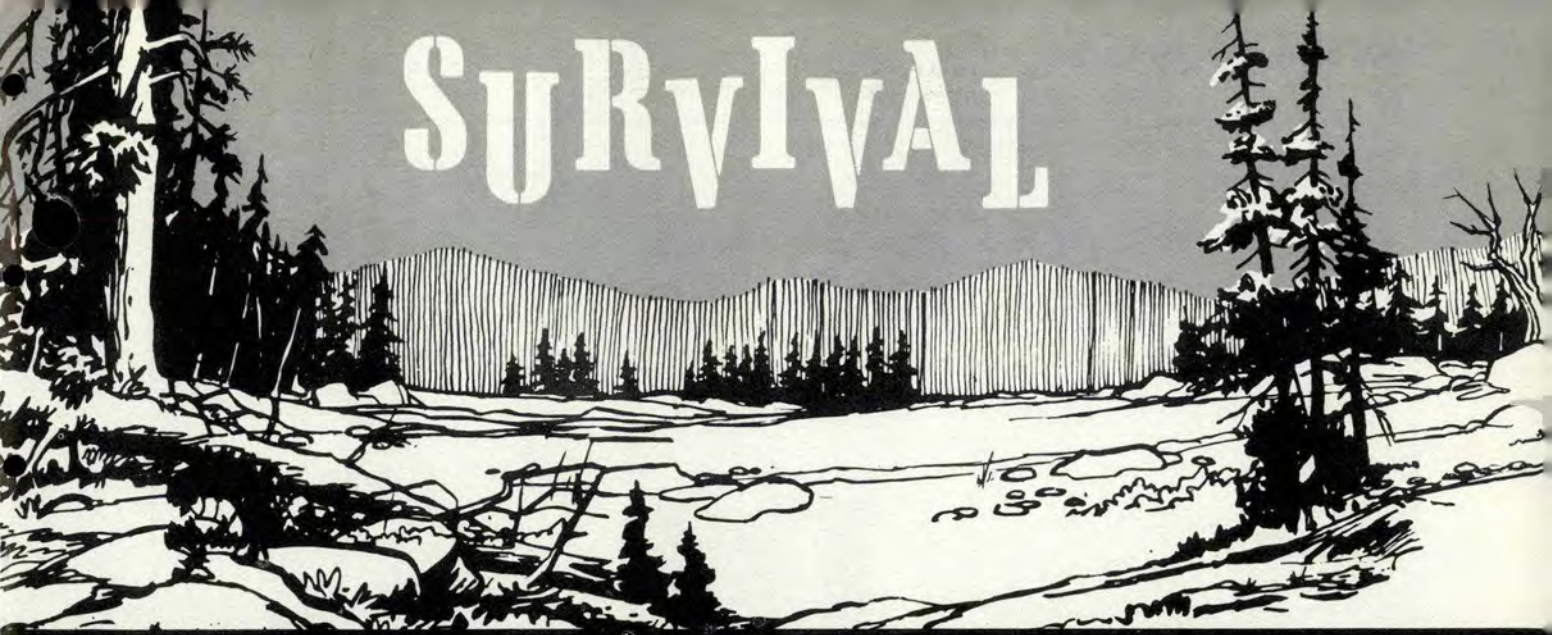
Right main tire with reverted rubber skid mark.

all flight manuals and, if they're wrong, they will be changed. All I can say is, if you get on the brakes, lock them and get below dynamic hydroplaning speed (if you ever do), you will go right into the reverted rubber hydroplaning and stay there till hell freezes over. And remember, you will have zilch cornering capability, so your nose wheel steering won't be of any help except to maybe put you into a skid. That brings us to a new subject.

If you are in a skid, your nose wheels will be castered and aligned with the direction of travel. What now? The flight manual writers seldom stick their neck out here because of the many variables such as degree of yaw, crosswind, cause of the skid, and how much runway is remaining in your direction of travel. I'll give you my opinions which I hope will feed your bar talk and help you reach your own conclusions, but don't shoot me if you follow my advice and get into trouble. I'll be vague so you can't pin me down.

Let's say you're in a slight skid with the nose wheel(s) castered in the direction of travel. I would use aerodynamic controls in an attempt to more nearly align the aircraft with the direction of travel, if I had enough hard surface in that direction, and then engage nose wheel steering. If you are in an aircraft which requires the centering of the rudder pedals to pick up nose wheel steering and the steering is engaged, the nose wheel(s) will rapidly align with the nose of the aircraft. This means they will also be skidding. This probably won't present any problems if your yaw angle is small and you realign the nose wheel(s) with the direction of travel with steering, but if the skidding yaw angle is significant (whatever that means), then you could aggravate the situation. It all depends on the many variables but basically, it's like a car.

Use what you have available to align the vehicle with the direction of travel, keep the tires rolling so you can achieve cornering capability, use steering to put the cornering capability to use and test the brakes. Once braking becomes effective, you should be home free unless you lock them up again. ★



food

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PART I (of a three-part series) NUTRITION AND SURVIVAL RATIONS

Ten thousand years ago, man was a hunter and gatherer of food. Though food proved difficult to procure at times, he did persist. In time he learned how to acquire more than he could consume; hence a surplus. This surplus allowed man to devote more time and energy toward making life easier and more enjoyable. But man also lost some of his individualized skills and techniques of food procurement. This loss made him both dependent and specialized—dependent on others for his needs and wants, and specialized in his job.

How would you, the aircrew member, fit into an environment where you had to think in terms of "Where will my next meal come from?" For some, adapting to the environment and finding food would be easy, but for others, disastrous. The military realizes that today not everyone is able to live out of doors and off the land without some aid from his technology. So, through survival education man is learning to adapt to his environment.

Good physical condition is important to all military personnel and especially to you, the aircrew member. Many aircrew members have had emergencies, found themselves on the ground, and then, due to poor physical condition, found the going rough. Survivors and prisoners of war (PWs) who maintained good physical condition increased their effectiveness in coping with the environment, deprivations, and enemy personnel.

To maintain good physical condition it is important to eat nutritional foods. It is necessary to know the components of food and how the body utilizes these components, to fully understand the value and importance of food. There are two groups of basic food components: major food solids (fats, carbohydrates, and proteins) and minor constituents (minerals, salts, and vitamins). Most foods contain a mixture of these components. The ingestion of these components, in varying degrees, is important for adequate nutrition; some can be stored by the body for later use, but others must be consumed regularly.

This three-part article on food will cover Nutrition and Survival Rations (Part I), Subsistence from the Land (Part II), and Food Prepation (Part III). Parts II and III will be published in subsequent issues of *Aerospace Safety* and will explain how to overcome many different difficulties encountered in survival situations.

The following is a breakdown of the food components and their application to a survival situation:

FATS

Body Uses: Fats are used to generate body heat or to supply energy. Ingested fats can also be converted to body fat which can be utilized later. Fat is an important source of energy because it will yield twice as much energy, by weight, as carbohydrates.

Sources: Solid fats are found on meats in the form of lard, drippings and suet. Milk fat is contained in dairy products.

Survival Uses: A constant intake of solid fats is not necessary to maintain good physical condition except where a special diet is necessary. For example, in arctic areas a large amount of fat is required to generate heat. Fats also give a longer feeling of satisfaction of fullness due to the delay in their passing from the stomach. In PW or

survival situations a deficiency or a complete lack of fat could lead to kidney lesions or other diseases. Do not eat mineral oils, such as liquid parafin, or greases, such as vaseline, for they have no food value.

CARBOHYDRATES

Body Uses: Carbohydrates are used as quick energy for muscle movement. Carbohydrates may also be converted into body fat for later use. They supply the body with two-thirds of its immediate energy.

Sources: Cereal grain, potatoes and other tubers, animal blood and livers, candy, etc.

Survival Uses: Carbohydrate sources such as tubers should be cooked to facilitate the body's use of nutrients. During difficult walks or other strenuous physical activity, candy provides an excellent source of energy. The sugar found in survival rations will also serve the same purpose. In starvation situations the presence of carbohydrates in the diet will help prevent the body from depleting its own body fat and protein (muscle).

PROTEINS

Body Uses: Proteins are the building blocks of the body. They are needed for the growth, repair, and maintenance of body tissue.

Source: Protein is found in the lean meat of animals and in other foods such as milk, cheese, and eggs. Protein is also found in all plant foods and especially in seeds like those of grains, beans, peas, and nuts.

Survival Uses: Protein has the distinct advantage of being available from plant and animal life. To a limited degree it can be converted to dextrose for energy. If given a choice, animal life will provide more protein than plants. In PW or survival situations the lack of protein can cause a deterioration of physical and mental capabilities.

VITAMINS

Body Uses: Vitamins are substances necessary for the regulation of body processes. They serve as a catalyst for metabolic reactions within the body. The chemical factories in our bodies are not capable of manufacturing these substances, so we must replenish our stores regularly.

Sources: Plants and animals.

Survival Uses: A vitamin deficiency could cause anything from beriberi to just ill health, depending on the specific vitamin lacking. A diet balanced between plant and animal foods will enable most vitamins to be absorbed and utilized by the body.

NOTE: Solar radiation serves as a catalyst which enables the skin to produce small amounts of Vitamin D.

MINERALS

Body Uses: Minerals are used in the building of bones and teeth, the formation of organic compounds and body fluids, and influence the function of body tissue. Minerals are essential in maintaining the electrolyte balance of the body. Without an intake of minerals you could experience loss of electrodes in the body which in turn can cause sickness. For example, the lack of salt causes muscle cramps during heavy perspiration. An excess of minerals, especially salt, can also cause problems. Salt taken without an adequate source of water causes thirst, dehydration, stomach ulcerations, and eventually salt poisoning. Salt poisoning is the body's inability to expel excessive amounts of salt either through urine or perspiration because of the lack of water.

Sources: Minerals are essential in maintaining the body and are found in most foods, both natural and processed.

Survival Uses: Though some minerals are consumed by drinking water, a balanced diet is needed to assure an adequate intake of essential minerals.

With this information on the food components, let's look at the general purpose rations adopted by the military.

GENERAL PURPOSE SURVIVAL RATIONS

The general purpose survival ration in your survival kit was developed over a long period of time and is suitable for use in any survival situation, under all environmental conditions, including those where potable water is limited. Four food bars of uniform nutritional content comprise the major constituents of each food packet. Six different bars have been developed for random assembly into the packet. The protein content of these bars is rigidly controlled so that the food packet conserves body water yet assures maximum value from protein at any level of consumption. This unique nutritional design allows the adjustment of issue and consumption to anticipated needs. It was adopted by all branches of the Armed Forces as a standard survival ration and is also used in training and indoctrination at the Air Force Survival Training Schools.

The food packet is packaged in a 12-ounce rectanglar can (key opening type) and consists of the following:

Food bars, survival type (four of six types randomly selected):
Fruitcake, Chocolate fudge,
Cornflakes, Rice-Cornflakes,
Cornmeal bar, Cheese potato
Coffee—instant
Sugar
Soup—gravy base, chicken flavored
Can opener—key type (taped to container)
Directions
Total Calories: 870

It's important to remember that it's not how much you eat but rather what you eat. You should not restrict your diet to just one particular food source, but should try to eat a variety of foods to assure an edequate diet. It is possible to starve to death in an abundance, only because of what you're *not* eating. (Next month—*Subsistence From the Land.*) ★

P STANDS FOR

MAJOR ROBERT L. GARDNER
Directorate of Aerospace Safety

It was a sunny 73 degree afternoon when Captain Roger Rollon and Captain Henry Hover pulled in collective and brought their H-3 into the calm coastal air. Both Rog and Hank were experienced helicopter instructor pilots. Their mission today was a training sortie and each pilot was going to practice autorotations. The only thing unusual was that neither pilot had practiced simulated engine out landings for over two years and they were scheduled to requalify themselves. This had caused the crew to prepare extensively for the flight.

The day before, both pilots reviewed the flight manual procedures concerning autorotations and during the pre-mission briefing autorotations were again covered in detail. As a matter of fact the crew briefed autorotation training twice that day. Earlier in the afternoon the two pilots had flown the same helicopter and when the autorotation rpm was checked it was found to be low, so they had terminated the flight and turned the chopper over to maintenance for adjustment.

This time the autorotation rpm was right on. As a precaution the crew conducted a fly-by over the runway at 150 feet so they could regain the proper site picture for starting the flare. Roger flew the first two autorotations to the runway and then due to other traffic, tower moved them to the helicopter transition area, which was a closed taxiway.

After five more practice auto's, Rog felt pretty comfortable performing the maneuver which he had not done for so long. He then began alternating approaches

PRACTICE not PRANG

with Henry. On the (lucky?) thirteenth approach and Roger's tenth time at the controls, he positioned the chopper for a straight ahead autorotation. The before landing checklist procedures were accomplished and the instruments looked good.

Entry was started at 1000 feet and the trusty copilot, Captain Hover, retarded the speed selectors to 98 percent as Roger called out "collective is bottomed." The descent was normal with rotor rpm at 104-105 percent and the airspeed 70 KIAS. Captain Rollon started a gradual flare at approximately 150 feet. Although airspeed at this point was not observed, the flare height and wind appeared to be the same as on previous approaches.

As the forward speed slowed, the rate of descent did not decrease normally and the helicopter rapidly fell through the last part of the flare. Roger recognized he was too low, called for speed selectors and initiated a recovery as the speed levers were advanced.

But—it was too late. Before the big chopper could be rolled level it struck the ground in an approximately 15-18 degree nose high attitude with 15 knots forward speed. The main landing gear did not touch down and the lumbering machine momentarily stabilized in a 10-foot hover still moving slightly forward. The chopper then began to yaw right so Roger immediately landed the helicopter and shut it down.

Although the crew heard a clunk they did not realize they had hit the runway. The tail rotor blades had struck the ground first, followed by the tail cone. All five tail rotor blades had to be replaced, the intermediate gear box cowling was damaged beyond repair and the gear box was cracked. Shrapnel from the blades tore a 3-inch hole in the left sponson and dented fairing above the cargo door. In addition, the tail rotor gear box and rotor head were replaced and sent to depot for inspection.

Why did this mishap occur? The crew was experienced, the air-

"P" *continued*

craft was airworthy, altitude near sea level, wind calm, and weight was not a factor. Most likely the pilot allowed the airspeed to get too low during the flare entry and this resulted in the higher than expected rate of descent in the bottom of the flare. Then the pilot failed to rotate the chopper level or initiate recovery soon enough to prevent the tail rotor from striking the ground. The crew's lack of proficiency in the maneuver and the command's procedure of letting pilots requalify themselves in autorotations were also contributing factors.

A few months later, at another location involving a different type of twin engine helicopter, a similar mishap occurred. This time, Captain Sammy Smooth Slide, instructor pilot, and Major Audi Rotate, instructor pilot upgrade student, were at the controls of a UH-1N. Major Stan Evaluator, Wing Flight Examiner, was also on board to administer a no-notice flight check to Captain Slide.

After accomplishing several basic transition maneuvers, Major Rotate completed six autorotations. Captain Slide then assumed control to practice a 180-degree autorotation. He rotated the throttles to flight idle, entering the autorotation at 500 feet AGL, 90 KIAS, and 95 percent rotor rpm. Captain Slide rolled into a 50-degree right bank and approximately halfway around the turn the airspeed had decreased to 60 KIAS. Sammy lowered the nose of the twin Huey to regain airspeed. About the same time, he decided to go around and rotated the throttles to full open at approximately 150 feet.

As Captain Slide continued the turn to line up with the runway, he decreased bank and dive angle and applied some up collective; however, the chopper continued to descend. At about 25 feet he flared the helicopter to a slight nose high condition. When ground impact was imminent he leveled the bird, but did not bring in additional collective.

The right skid contacted the ground first, then the left skid hit hard and bent allowing the left chin window to strike the ground and break. The chopper bounced back into the air then touched down on the left skid and this impact sheared the cargo hook. As the right skid touched down the aircraft slid another 40 yards with no further fuselage-to-ground contact.

During the last 15 yards of the final slide the chopper turned 30 degrees to the left. When the aircraft came to a stop the crew applied the rotor brake and exited without incident. The hard landing spread the crossover tubes to nearly full extension, wrinkled the tail boom and damaged the underside of the fuselage.

Again in this case, experienced pilots were at the controls. The instructor pilot was current in autorotations and there were no problems with the aircraft. The 5335 foot pressure altitude, 13 knot wind, and 180 degree turn during the maneuver are factors to be considered, but the pilot just didn't take adequate action during the latter portion of the maneuver to stop the rate of descent.

Not only are these two mishaps similar in that they involved practice autorotations, but in both instances, instructor pilots were at the controls. Although autorotations are not considered exceedingly high risk maneuvers, they can be affected by a number of factors and require skill and judgment to be completed successfully. The measure of success is judged by how the maneuver terminates. The pilot must carefully time the exchange of potential, kinetic, and rotational kinetic energies, to achieve a controlled, level-attitude touchdown at a minimum rate of descent and forward speed.

Timing is crucial during the entry, the steady descent, initiation of the flare, level out, and collective application. But, when it comes to *practice* autorotations the most important timing decision is when you initiate recovery or go-around. It doesn't matter whether you are a copilot, brand new aircraft commander or crusty old flight examiner, delaying this decision may give you the same results experienced by Roger Rollon and Sammy Smooth Slide. Remember when practicing autorotations, "P" stands for perfect not prang. If the airspeed is not right or the rate of descent is high, don't take a chance and try to salvage the approach. Even if you are an IP and consider yourself sierra hotel at autorotations, take it around and save not only yourself, but your boss and the Air Force the embarrassment and cost of an aircraft accident. ★

OPS TOPICS

HE ALMOST GOT IT RIGHT

The KC-135 copilot was making a touch and go landing out of a PAR approach. At DH he went visual for landing. The aircraft was aligned with the runway but the heading was 5 degrees right. The IP in the left seat instructed the copilot to use left rudder to correct the heading. While doing so the copilot allowed the left wing to drop. The aircraft touched down firmly and bounced into the air about 5 feet. The copilot had put in a correction to raise the wing but thought the aircraft was on the ground so he applied left aileron and nose down elevator while slightly airborne. This caused nrs 1 and 2 engine cowlings to strike the runway. At this point the IP took control, made a go-around, and subsequently an uneventful full stop landing.

LACK OF RESTRAINT

The C-141 cargo included a large forklift. Approximately 3 seconds after takeoff power was applied, one of the 25,000 pound restraint rail tiedown fittings came out of its receptacle. This let the forklift slip aft and swing to the right against the catwalk. Two 10,000 pound tiedowns failed when the forklift shifted. The remaining tiedowns held and the takeoff was aborted. The 25,000 pound tiedown had not been properly locked in its receptacle.

WIN A FEW

During a survival training demonstration using an MK 13 Mod O Marine Distress Signal, an attempt to function the night end of the signal resulted in an explosion in the user's hand. The malfunction sounded like the report of a 12 gauge shotgun and both ends activated. This is one time that safety preparation paid off. There was no injury. The user was wearing heavy work gloves with liners and was following the safety procedures outlined for the demonstration phase of the training. He sure would have had a hot hand without any protection.

RANGE TRAFFIC

An F-4 was on final for a 30 degree dive bomb pass when the range officer called out traffic. Since it was night and the exact position of the traffic could not be determined, the F-4 pilot aborted the bomb run. Just prior to bottoming out on the pull off, the pilot in the front cockpit saw a light aircraft ahead and to the left. During the range missions that night, the range officer saw four light aircraft in the vicinity of the range. None of the aircraft were working with center.

UTILITY FAILURE

The FB-111 experienced utility hydraulic failure during gear extension. After completing the proper Dash One procedures, the crew got the gear down and landed. The right main tire began hydroplaning on touchdown and blew out when the aircraft reached the porous friction portion of the runway. The difference in braking coefficient was sufficient to cause the tire to fail after it was weakened by reverted rubber hydroplaning.

OPS TOPICS

NO OFF FLAG

The F-15 start, taxi and runup were normal. However, the airspeed indicator did not increase on takeoff roll so the pilot aborted. During the abort, the airspeed indicator began working. At no time was there an airspeed/mach indicator off flag displayed. Extensive troubleshooting has not uncovered a cause. However, this event points up the fact that a good cross check of all the instruments can save problems later. Not all malfunctions trigger the OFF flags.

EARLY CUT OFF

The F-100 pilot made an excellent landing, then with about 4000 feet remaining, he retarded the throttle to idle, turned off the antiskid and unfastened his life support equipment. The engine flamed out with about 3000 feet remaining. There was no discernible malfunction which would cause a flameout. The pilot's actions were not in compliance with the checklist since he accomplished the after landing checks and unstrapped while still on the runway. It is possible that while preoccupied with the other tasks, the pilot inadvertently bumped the throttle and moved it into cut off position.

IT WILL GET YOUR ATTENTION

Two F-4s making a formation landing touched down normally. Shortly after the wingman deployed his chute, lead's aircraft began to vibrate heavily and swerved to the left. Fortunately, the wingman was on the right so lead's only concern was to get his aircraft stopped, which he did without further difficulty. This could have been a much more serious mishap. That's why such failures should be a part of every formation briefing where a wing landing is contemplated. How about yours?

IT'S THE LITTLE THINGS . . .

During his preflight of a KC-135, the crew chief pulled on the bungee cord for the pitot tube covers. The cord on the pilot's cover came loose and the cover remained on the pitot tube without the crew chief noticing that the cover had not been removed. When the aircrew performed their preflight, the pilot noticed the pitot cover and asked that it be removed. The assistant crew chief agreed to do so but in the press of the launch forgot. The pilot did not check to be sure the cover had been removed. Due to the color of the covers (brown), the SOF did not see the cover installed when he checked the aircraft. On takeoff roll, the aircraft aborted when the pilot's airspeed indicator did not work.

GOTCHA

The C-141 was being vectored for landing. The crew was aware of the presence of thunderstorms and had requested avoidance vectors. During the vector, the aircraft penetrated an area of moderate turbulence and hail which caused some damage to the radome and leading edge areas. Air traffic control radars cannot always "paint" areas of severe weather.

OPS TOPICS

ASSUMPTION

The T-37 had been working in the GCA pattern at the auxiliary field. Several times during the pattern work the crew had been advised of traffic which was always low flying "crop dusters." So when they were advised of traffic during climb out on departure the crew was not particularly concerned. Because of the previous experience with the low flying agricultural planes, the IP did not request avoidance vectors even though he did not see the traffic called to him. In this case the traffic was at 7000 feet (co-altitude with the T-37). The T-37 crew saw the civilian aircraft barely in time to avoid collision. The aircraft passed about 100 feet from each other.

A SUDDEN STOP

An Aero Club instructor and student were flying a Citabria on a sightseeing flight. They had completed a portion of the flight and were flying low level over a remote riverbed when the main gear struck the snow and the aircraft cartwheeled. The instructor was attempting to maintain his crop dusting proficiency. However, he was flying over a level, snow covered riverbed with insufficient references to discern his altitude.

STOPOVER FLIGHT PLANS

There have been two cases of confused clearances recently which merit attention from aircrews. In both cases the flight plan called for a stopover at the same base twice in the same day. On the first stopover the crew confirmed their clearance with the clearance delivery facility but on departure they discovered that, although they had been "cleared as filed," the Center thought they were enroute to a different destination—the one they had filed after the *second* stopover. While mistakes can happen, no matter what, the aircrew can minimize the chances for such a mixup by identifying the destination airport each time they request activation of a stopover flight plan leg.

WAKE TURBULENCE

As the pilot of a Cessna 172 was making an approach to a big civil airport, he noticed that an air carrier DC-9 was preparing to take off on the parallel runway. Just prior to touchdown the Cessna pilot saw the DC-9 had lifted off on the parallel runway. Seconds later the Cessna abruptly rolled right. The pilot recovered and after the 172 rolled straight for a few feet it began to drift off the right side of the runway. The pilot was unable to control the drift and so shut down the engine. The DC-9's wake turbulence caught the Cessna just as it touched down. No wake turbulence advisories had been issued since the DC-9 was not designated as a "heavy" jet. ★

The

Next to a parent, the IP may be the most important person in a pilot's life. He plays many roles—teacher, confessor, judge, disciplinarian, friend, advisor, and so on. Depending on his skill and dedication to his job, he can help a raw new student become a pro, or an experienced pilot training in a different aircraft become truly proficient. Without these attributes, one would surely fail as an IP.

Since we feel the job of the IP is so important, we have solicited and received articles on the role of the instructor pilot from Air Training Command — for the UPT instructor — and other commands for the somewhat different problems their IP's cope with.

This month's article from ATC will be followed next month by one from the 4018 CCTS (SAC) at Carswell AFB, Texas.

The ATC IP's situation is somewhat different from that of his counterpart in the operating commands. His students have virtually no experience base to rely upon. He is working at a more basic level, and at the beginning of development of professionalism. This difference is amplified by the lower experience level of the ATC IP force. Currently about 55 percent of UPT IPs are on their first rated tour. However, the ATC IP's responsibility to his students and the Air Force is the same. In addition to instructing, he must accomplish three more subtle tasks. First, he

Instructor Pilot

CAPTAIN FRANK B. MERCY, Air Training Command, Randolph AFB TX

must set an example in his own flying. Second, he must ingrain a strong sense of air discipline and professionalism in his student. Third, he must be the manager of his students, not only of their flying development but of their physical and mental condition as well.

Although flying instruction consumes most of an IP's efforts, the other three areas can be more difficult due to the lack of help. They do not lend themselves to academics, textbooks, and learning centers.

The first area, that of setting the example, is usually not as great a problem for a recent UPT graduate. However, a pilot with previous experience has developed many short cuts and techniques that are not appropriate for someone with little time in the aircraft. To be an effective IP, he must frequently fly the aircraft differently from how he would if he were a "line jock."

The second area, that of instilling a strong sense of air discipline and professionalism, is related to the first in that these two subjects are more effectively taught by example. Because they're so intangible, more a "frame of mind," it is probably the most critical of an IP's responsibilities. They must be learned at the very beginning. It is relatively easy to correct a flying weakness, for example, in TACAN penetrations. However, correcting a weakness in discipline or an unprofessional attitude is a monumental task for a flying supervisor. If the IP force fulfills this responsibility, flying supervisors should never have to face that problem!

The third responsibility, that of student manager, has a tremendous impact on an IP's effectiveness. Even though the students normally may be able to manage themselves, the IP must assume this responsibility. The student devotes most of his concentration to the mechanics of flying. This, combined with the drive to succeed, will often impair his judgment in making training management decisions. Also, the IP has the necessary power to resolve conflicts in the training situation such as academic load, flight scheduling, etc.

Among the many problems an IP faces, probably the biggest in ATC is building judgment in the necessarily "canned" environment. To build judgment, the IP must expose his student to as many decision making circumstances as possible. It is very easy to do a task the same way every time rather than vary each situation within our training limits.

Exposing a student to decision making brings up the question of how far to let him go. Obviously jeopardizing safety is too far. However more subtly, is it necessary to let the student land in the overrun, or land minimum fuel to learn these are not the right ways to do it? The IP must remain constantly alert for any unexpected situation. Most discussions of, "How far?" ask more questions than they answer. It boils down to the fact that each IP must thoroughly think this question through on the ground, establish limits and apply them as he monitors his students in the air.

One insidious trap is the complacency that the "golden hands" student can lull the IP into. After he has demonstrated superior proficiency in a maneuver, there is a tendency to think of him as competent. That's when he can surprise everyone with a momentary lapse in ability or judgment!

One IP responsibility that is difficult to measure is emergency procedure training. Even with trainers, tests, and ground evals, it's hard to determine how a pilot will react to a real emergency. The IP can do two things to help prepare the student. First he must ensure the complete mastery of all procedures, and of aircraft systems. This is the base for not only the correct action, but for the confidence in his ability to handle the situation. Secondly the IP must strive to present and instruct emergency procedure practice as realistically as possible. Often operational limitations and safety considerations restrict the realism of practice emergencies. When these limits are encountered, the IP must point out their effects, and how a real emergency would differ. If the basis of this instruction had to be condensed, it could be found in our Dash Ones. Basically, number 1, fly the airplane. Number 2, make timely accurate judgments for the situation. ★

HAVANOUT

BARNEY "B" BRYANT, USN (Retired)

We could relax, sit back, and enjoy 100 percent absolute, undeniable aviation safety if we were willing to pay the price. The price would be the grounding and isolation of all aircraft with no physical contact of any kind.

This is, of course, ridiculous. What then is "acceptable?"

The education and training of intelligent people who work with, in, or around aircraft should be pursued so that no unexpected situation shall develop that has not been considered from the safety of a desk, an armchair, or the simulator.

There will always be that remote condition where no human effort can foresee the failure of a part or particle that is going to set up an emergency condition. Who can forecast engine failure while he is crossing the upwind end of the runway? The failure of a brake line during rollout, loss of the tail rotor in a maximum performance hover? The list can go on and on. The saving factor is that under each set of circumstances there is, usually, a choice of alternatives available so that recovery will result in the least amount of injury or damage.

This is where the educated, trained, intelligent being takes over. The alternate courses of action have to be considered, the correct choice selected, and the necessary action initiated, all within a fraction of a second.

This brings us to our key word or phrase for the day, "Havanout." In the armchair engrossed in thought, on the bar stool "hangar-flying," or at a desk is the place where you exercise your intelligence. This is where you develop the answer to "what if?" From engine failure on lift off to your lighter running out of fluid, this is where you develop your "out." Land straight ahead—wings level, or use those book matches from the motel, but you "Havanout." Throughout your daily life, on the freeways, at home, or in the cockpit, the thinking man will have an out for that fire, engine out, or sleepy driver. Whatever emergency develops—

"Havanout!" ★

ABOUT THE AUTHOR

Mr. Bryant was a Navy pilot for 16 years. Since retiring, he has flown the FAA for the past 15 years number of fixed wing aircraft helicopters.

the light that NEARLY failed

CAPTAIN MICHAEL J. POLAY, 3d Tactical Fighter Wing (PACAF)

I was the Instructor Pilot in the rear cockpit of an F-4 on a Ground Attack Night (GAN) mission to the gunnery range. In the front cockpit was a student aircraft commander on his second non-flare GAN mission. Number two aircraft was managed by a student crew.

I briefed the mission using the TAC briefing guide. Special items covered were: weapon preflight, night navigation, delivery parameters and techniques, and human cockpit engineering problems during night flight. The last item was very important since the F-4 has a very poor night lighting system.

Start, taxi, takeoff, and acceleration to the navigation start point was normal. During the first leg, I could see that the route would be very scenic due to great visibility. We turned north and had no problems climbing to our cruise altitude of 16,000 feet MSL. At altitude, the view was breathtaking. We could see lakes, many cities and towns.

Finally we switched to the range frequency and got ready for our bombing passes. Fuel was checked, aircraft trimmed up, gunsight turned on, armament switches set up and all crewmembers ready for the briefed six bomb passes—three high angles and three low angles.

The first two passes were normal—the bombs impacted somewhere on the range. Downwind, base, roll-in, and final for the third pass was also normal, but on pull-out, I heard the aircraft commander say, "The right fire light is on."

While he was recovering the aircraft from the dive, I got out the checklist. Above safe ejection altitude we accomplished the checklist items. When the throttle was retarded to idle, the light went out and since we had no other indications of fire, we left it there. We then declared an emergency and flew direct to our base. Recovery was accomplished with a single engine GCA and the landing was uneventful. The bad engine was shut down during the landing roll-out and the aircraft was fully secured in the dearming area. Prior to returning to operations for the flight debriefing, we stopped off at maintenance and let them know the condition of their aircraft.

So far this seems like a normal mission that was slightly complicated by an emergency. The mission was briefed and flown in accordance with TAC regulations. The emergency was handled according to Dash One procedures and the bird was brought home with no further problems.

The abnormal conditions surfaced during the flight debriefing. During the routine after flight discussion, the AC remarked, "I am glad that the fire light illuminated when I was pulling off the target and not at some other time."

I then asked the age old question, "Why?"

The shocker followed. "Because I had put tape over the fire light so that if it came on, it would not be too bright and bother me. With my head in the cockpit, I was able to see it."

Needless to say, I could not believe what I had heard. Who would ever think that the fire/overheat light would be taped over and defeat one good feature of the F-4 lighting system.

I thought about this incident for many days in order to fully comprehend what happened and why. I came up with two conclusions—one bad, one good.

First, as an experienced pilot, I was not aware of all of the problems that inexperienced pilots have. In numerous briefings this young student aircraft commander was briefed on the techniques of taping up bright lights in the F-4. So he taped up the fire/overheat light that night and he (and I) were lucky that he saw it when it came on. Imagine what the consequences would have been if it was a real fire light and he did not see it for a minute. If I was aware of the problem, I could have told him not to tape up the light.

Secondly, we must build good habit patterns. The student aircraft commander had his head in the cockpit right after bomb release until full recovery. This allowed him to see the light. Luckily, he heeded all of his night briefings and developed his good habit pattern of recovering on the gauges.

The good habit pattern does not negate the taping up of the light. It was just a coincidence that the two events occurred at the same time. The fact remains that we must be aware of problems and build good habit patterns. ★

ABOUT THE AUTHOR

Captain Polay is an alumnus of the University of Buffalo. He graduated from pilot training at Laughlin AFB, TX, in 1967 and has flown T/AT-33s and the F-4. At the time of the incident related in his story, Captain Polay was an IP in an F-4 RTU. He is currently Chief of Flight Safety for the 3 TFW, PACAF.

MAIL CALL

Sorry gents, the Martin Baker seat in the F-4 on page 6 (April 1976 *Aerospace Safety*) is an old H-5 not an H-7 as indicated on page 7. True it's nit pickin', but at least it proves someone is reading your mag.

DOUGLAS C. NELSON, MSgt, USAF
1st Field Maintenance Squadron (TAC)
Langley AFB VA

1. I enjoyed your article and pictures of Doolittle's Tokyo raid (April 1976 *Aerospace Safety*) very much. However, I would like to add one important bit of information.

2. On the back page of the magazine you show several pictures including one of Doolittle's own crew. The officer standing to the right of Doolittle is not identified but he had one of the most important roles in the mission. He was the navigator/bombardier. That man is

Col (Ret) Henry Potter who was a 1st Lt at the time of the raid I believe.

3. You have an excellent magazine; keep up the good work.

JAMES D. CAVEN, Captain, USAF
63d Tactical Fighter Squadron (TAC)
MacDill AFB FL

Thank you for your letter and copies of the *Aerospace Safety* magazine (March 1976 Well Done Award) which arrived just yesterday. It has been just over a year since the incident occurred and I see progress already in the field of bird resistant windscreens as reflected in the same issue in the article written by Lt Col Frank Pyne. I was very lucky that the bird (later identified to be a mature Golden Eagle) struck the radome prior to glancing off the windscreen. If the Eagle had hit the windscreen full force, I'm sure that the results would have been very seriously different. As it was, with a windscreen that was structurally as flexible as a wet noodle, I was able to recover and land the aircraft. If the Air Force can procure a windscreen and a compatible canopy that can withstand the impact of a bird strike without degrading the ability to see safely, then one incident such as mine is well worth the expense.

JAMES D. THOMPSON, Captain, USAF
366th Tactical Fighter Wing
Mountain Home AFB ID

Our weapons need to be as sharp as we can make them. We must be careful that in the name of safety we don't restrict, inhibit, or change the capability to such an extent that the weapon is no longer sharp nor will it win any battles.

Consider the sword. You need one with sharp edges and a pointed end and one as long as your arm. Now if Safety comes along and says that it can only be as long as your little finger, and the end must be blunt because you might stick yourself, and the edges rounded so you won't cut yourself, then you will have a sword which will be quite safe, provided you don't try to swallow it. A bigger handle will fix that.

Now to really make the sword safe, make it tough so it won't break in battle; make it flexible, not brittle; make it so it won't rust and of a material so that you can keep it sharp. And give it to a guy who knows how to use it and isn't afraid that he might cut himself.

JOHN D. BABINSKI, Col, USAF
Chief, System Safety Division
Directorate of Aerospace Safety

35th REUNION—The 2d Aircraft Delivery Group will host a 35th Reunion 13 and 14 August 1976 at Langley AFB, VA. Former members of 2 ADG, 4440th, 1708th, etc., are invited. For details call Lt Cols Bill Watson or Hank Zimmerman at 804-764-5967, or write to 2 ADG, Langley AFB, VA 23665. ★

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Presented for

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significant contribution

to the

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Accident Prevention

Program.

CAPTAIN JAMES R. COLE

354th Tactical Fighter Wing

Myrtle Beach Air Force Base, South Carolina

On 1 December 1975 Captain Cole was number two in a flight of four A-7Ds scheduled for a night air refueling mission. Single ship takeoffs were planned and all ground operations were normal. The night takeoff phase was uneventful until just after lift-off when, passing through 155 knots, Captain Cole heard a loud "bang" and felt severe engine vibrations. The number of options was limited—immediate ejection, continue takeoff and make a precautionary landing with a damaged aircraft, land straight ahead on the remaining runway. He chose the latter. Since he had not retracted the landing gear, Captain Cole retarded the throttle to idle, and perfectly executed an idle power approach to touchdown. Immediately thereafter he lowered the tail hook in anticipation of a departure end barrier engagement. His braking attempt at this high speed had little effect. He successfully engaged the first available barrier thus providing an additional safety margin in case of hook skip or barrier failure. Postflight inspection showed ingestion of a large bird, causing massive engine damage and a six-inch hole in the air inlet extension. The severe engine damage may have necessitated ejection had Captain Cole continued his takeoff. Captain Cole's timely reaction to a critical emergency during a night takeoff prevented the loss of a valuable aircraft. WELL DONE! ★

Chief of Staff INDIVIDUAL SAFETY AWARD

Presented to Air Force personnel who made exceptional contributions to safety during the previous calendar year.

CAPTAIN EUGENE G. LA MOTHE, USAFE

SMSgt LAWRENCE B. BUCHANAN, ADCOM

TSgt RICARDO M. GUERRA, SAC

GS-11 STANCIL R. HARDISON, TAC

The Koren Kolligian Jr. Trophy

Recognizes an outstanding feat of airmanship by an individual crewman who by extraordinary skill, exceptional alertness, or ingenuity averted an aircraft accident or minimized the seriousness of an accident.

CAPTAIN ROBERT C. HELT, SAC

The Colombian Trophy

Recognizes outstanding achievement in military aviation safety by an Air Force unit involved in tactical air operations.

388th TACTICAL FIGHTER WING, PACAF—currently TAC

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Safety Awards 1975

MISSILE

AAC	21 Munitions Maintenance Sq
	5010 Consolidated Aircraft Maintenance Sq
ADCOM	5 Fighter Interceptor Sq
	10 Aerospace Defense Sq
	84 Fighter Interceptor Sq
	318 Fighter Interceptor Sq
	4751 Air Defense Sq
	4756 Munitions Maintenance Sq
AFSC	Air Force Eastern Test Range
NGB	120 Fighter Interceptor Gp
	144 Consolidated Aircraft Maintenance Sq
	141 Fighter Interceptor Gp
	142 Fighter Interceptor Gp
TAC	4 Tactical Fighter Wg
	33 Tactical Fighter Wg
USAFE	86 Tactical Fighter Wg
SAC	19 Bombardment Wg
	28 Bombardment Wg
	42 Bombardment Wg
	68 Bombardment Wg
	319 Bombardment Wg
	320 Bombardment Wg
	90 Strategic Missile Wg
	91 Strategic Missile Wg
	308 Strategic Missile Wg
	381 Strategic Missile Wg
	1 Strategic Aerospace Div
	99 Strategic Reconnaissance Sq
	100 Strategic Reconnaissance Wg

EXPLOSIVES

AAC	21 Munitions Maintenance Sq
ADCOM	Air Defense Weapons Cntr
NGB	181 Tactical Fighter Gp
PACAF	400 Munitions Maintenance Sq
SAC	28 Bombardment Wg
TAC	57 Fighter Weapons Wg
USAFE	26 Tactical Reconnaissance Wg

NUCLEAR

ADCOM	Det 5, 425 Munitions Support Sq
	318 Fighter Interceptor Sq
AFLC	3097 Aviation Depot Sq
MAC	6 Military Airlift Sq
SAC	319 Bombardment Wg
	341 Strategic Missile Wg
	308 Strategic Missile Wg