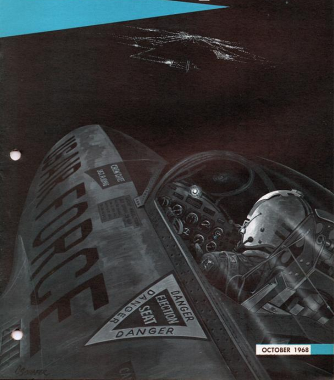
Interceptor



OCTOBER 1968

FOR THE MEN RESPONSIBLE FOR AEROSPACE DEFENSE

Interceptor

volume 10
number 10
ADCRP 127-2

Hq ADC Field Printing Plant
Ent AFB, Colorado

spotlight

A man is richest whose pleasures are the cheapest.
Thoreau

departments

special features

OUR COVER

Our artist sets the scene — a clear night, a high performance airplane making a straight-in, night visual approach — without reference to altimeter this pilot will probably land short! See article page 6.

memo
from the CHIEF OF SAFETY

FOR WANT OF A WORD

We hear a lot these days in the way of sensationalism. The rioting Hippies, the rabble-rousers, and the dissenting groups seem to get much of the attention on TV, the newspapers, and periodicals. It almost seems like you have to do something bad to get recognition. Other people in the public eye are "artists," "notables," and "stars;" "alltime greats," "Red Barons," and Snoopys." All famous because of the lip service, of publicity. The average, hard-working, clean-living, responsible citizen just isn't sensational news.

Now, I believe we should invent a new word or phrase similar to "star" or "ace" or "alltime great" to make famous the guy who supplies the dependability, the courage, the dedication, and the sweat that day after day turns the wheels of our country, the Air Force, and our Command. These are the solid citizens with the less than sensational jobs who because of the lack of publicity go unnoticed by the thrill seekers. How about recognizing an honest day's work, a clean, healthy family, a law-abiding, God-fearing citizen with a flawless safety record and a dedication to his chosen profession — the man who continually supplies the honesty, integrity, loyalty, and produces the work that supplies us our daily bread? These are the people, be they civilian or military, who provide the stability, character, finances and safe environment which made our country great and will continue to make our country great. Our hats are off to this unnamed, vast majority.

COL H. C. GIBSON

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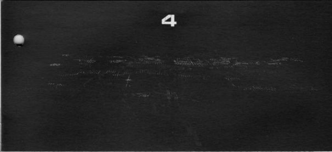


PHOTO QUIZ FOR PILOTS

You are approaching the city of Nighterton in your particular type airplane—the runway is dead ahead, you are cleared for a straight-in night visual approach. It's a beautiful, clear night and without reference to your altimeter, by using just your thousands of hours of experience and your steely-eyed, expert judgment, tell us:

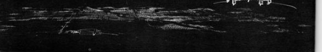
A. How far from the runway are you?
B. How high are you?
C. Can you tell if the city is on a flat plain or a sloping plane?

We know that you can't be off more than a foot or two in altitude and if you're as good as we are—probably a hundred feet or two in distance! But just to check your correct answers, turn to page 28

5

how high is up (or)

"If I were meant to fly at night, I would have been born an owl!" — *Phenomenous, 1900 A.D.*



The following information is a compilation of the efforts of Dr. Conrad L. Kraft and Dr. Charles L. Elworth and their staff of research associates at The Boeing Company, Corporate Headquarters, Seattle, Washington.

The article exposes a critical human failing inherent in all of us, but particularly important to those who fly airplanes at night . . . for the lives of the crew, and for the lives with which they are charged. Our particular thanks to The Boeing Company and to Doctors Kraft and Elworth for their outstanding contribution to flying safety. The Editors.

You are making a night approach to the city of Nighterton which is located on a three degree slope. It is a city approximately 16 miles square and not unlike many other cities all over the world. It has a river bisecting it along an irregular path. On the northeastern border of Nighterton is a large well-lighted airport and just south of the city is another large airport, the one you are approaching on a 360 degree heading. There are no lights between you and the airport, a situation you have found frequently when making approaches over water. The night is clear and the city lights are sparkling bright. Vision is so good that there is little need to rely on instruments except to check your airspeed, so you inform the tower that you're coming in VFR. Your straight-in approach is so uneventful in a smooth handling stable aircraft on a clear night that the only facet of interest is that you've never landed at Nighterton before.

Peaceful? Strictly routine? You would certainly think so — unless you were aware of the fact that within a recent two-week period, eleven out of twelve highly experienced pilots "pranged" their aircraft somewhere between eight and five miles from touchdown. Furthermore, they were concentrating on the task of flying the best path because their performance was being monitored as part of a test. In this test, they had no altimeter available for reference, but starting at 18 miles from touchdown, they received requests to report their estimated altitude every two miles. They did have an airspeed indicator and a vertical velocity indicator. They were instructed to be at 5,000 feet ten miles out and at 1,240 feet 4.5 miles out.

Why did these eleven experienced pilots fly a path which took them below zero altitude? Shall we call it pilot error? It was no more pilot error than would be the case where we asked pilots to fly an aircraft requiring stick forces far exceeding normal human strength. The visual task was simply one which exceeded normal visual ability.

Nighterton does not exist as a city, only as a simulation of a city. No aircraft were lost, no casualties were recorded in the test. However, the simulation is good enough to lead Boeing scientists to believe that the "crashes" of the eleven pilots would have been real had the city been real.

Plan view of the city "Nighterton"

The research being conducted at the Boeing Night Visual Approach Simulator is directed toward the determination of the limits of visual ability for piloting aircraft in night approaches. The versatility of this simulator is unique in that the simulated aircraft can be flown to a negative altitude of 2,500 feet. We can thus obtain a quantitative measure of how far the pilot will go into a dangerous situation, without any specific harm to men or equipment.

Our major emphasis is on the visual aspects of landing approaches and research results have convinced us that at least some of the "pilot error" ascribed to approach accidents is based on incorrect assumptions concerning normal human visual abilities. For example, pilots seem generally unable to judge a safe approach altitude by vision alone if the terrain has an upward slope. They fly too low. On the other hand, they tend to follow too high an approach when only the airport is visible. Another finding is that they tend to use the pattern of city lights as a horizon reference even if it results in one wing being low.

In our study of night visual approaches, we attack the problem in three ways. First, we study accident reports to search for clues relating the accident to the visual environment. Second, we analyze night approaches in terms of the visual information available to the pilot and that which he would need in order to maintain or correct his flight path. Special emphasis is placed on those situations where information from vision outside the aircraft may tend to conflict with that provided by the instruments. Third, we measure the actual path flown by experienced pilots in the simulator and compare this with requested path and with pilots estimates of altitude.

It will surprise no one that a survey of accident reports involving commercial jets showed up many more differences than similarities in the visual environments where these accidents occurred. However, we were impressed with the difficulties faced by the pilot whose approach path provided him with a poor set of visual cues—not the absolute minimum of dense fog, but rather conditions which would lead him to trust a VFR approach when visual information is marginal, possibly misleading. The most obvious of these conditions is the darkness of night when manmade sources of light provide the only visual stimuli.

The complex pattern of a city at night can replace to a large extent the normal daylight cues and the experienced pilot can successfully rely on them most of the time to get his bearings. There is a redundancy of such reference points in an approach over lighted terrain. However, an approach over water or unlighted terrain means that the visual reference points occur at a distance where altitude and sink rate would be more difficult to judge.

Our accident survey pointed up a continuing problem area:

- 234 major commercial jet accidents have occurred by December 1967.
- 82 had occurred on approach and landing.
- 38 had occurred at night, over water or dark land, toward lighted cities.

- Similar percentage of night visual approach over darkness accidents this year (17.5%) as in previous 8 years (16%).
- Increasing possibilities of more approach and landing accidents.

This survey showed that crashes continue to occur with some regularity under night visual approach conditions with highly instrumented aircraft. Accordingly, we set as our research objectives the following considerations:

- To determine the degree to which night visual approaches are unsafe.
- To determine how specific topography, light patterns, descent paths, etc. result in inadequate visual information.
- To determine the degree to which external visual cues provide information that may conflict with instrument readings.

The results of the research would be used to identify requirements for hardware and operational procedures to make night approaches safer.

APPROACH TO THE PROBLEM

- Analytical investigation of cities, flight conditions, accident records, airline procedures, in relation to visual abilities.
- Operational flights to obtain realistic data.
- Design and construction of simulator containing the essential elements of visual operational conditions.
- Experimental investigation of pilot performance and judgments in aircraft approaches toward cities.
- Quantitative assessment of each of the factors and their interaction.
- Apply research data to recommendations for improvements in hardware, procedures, and training.

TWO VISUAL CUES FOR NIGHT APPROACHES

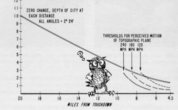
Looking at the problem from the standpoint of the visual environment, we asked: "Was there something about those approaches in the accident reports which might have resulted in insufficient information or in false information to the pilot?" In this examination, we considered the visual angle which provides information to the pilot. This is the angle subtended at the eye by the nearest and farthest lights of the city as the pilot follows his flight path. On a level course, flying at a constant altitude, this angle increases progressively as the pilot approaches the city. With a vertical descent at a constant distance from the city, this angle progressively decreases. There is a specific flight path in which the visual angle subtended by the city remains constant. If the airplane is maintained on this path, the pilot may be losing important closure information without his awareness. This approach path follows the arc of a circle centered above the pattern of city lights with its circumference contacting the terrain. This path provides no changing projection of the topographic plane, formed by the pattern of city lights, along the dimension which is, in visual terms, most relevant.

In addition to the changing projection of the topographic plane, visual information is available from the relative motion of the light pattern as seen from the cockpit. However, since this motion must exceed approximately one minute of visual angle per second before it is perceived, approaches over dark areas do not provide relative motion cues until the aircraft is relatively close to the city. Figure 1 shows that at 240 mph and 3,000-foot altitude, motion would first be perceived eight and one-half to nine miles out. When slowing down and descending, as one would in an approach, the motion threshold occurs later. At 1,000 feet and a speed of 120 mph, the threshold distance would be three and one-half miles.

Figure 2 illustrates the ways in which visual angle of topographic plane projection and perceived motion relate to flight path and aircraft velocity for approaches to level and to graded terrain. The area of greatest interest is between ten miles and three and one-half miles out, where dangerously low altitudes and fast sink rates may result from the interaction between inadequate visual information and topographical variation.

FIGURE 1

ZERO CHANGE APPROACH PATH AND THRESHOLDS FOR PERCEIVED MOTION

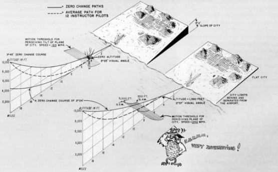


SIMULATION FOR NIGHT VISUAL APPROACHES

A simulator for night visual approaches was constructed and the first studies were carried out with movie films taken of fluorescent chalk models illuminated with blue light, with cameras equipped with proper filters and mounted on scaled approach tracks. With this simulation, the pilots provided altitude estimates but were not given control of their flight paths. In the current, more sophisticated simulation, the city model is situated atop an 8 x 10 foot table, which would appear as a large light panel if the city were removed. The city light pattern is made of thousands of tiny raised translucent bumps in

FIGURE 2

ZERO CHANGE APPROACH PATHS AND THRESHOLDS FOR PERCEIVED MOTION



an otherwise opaque film. The city thus remains visible at simulated ground level, with each bump a point source of light. Selective coloring has been used to simulate lights of sodium yellow, mercury vapor, and tungsten. The plan view of the city appears at the head of this article. Because of the scale of the photograph, individual lights have fused to form lines. The city model in the simulator is scaled 6 inches to the mile. There is a tendency on the part of the pilots "flying" the simulator to try to identify the city from their past experience.

The table containing the city moves vertically and is mounted on a wheeled carriage which moves toward the pilot on rails. The pilot's control of the stick and throttle in the cab (see photos) is fed through the motors which drive the table along these two axes. Distances from 34 miles to 4.5 miles from the airport can be simulated. Maximum altitude is 16,000 feet; minimum altitude is *minus* 2,500 feet. The simulator is programmed to react like a 135,000 lb. commercial airliner in an approach. Maximum forward speed in level flight is 380 IAS; maximum climb rate is 6,000 feet per minute; descent, 8,000 feet per minute. Stall speed is set at 100 IAS, and the aircraft loses altitude at the rate of 12,000 feet per minute under stall conditions.

To make the simulation realistic, the pilot's view was restricted to one eye, because at the distances simulated there are no stereoscopic visual cues as there would be with the actual distances used in the simulator. The validity of the simulation is best represented in the enthusiastic acceptance by experienced pilots of how realistic an impression it creates.

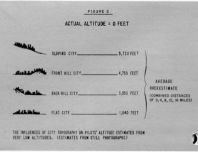
Test crew flying the Boeing Simulator into "Nighterton"

Simulator with pilot seat removed. Controls are stick, throttles, airspeed, rate of descent, and "eyeballs" only.

THE INFLUENCE OF TOPOGRAPHY ON NIGHT VISUAL APPROACHES

In a preliminary study pilots sorted 200 photographs representing cities of different topographies viewed from distances ranging up to 16 miles and altitudes up to 20,000 feet. The photos were masked to provide a frame like that of a pilot's windscreen. They placed the photos in categories separated in units of a thousand feet, spending not more than ten seconds with each photo, thereby simulating short glances outside the cockpit in instrument let-downs. One of the findings from this study is shown in Figure 3 which contains the average estimates for all distances combined. The results show that such estimates are very difficult to make and, while one would not want to make too much of the absolute values of these estimates, the data do suggest an important influence of topography.

When the construction of the simulator was completed, it was possible to compare the results from the still photographs with



pilot performance in the dynamic situation. Twelve Boeing instructors from flight crew training each made 12 approaches, half of which were to the city in a flat position and the other half to the same model with a 3 degree slope. They were informed of the slope or lack of it before each approach. Two other variables were tested in the experiment, starting altitude (16,000 feet vs. 10,000 feet) and distribution of lights (airport only, airport with distant half of city, and airport with full city).

Pilots were instructed to choose their own approach path to the airport at the near edge of the display, except that they should attempt to be at 5,000 feet ten miles out and 1,240 feet four and one-half miles out, at which distance the problem ended. They were also asked to be flying 180 mph IAS at ten miles and 120 mph at four and one-half miles. An x-y recorder at the experimenter's station makes a continuous record of the flight path generated by the pilot.

During each approach the pilot received 8 requests for altitude estimates, starting at the 18-mile point. He was forced to guess because there was no altimeter in the cockpit.

To increase the workload on the pilot during his approach, he was required to report the presence of other aircraft in the area. Two simulated aircraft orbited over the city, one in a clockwise fashion, the other counterclockwise. A special switching arrangement made one or the other aircraft visible for 10 seconds at a time, for a total of eight such exposures during each approach. The pilot was alerted to the presence of other aircraft when he heard communications between the ground and the airplane he was to locate. Upon detecting the other airplane, he was to report its position and altitude relative to his own, and its heading.

EXPERIMENTAL FINDINGS

The performance variable of major interest was generated altitude (the approach actually simulated by the pilot).

Source	Percent of Variance
Pilots	24.9
Distances	19.8
Slope of City	16
Light Distribution	4.3
Beginning Altitude	——

The above table shows the relative importance of the main experimental variables in their effects on generated altitude. One of the main variables, beginning altitude, had no significant effect on generated altitude. The remainder of the observed variation in performance (the 35% which does not appear in the table) occurred as a result of two or more variables acting together. All such interactions included differences in distances or pilots.

The largest source of variation in generated altitude (25%) is due to differences between individual pilots. While individual differences are typically large in human factors studies, this finding is particularly interesting in this case because it is assumed that approach paths would be rather standardized for commercial jet aircraft. The performance of Boeing pilot instructors in our simulator suggests that there are broad limits in the range of altitudes chosen on the basis of visual reference.

The second largest contributor to variation in generated altitude is distance from touchdown (20%). This measure is actually a difference score, the difference between a straight path between requested altitudes and the path flown. The pilot started his run at an experimenter-controlled altitude (15,840 or 10,000 feet) and was requested to be at 5,000 feet ten miles out and at 1,240 feet 4.5 miles out. Unexpectedly, this factor of distance from touchdown has less effect than differences between pilots.

City slope, the main experimental variable, accounts for 16% of generated altitude variation and is the third most potent variable tested in this study. The effect of this variable was consistently that of causing the pilots to take a lower approach path.

The remaining variable of distribution of lights on the terrain had a small but significant effect on approach path (4.3%). It is the direction of this effect that is most interesting. We would expect that increasing the amount of visual information by adding lights provides better reference information. However, our data suggest that more visual information may actually be detrimental if it tends to be misleading. Thus, the addition of lights in this study caused a greater deviation in approach path toward dangerous altitudes than was the case where only the airport was visible.

It was anticipated that the detection of other aircraft would be easier when only the airport lights were on, and this expectation is supported by the data. Approximately four times as many aircraft went undetected when all or part of the city lights were on as when only the airport was lighted.

Returning to the major experimental variable of city slope and the performance variable of generated altitude, let's look at the two curves in Figure 4 for approaches into the airport with all of the city lights on. Although the pilots were informed prior to beginning each approach as to whether the city was flat or sloping, their flight paths were obviously quite lower when the city was sloping. The visual angle subtended at the pilot's eye by the city was very nearly the same at the 4.5 miles point for both cases—2 degrees 49

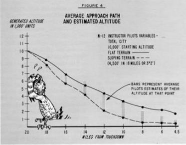


FIGURE 4

minutes for the flat city, 2 degrees 46 minutes for the sloping city. Beginning at the eight mile point, the approach path to the sloping city is dangerously close to zero altitude.

What path did they think they were taking? Look at the shaded bars projecting upward from the points on the lower curve in Figure 4. The tops of these bars represent their estimates of altitude at these points. It appears that these experienced pilots thought they were at approximately the same altitudes as in the approach to the flat city. Two ADC fighter pilots who recently flew the simulator generally typified the reactions of other pilots. Their test results add to their comments that the visual deceptions induced are quite shocking. They said that if you have to land short at night, the simulator is a good place to do it.

We conclude that pilots acquire through their training and experience a visual frame of reference that approximates a safe and conventional flight path onto a flat terrain. Many successful approaches are made with this reference particularly with assistance from instrumentation. The night visual approach accidents with highly instrumented aircraft then may occur when the light pattern, topography, etc. provide *invalid* visual information, and circumstances are such that other sources of information are not referred to or fail to provide corrective information.

The July 1962 (page 5) issue of the INTERCEPTOR provided us with an example that befell the military. At Webb Air Force Base during a practice VOR approach on a clear night, two pilots aboard a T-33, one hooded with the other observing, were involved in an accident. The hooded pilot inadvertently lost a thousand feet during the turn after a low cone, without its being noticed by either him or the safety observer. As they came out of the turn, he leveled off at what both pilots believed to be the low cone minimum altitude for the low approach. After 300 feet of descent, the aircraft crashed 6.8 N.M. short of the runway. Captain Richardson, the author of the article, (later with the INTERCEPTOR staff) contended that one aspect of the accident was not explored fully. He felt that the real causal factor of this accident, and others like it, can be determined from the answer to one question:

"Why didn't the Safety Observer, even without reference to his altimeter, see that he was low and take corrective action?" We agree with Captain Richardson in his raising this question, but we wish to offer a variation on his explanation.

Some contributing factors must be developed to give the reader the background of the accident and explanation.

(1) The Webb VOR is 10 N.M. (11.4 statute miles) from the runway threshold which is 100 feet below the surrounding field elevation. All altitude figures in Figure 5 use the runway threshold as an altitude reference.

(2) There are no lights on the ground between the VOR and the field.

(3) The approach end of the runway is 14 feet below the midpoint of the runway.

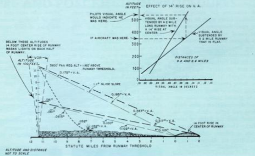
(4) The approach, threshold and runway lights are visible on the ground at the crash site.

(5) The accident board report quotes the pilot who was flying the aircraft as reading 3600 feet on his altimeter just before impacting at 2650 feet.

Our interpretation agrees with Captain Richardson's contention that the glide path angle, 1.1° is a very small angle. From the F[illegible] specified altitude at this VOR (1160 feet above runway thresh-

FIGURE 5

ANALYSIS OF WEBB AFB ACCIDENT



old) the visual angle subtended by a 10,500-foot runway is not greater than 0.16°. (For the reader's frame of reference, the 12 pilots in the simulation study flew a mean VA of 0.68 at 12 miles and 0.73 at 10 miles toward a runway of the same length and a conventional 3° glide slope would provide a VA of 0.467° at Webb.)

We are assuming the T-33 crossed the VOR at 1160 feet and descended along the curved dotted line in Figure 5 which follows the reenacted path flown for the accident investigation board. What would have been required of the safety observer in the front seat? He would have had to discriminate a rate of visual change of 0.038°/minute. This translates into 2.28 minutes of visual angle/second [illegible]l is just above the visual threshold and, therefore, might have been discriminated under ideal conditions and no distractions. In this case, other work may have kept the pilot from looking at the scene except between 9.5 miles and 8.4 miles. (It was at 8.4 where the slower rate of descent was initiated.) Discrimination of the excessively low altitude would not have occurred here as: (1) The rate of change of the visual angle is below threshold (0.6 minute/second; (2) the pilot would have been looking at the front half of the runway due to the raised center portion (14 feet). The angle he would have seen, if he correctly judged its magnitude, would have corresponded to an altitude of 560 feet when his actual altitude was 360 feet. The aircraft had reached an altitude and distance combination where the raised center of the runway masked the back half of the runway. After this masking, the visual angle has a different relationship with altitude, changing more slowly, and having different absolute values except at 150 feet (crossover point in upper right graph of Figure 5).

So...

The modification of valid visual angle information occurs as a function of natural, economic and chance conditions; i.e., topography, distribution of population, irregularity of lights within city limits, attenuation of brightness and clearness of lights by atmosphere. Man has also by design made certain cities or airfields more dangerous than others. He was designing, in these instances, for man's other comforts or safety when he created these more dangerous airports for night visual approaches. He locates airports away from cities, requiring approaches over water, over deserted farm lands, etc., to avoid for the terrestrial population noise and potential injury. He builds airports by filling in shorelines, using remote land, and by locating them in close approximation to ground transportation systems (which systems also have flashing red lights which may be confused with the lights of other traffic). Thereby he builds into his city or military airfield higher probabilities for dangerous night visual approaches.

The commercial accidents have clustered about some 20 cities. There are probably many more airports having unsafe conditions, which have not had such accidents. Where are they and are they characterized by some special conditions which prevent such accidents? These questions haunt us because only through this kind of knowledge can we hope to prevent new accidents or provide new information to reduce their probability. Do you know such airfields, military or civilian? We would appreciate any account of misleading visual cues, any personal experience of disagreements between your instruments and the visual scene that would help us to look for trouble spots and to develop methods of correction.

As a guide to features that we would consider dangerous, we will describe a hypothetical city. This very dangerous city is approached over darkness (land or water). The airport is on the near side and is of nonconventional width and length and has a rise in its center section. The airport is situated at a different altitude and on a different slope from the surrounding terrain, and the dark terrain has some smooth hills along the flight path. The outer marker is quite a distance out, beyond 8 miles. The lighting of the runway is substandard, the ILS is known to vary and GCA is not available or seldom used. The city is a sprawling irregular matrix of lights of no particular plan spread over a variety of hillsides in back of the airport. These same hills hold clouds which obscure the horizon and hold in industrial smoke which decreases the brightness of lights without making them appear blurred. The city fathers, interested in the increased business your arrival represents, have erected a large extremely well illuminated sign just beyond the end of the runway saying "Welcome!"

None of these conditions are impossible and we hope you never have to fly into an airport that combines all these conditions. A first step may be the tallying of where they exist and the preparation of briefing material to warn the pilot of their existence. ★

As for the authors, they shall continue research in this area along the paths outlined in this report. If the reader has information of some potential value in this effort, please communicate it to the authors at the following address:

Mail Stop 23-28
Support Systems Laboratory
Military Aircraft Product Development
Corporate Headquarters
The Boeing Company
Seattle, Washington 98124

Dr. Conrad L. Kraft's Ph.D. is in Engineering Psychology from Ohio State University, where he engaged in research on human engineering aspects of radar air traffic control for the USAF. At Boeing since 1959, he has headed the human engineering work in aerospace, done research in aerial photographic interpretation, and is now engaged in this research on night visual approach. This work that he heads as part of his duties as Chief Scientist for the Personnel Subsystem organization in Military Aircraft Product Development, is supported by the Electrodynamics Staff of Boeing's Commercial Airplane Division.

Dr. Charles L. Elworth's Ph.D. is from the University of Rochester where he was engaged in "Laboratory Studies Pertaining to Visual Air Reconnaissance", a USAF research contract. After two years of research in physiological aspects of vision at Vassar, he joined Boeing in 1962. At Boeing, he has engaged in research in interpretation, sonar operator performance, basic vision, and stereoscopic skills, in support of the USAF, USN, and Army. He currently heads the Exploratory Research Laboratory of the Personnel Subsystem organization in Military Aircraft Product Development.

PRE AND POST EJECTION PROCEDURES

Don't delay the ejection decision.

Recent events within the Command have pointed up the need for re-emphasis and clarification on the subject of *decision* to eject, proper pre- and post-ejection procedures, and to highlight some recent changes in these procedures. We are concerned not only with your successful egress from the aircraft, but also with the subsequent chain of events which can cause injuries if not dealt with properly.

THE EJECTION DECISION

THE DELAYED DECISION TO EJECT HAS BEEN RESPONSIBLE FOR MORE UNSUCCESSFUL EJECTIONS THAN ALL OTHER FACTORS COMBINED. Not only is it enough to be thoroughly knowledgeable and familiar with your aircraft systems, emergency procedures, and the all-important ejection procedures . . . YOU must have a mentally preconceived notion as to what YOUR actions will be to the many and varied situations that you can come up against while flying your particular aircraft. Only YOU know what your real proficiency level is, your past experiences, what your mental and physical conditions are. How far are you willing to press a shaky and tenuous situation and why? If you fly with a man in the back seat, HIS life is in YOUR hands. We need YOU more than we need the bird!

General Putnam's guidance to the pilots of the Fourteenth Air Force, INTERCEPTOR, June 1967, is quite appropriate, ". . . at that moment when conditions for a successful emergency landing do not appear ideal, the aircraft becomes valueless and ejection at a safe altitude is the proper and only course of action." Safe altitude? . . . ACCIDENT STATISTICS EMPHATICALLY SHOW A PROGRESSIVE DECREASE IN SUCCESSFUL EJECTIONS AS ALTITUDE DECREASES BELOW 2,000 FEET TERRAIN CLEARANCE. *Don't delay the decision to eject!*

In "Get Out – Get Down – and Get Back," INTERCEPTOR, June 1968, Major Chuck Lehman of the ADC Life Support Branch says, "The first step in an ejection sequence is that big decision to leave the cozy cockpit womb and venture into the unknown. Delaying this decision can make your wife a widow! Unfortunately, just telling you not to delay probably won't prevent it. You've got to be so confident in your equipment and your procedures that fear of the unknown won't tempt you to wait too long."

PRE-EJECTION PROCEDURES

Note: Most ejection seat aircraft Dash Ones preface this section with the wise warning, "IF TIME AND CONDITIONS PERMIT." Each ejection seat aircraft Dash One contains the pre-ejection procedures which apply to that individual aircraft. These may vary somewhat, and, the conditions vary considerably, but basically they are:

• Head aircraft toward an unpopulated area.

- Stow loose equipment.
- Advise other occupant of decision to eject (if applicable).
- IFF/SIF selector switch—EMERGENCY; Mode 3, Code 77 dialed in. Note: Some aircraft have an automatic feature that selects IFF/SIF — EMERGENCY when the canopy is ejected.
- Transmit MAYDAY and give position report (in the blind if necessary).
- Reduce airspeed if excessively high.
- Pressurization—ram and dump (high altitude).
- Zoom aircraft if at low altitude, airspeed permitting (aircraft attitude is important during low level ejections).
- Lower helmet visor *(chin strap should always be secure).*
- Actuate oxygen bailout bottle (if applicable).
- Proper body position: The legs and feet position vary with different aircraft, but normally the crew member should sit erect, arms and elbows firmly in the arm rests, head hard back against the head rest, with chin tucked in (improper body position has frequently resulted in compression fractures of the spinal vertebrae).

EJECTION PROCEDURE

Note: The automatic lap belt should not be opened prior to ejection regardless of altitude.

- Firmly raise either or both ejection seat handgrips (as applicable).
- Pull the trigger or triggers (as applicable).

POST EJECTION PROCEDURES

Note: Refer to T.O. 14D1-2-1, "Personnel Parachutes," 15 April 1968, for detailed information on most of the following procedures.

- Immediately following ejection, attempt to manually open the lap belt. This is strictly a precau-

Proper pre-ejection position (T-33)

Post-ejection free-fall position

"Spread Eagle" position to stop body spin

tionary measure in case the belt fails to open automatically. If the belt is operating normally it will be impossible to better the automatic opening time.

• As soon as the lap belt releases, a determined effort must be made to separate from the seat to obtain full parachute deployment at maximum terrain clearance; this is vital for low-altitude ejections. This is also a precautionary measure for ejection seats equipped with a man-seat separation device, should it fail to function. (More than one man has ridden the ejection seat into the ground with a firm grip on the handles.)

• If the lap belt fails, and is opened manually, the automatic feature of parachute deployment is eliminated. The parachute arming lanyard must be pulled if above 14,000 feet, or the parachute ripcord handle must be pulled if below 14,000 feet.

POST EJECTION FREE FALL

• Recommended free fall position is to bend at the waist and KEEP YOUR ARMS AND LEGS TOGETHER. When the pilot chute and canopy come out of the pack, they come out FAST. Keep your arms in close to your chest and keep the right hand *near* the rip cord handle. Don't grab it until you are ready to pull. Be sure your delay carries you below 15,000 feet; otherwise, *wait* or pull the automatic release arming knob, if available — BUT DO NOT PULL THE RIP CORD HANDLE ABOVE 15,000 FEET!

BODY SPIN

• If it is necessary to free-fall beyond a few seconds, the body position recommended above may, in some cases, result in body spinning. This free-fall phenomenon normally starts after the body has reached terminal velocity and is especially noted when the body has assumed a back down, head low attitude in relation to the ground. The onset of the spin may be gradual or rapid. A "FLAT" BODY SPIN, IF SUFFICIENTLY SEVERE, CAN BE DANGEROUS and result in loss of consciousness and even serious injury. If you are approaching a flat spin, move your arms and legs to a wide "spread eagle" position and try to keep your spine arched to the rear as much as possible. These movements will break or slow the spin. On recovery from the spin it is essential to GET YOUR LEGS AND FEET TOGETHER AND ELBOWS CLOSE TO YOUR BODY PRIOR TO 'CHUTE OPENING. Injuries frequently occur as a result of line entanglement during 'chute deployment if the proper position is not maintained.

• After 'chute opening, survival kit deployed, if applicable.

MID-AIR MODIFICATION

The following procedures can be safely utilized to *reduce oscillations* and provide a *capability for steering the parachute*. The modified canopy will inherently glide in the direction you are facing at approximately 3 to 4 knots in calm air. Use this drift to your advantage by maneuvering toward a suitable landing area, or correct for wind drift. These procedures should not be attempted when parachute opening occurs below 1,000 feet, and the four-line cut at any altitude if you are oscillating severely, or at night. (The reason for this is to preclude accidental cutting of more than the required number of lines.)

• The Four-Line Cut

1. Visually locate shroud lines one and two and twenty-seven and twenty-eight. They *are* identified by red tape.

2. Remove your hook blade knife from the pocket located on your flight suit or on the right front riser.

3. Pull the rear riser down until you can cut the marked suspension lines on both sides.

4. To turn the parachute, grasp the appropriate riser (i.e., right rear riser for a right turn and left rear riser for a left turn) and pull down. Release the riser when the turn has approached the direction in which you wish to be oriented.

• Four-Line Jettisoning Lanyard. Parachutes of latest design, or which have been modified, will have a four-line jettisoning lanyard installed on each rear riser strap. This will eliminate the need for cutting lines. The lanyard will be

After the four-line cut

Body position for land landing

New method of canopy release using fingers

identified by a red loop on the rear riser straps.

1. If the hand tacking through the riser straps has not broken during the opening, grasp either riser strap above the tacking and tug sharply to break the tacking and free the red pull loop of the jettisoning lanyard.

2. Grasp the pull loop and give a second sharp tug (both sides) to unlock the four lines.

3. To turn the parachute, pull on the appropriate lanyard for the desired direction of turn, as the lanyards are attached to the rear connector links.

Note: Use of the four-line jettisoning lanyard during oscillation can be accomplished safely.

PARACHUTE LANDING FALLS

- Land Landings
  1. Mask on.
  2. Visor down.
  3. LPUs inflated.
  4. Body position. RECENT CHANGE IN PROCEDURE! *Arms not crossed—right hand over right safety cover, left hand over left safety cover.* Place your feet together, bend your knees slightly and point your toes toward the ground. Eyes on the horizon—DO NOT LOOK STRAIGHT DOWN AT THE GROUND!
  5. Release—Do not put fingers in release cables over land! (Unless in high winds, which will be covered later.) Actuate safety covers and cable releases after contact. Use a sharp tug or jerk (not a steady pull) on the cable loop with either one or two hooked fingers or your thumbs.
- Water Landings
  1. LPUs inflated.
  2. Mask off.
  3. Visor up.
  4. Canopy release procedure —Remove safety covers and release canopy, using the following procedures:

a. Hook your arm through the V of one of the risers and firmly grasp the opposite forward riser, with fist closed. Visually locate the safety cover underneath the bent elbow.

b. With the opposite hand, reach across using thumb and forefingers, pull down the safety cover.

c. Slowly remove arm from V of riser and repeat process on opposite side.

d. Immediately place your hands on the canopy releases.

e. On contact with the water *and not before*, operate releases with a sharp jerk.

Note: These procedures also ap to high wind water landings.

New method of canopy release using thumbs

Releasing safety covers for water, high wind, or night landings

Body position for a tree landing

• High Wind Landings — Land. Use the canopy release procedure as spelled out in the above-described Water Landing procedures.

• Tree Landing
1. LPUs inflated.
2. Mask on.
3. Visor down.
4. Safety covers closed.
5. Forget your risers and canopy releases and cross your arms in front of your face; then bury your face in the crook of one elbow.
6. Keep you feet and legs together.
7. Don't try to stop or slow your trip through the trees by grabbing limbs.
8. Don't be in a hurry to get down after your canopy hangs up. Rest a moment or two to get over the shock of ejection and then evaluate your situation. Use the personnel lowering device if necessary.

• Night Landings.
1. Prepare for any type surface.
2. LPUs inflated.
3. Mask on.
4. Visor down.
5. Normally you will be able to see the ground, but your judgment of distance will be poor. If it is dark and you can't see the ground or horizon:

a. Prepare for a landing as soon as the parachute is open.

b. Be prepared for contact at any time, but do not try to anticipate landing. Statistics show fewer injuries occur during night ejections. The reason for this is apparently explained by the fact that men generally do not tense up for the unexpected.

c. High wind landing procedures for canopy release apply to night landings.

Further recommended reading on the subjects covered can be found in T.O. 14D1-2-1, "Personnel Parachutes," dated 15 April 1968, ADCPI 62-8 (INTERCEPTOR), "Ejection vs Forced Landing," ADCPI 62-20 (INTERCEPTOR), "Post Ejection Survival," and ADC Ejection Exposure Analysis, January 1960 through June 1965, Analysis: ADCSA-N/65 8-2. ★

HOT LINE

Correct — flush surface

Incorrect — notch exposed

SEAT-MAN SEPARATOR

Tech Order 1F-106-1031 is being issued to provide for installation of seat-man separator guides in the backrest of F-106 ejection seats. This mod is being initiated to correct a deficiency detected during TDRs of several past accidents, where seat-man separator straps had doubled and were not completely reeled into the rotary actuators. It should be pointed out that these failures did not adversely affect seat-man separations. However, to preclude the possibility of any future seat-man involvements, it was decided a positive fix was required. The—1031 TCTO will require installation of strap guides on the ejection seat backrest to keep the straps properly aligned during retraction. Without the guides, proper alignment is not maintained and the straps can become jammed at some point during seat-man separation, resulting in incomplete separation and possible seat-man-chute involvement.

F-102 FAST EXIT

You can tell a fighter pilot, but you can't tell him much. He wants to be shown. And so, one of our Deuce units set about doing just that. A number of pilots were skeptical about retaining the F-102 canopy during a crash landing. They believed the canopy was too tough to break through using the tool in the cockpit. An agreeable jock was picked to demonstrate the feasibility of escape in a bird scheduled for P.E.

It took him 20 seconds to unstrap and get out of his chute. He took the breaking tool in both hands and started beating away at the bottom portion of the left canopy panel. On the eighth whack, a large piece of canopy departed. The hole was more than adequate to allow the pilot to climb out of the aircraft. It took just 20 seconds. Helmet and mask were kept on with the visor down. Total elapsed time from the start of the escape sequence to completion was 40 seconds. No more skeptics!

T-33 NOSE GEAR

During takeoff on a cross-country flight, no discrepancies were noted by the pilot. After landing at destination, the roll-out was normal until reaching the 4,000 foot remaining point. The pilot then felt excessive nose gear shimmy. Approximately 1,000 feet further down the runway, the aircraft veered sharply to the right and did a 180 degree turn. The engine was shut down and the aircraft had to be towed to the parking area.

Investigation revealed that the lower nose gear torque arm (PN 175174 WUC 13213, Ref T.O. 4S2-32-34) had failed. This allowed the nose gear to cock and spin the aircraft partially around. A review of the AFTO Form 781-A indicated that a crack had been discovered in the torque arm previously and the arm had been replaced. Cause of the failure during roll-out is believed to be improper installation of the torque arm in that the lower unit had been installed upside down. This resulted in the nose wheel being slightly off center, causing undue stress on torque arms and led to the eventual failure.

ORI

OPERATIONAL READINESS INSPECTION TEAM
HQ, ADC

A DAY BEHIND THE FENCE

At 0720 in the morning the personnel of the munitions storage area begin to clear through the entry control point where they exchange their badges. After depositing their spark producing items, still somewhat sleepy, they proceed to the maintenance area.

The work day begins with the morning briefing. The NCOIC Briefer includes the latest COLLEGE GOOF message along with the daily work schedule. This day's principle item of maintenance will be to perform a 120-day inspection on unit 1234 (an AIR-2A missile).

After briefing, the maintenance crew chief checks the certification chart to insure that all members are properly certified. He then conducts his *crew* briefing.

Part of the crew performs the pre-use inspection on their equipment. They reject the T-283 Pressure Test Set because the AFTO Form 255 covering two of the screws on the back side of the meter is broken. The calibration of the meter is now questionable. Since a serviceable spare T-283 is available in the maintenance building, it is not necessary to go through FK supply at the time.

Meanwhile, two other maintenance technicians perform the pre-use inspection on the tow vehicle and proceed to the storage magazine. Prior to their departure their names were given to the alarm control monitor at the entry control point. OUTSTANDING! This coordination between security and maintenance is so vital. Simply stated, designated munitions personnel must notify the alarm panel operator of the two people who will enter the cell and the amount of time they will be there. The two-man concept becomes extremely important at this point. This alarm panel operator checks his list to insure that entering personnel are authorized and then verifies the call from munitions. The two munitions people proceed to the cell and then call the alarm monitor. They identify themselves individually by jack phone and are challenged by the alarm monitor with the code of the day. When the alarm monitor is satisfied with the identity of the entering personnel, he places the alarm in OFF position and then turns close-in security responsibility over to the munitions personnel who made the entry.

Close coordination is evident throughout the above procedures. Security police prepare the code of the day and distribute it to all interested agencies. Munitions supervisors insure that their personnel receive and protect the code of the day. Munitions and security must continually coordinate on the length of time that personnel will remain in "Sensitive" cells. Any change of the original time must be reported immediately. This type of coordination continues through almost every activity behind the storage area fence.

The maintenance technicians then prepare the weapon and trailer for transportation, attach the MF-9 to the tow tractor, and remove it from the cell. At this time, they secure the cell, inform the alarm control monitor accordingly, and proceed to the maintenance bay. After entrance the crew chief assigns tasks to his team. He informs them that the QC inspector will observe the entire 120-day periodic.

And now the maintenance operation proceeds in the normal sequence of events; two team members working on the firing mechanisms and the other pair working on the warhead (two-man concept applies).

During the firing mechanism test the readings obtained from the GWM-1 test set are not within the tolerances listed on the ADC Form 536, the Firing Mechanism Test Record. The technicians notify the crew chief, obtain T.O. 11A11-9-2 and start trouble shooting in accordance with Figure 5-3a.

The firing mechanism has to be rejected and the FK supply NCO, a recent graduate of FK Supply School at Lowry AFB, is notified that a new item is required. The FK supply account is a manual stock record account. FK supply personnel are responsible for the receipt, storage, issue and accounting for all nuclear and non-nuclear munitions and spares consigned to the activity.

Since the requested item is a recoverable spare, a DD Form 1150, Request for Issue/Turn-in, is required. Upon receipt of the issue request and completion of the document control register and other necessary action, the FK supply NCO determines the availability and storage location of the item. The required firing mechanism is available and withdrawn from storage and issued to the maintenance technician authorized to receipt for this property. The reparable firing mechanism turned in on a DD Form 1150 cannot be repaired locally and disposition is requested from the item manager at the prime depot, OOAMA.

The new mechanism passes the test and the periodic inspection continues. After the firing mechanism, igniter, forward umbilical cord, and the rocket motor are tested, the technicians then place signs on each component indicating "Critical Component" and requiring two-man concept coverage.

As this operation progresses the quality control inspector is like a shadow in the maintenance bay. The technicians are aware of his scrutiny but he doesn't interfere with their work. They know he could answer their questions but they also know he will refer these to the crew chief. The most important thing here is that the quality control inspector does not supervise — he is there only to inspect and report.

Following the final quality control inspection, the maintenance technicians perform final clean-up operation and return the weapon to storage. Here again, security forces come into effect just as in the removal from storage.

It is now 1230 hours and with their task complete, the "brown baggers" of the maintenance storage area break for lunch and a few quick hands of "hearts." Normally, a weapons storage area is too far from a regular Air Force messing facility to eat there.

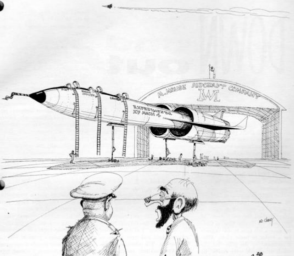
At 1330 hours, the maintenance NCOIC calls the troops together for a short debriefing on the 120-day periodic. He congratulates them on a job well done, commenting on the fact that the QC man was very thorough and found no discrepancies. He specifically comments that the firing mechanism defect was quickly detected and corrected proficiently. At 1400 he dismisses the crew so that they may attend a class given by the training monitor.

The section training monitor had arranged a short session to instruct on the replacement of the floating plate nut on the warhead. For this exercise he had obtained a piece of aluminum from the sheet metal shop so that the technicians could practice the installation of rivets.

After a brief lecture, each technician has a chance to install a few rivets. They also inspect each other's work, giving them additional training in the proper inspection techniques required in this special type operation.

Time marches on and at 1530 hours, with the training completed, the maintenance and other munitions area personnel attend a briefing on Explosive Ordnance Destruction (EOD) for background information on tomorrow's scheduled EOD exercise. This exercise will consist of rendering safe procedures (RSP) which will be performed on the training weapon. Following the RSP, maintenance will return the trainer to its original configuration. The EOD NCOIC explains how the services of EOD personnel fit into the everyday sequence of events.

Assuming that during movement of the weapon, or during the 120-day inspection, an accident or incident occurs which causes the weapon to be in a hazardous condition, EOD personnel would respond with their equipment, report to the on-scene commander at the incident site to receive instructi



... IT'S A NEW AIRCREW CONCEPT, THE THIRD MAN'S THE Sonic Boom OFFICER.

make a reconnaissance of the area, report their findings, advise on actions to be taken, and perform rendering safe and disposal procedures when and as directed. As can be seen, their service is a vital one but one which hopefully never has to be used.

The briefing is completed and along with it the work day of the munitions area personnel.

A proper summary of a typical day for a munitions maintenance, FK supply, security police, and explosive ordnance disposal personnel who have responsibilities "behind the fence." Each individual involved contributes his part toward insuring that weapon 1234 (AIR-2A) is safe and reliable and will do the job it is designed for, if ever required.

We are proud of the excellent job these people are doing and hope you are too.

TOM WILLE, Colonel, USAF
Team Captain, ADC ORI Team

DOWN and out

T-33 FATAL

Two well-qualified T-33 pilots filed an IFR flight plan to return to their home station which was located in mountainous terrain. The weather forecast called for 3000 feet scattered, 8000 feet broken, and 7 miles visibility, with intermittent 1500 feet broken, 4000 feet overcast, 5 miles visibility in light rainshowers.

The flight proceeded as filed until the aircraft was observed by Center to be northeast of course as it approached the destination. At this time, the Traffic Control Center gave a left turn to 330 degrees for a vector to home plate. After a comment by the pilot that the winds at altitude were erratic, he was given a heading of 320 degrees.

At this point, a handover was effected from one sector controller to another with the comment that the T-33 had been wandering off course. It was during this switchover that a misidentification took place. A T-29 was proceeding north about 20 miles west of the T-33. Also, a Navy aircraft was flying north on a VFR flight plan behind the T-29. The next controller position identified the Navy aircraft radar return as that belonging to the T-33. After a frequency change, the T-33 pilot checked in with his flight level of 240. The controller gave a descent to 17,000 feet, a squawk change to 0400, and a heading of 350 degrees. The aircraft leveled at 17,000 feet. One minute later, the pilot was advised of traffic at 12 o'clock, six miles, a T-29 level at 16,000 feet. This was followed by three small heading changes to 010 degrees.

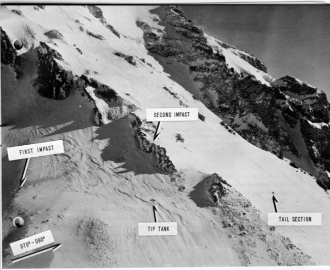
Center asked the T-33 pilot if he was squawking 0400 and to go "ident." Almost immediately a descent to 7000 feet was given. Center advised that the "ident" was not received. The pilot transmitted that he was on the 114°/32 NM of the destination TACAN. Center acknowledged and gave a turn to 030 degrees. The pilot asked if his TACAN position had been received. Center answered in the affirmative. He then asked if Center had him in radar contact and received an affirmative answer. Center then transmitted that the pilot apparently had gyro failure and that a no-gyro vector to destination was being initiated. The pilot acknowledged one right turn whereupon radio contact was lost, undoubtedly the result of collision with a mountain. Unaware of the accident, Center continued attempts to re-establish radio contact until it became clear that overdue aircraft procedures were in order. The aircraft wreckage was eventually located on the slope of a mountain at the 10,800 foot level. Both aircrew members received fatal injuries.

The primary cause factor was judged to be Air Route Traffic Control personnel in that they misidentified the radar return of another aircraft as that of the T-33 and gave headings and descent clearance which directed the aircraft into collision with a mountain. Contributing cause factor was deemed to be pilot factor in that he accepted descent clearance under IFR conditions into known mountainous terrain in spite of TACAN indications which placed him in the immediate vicinity of an exceptionally tall mountain.

It was recommended that all aircrews be reminded of the provisions of AFM 60-16 which allow for deviations from clearance instructions and specify that the pilot is the final authority for operation of the aircraft and is responsible for same. Also, AFM 51-37 states that a pilot need not accept an enroute penetration but may refuse the service in favor of a published high altitude approach procedure.

From a pilot's point of view, a lot of questions remain unanswered as far as preventing the same type of accident from happening again is concerned. The basic problem is not solved automatically by reminding the pilot of options available or that he is ultimately responsible for the safe operation of his aircraft. In order to take corrective action, he must first be aware that foul-ups are occurring elsewhere.

There is no doubt that one or both of the pilots involved in this accident suspected something was wrong, either with aircraft equipment or radar identification. Otherwise, they wouldn't have given their TACAN position or asked whether they were in positive radar



contact. It should be obvious that the Traffic Control Center convinced this particular aircrew that their airborne equipment was malfunctioning. As a result, they followed instructions which led to the accident. This is one of those tricky situations in which a pilot finds himself every so often, damned if he does and damned if he doesn't. If the airborne equipment was malfunctioning, this crew could have ended up on the same hillside by disbelieving ground instructions. In that case, all pilots would be reminded to take advantage of available radar service.

A pilot must take for granted many things over which he has no direct control. For instance, he must assume that his engine will function properly, that ATC will in fact provide traffic separation in IFR conditions, that weather will be as forecast on arrival, that a GCA controller is capable of cutting 200/1/2. He must place his confidence in all this and more with the foreknowledge that no man or system is perfect. In other words, he takes a certain calculated risk every time he steps into an aircraft. The risk is negligible until those things on which a pilot depends begin to fall apart. If cockpit information is not sufficient to clearly warn him of a dangerous situation, then a resultant accident is attributable in part in instrument deficiency, not pilot inadequacy.

Although advertised as a means to expedite the flow of traffic, the Enroute Penetration has proven to be a tremendous convenience to pilots. From a safety point of view, it has been beneficial in terms of fuel consumption and pilot workload. A lot of aircraft have bashed while making published jet penetrations. As this accident indicates, the danger in an Enroute Penetration is misidentification. If a pilot can keep track of his position, it's a safe, desirable approach. If a situation becomes questionable, he can always level off and squawk "Emergency." ★

✓ POINTS

We would sincerely appreciate your inputs mailed directly to: The Editor, INTERCEPTOR, Box 46, Ent AFB, Colorado 80912.

✓ The lack of seat belt use continues to be a major factor in generating fatalities within ADC in what should have been injury-only accidents. At least fifty percent of the 21 four-wheel vehicle fatalities incurred from 1 January through 30 June 1968 would have been alive today had they been using seat belts at the time of their accidents.

(14CSA)

✓ Vertigo or spatial disorientation in flight occurs most readily when a horizon is not available; however, it can happen any time. Factors which predispose to this phenomenon are:

- Instrument and night flying
- Changing from VFR to IFR
- Low-level flights over water
- Fatigue and/or minor illness
- Combinations of the above.

(FAA/NAAIS)

✓ During 1967, the Air Force success rate for ejection accomplished with over 500 feet terrain clearance was 92%. If ejection was made at or below 500 feet, the success rate was only 47%.

(ADCSG)

✓ For safe hunting:

- Treat every gun with respect due a loaded gun!
- Carry only empty guns, taken down or with the action open, into your auto, camp, or home!
- Insure that the barrel and action are clear of obstruction!
- Carry your gun so that you can control the direction of the muzzle if you stumble or fall.
- BE SURE OF YOUR TARGET BEFORE YOU PULL THE TRIGGER!
- Never point a gun at anything you don't want to shoot!
- Never leave a gun unattended unless you unload it first!
- Don't climb a fence or tree with a loaded gun!
- Never shoot at a flat, hard surface or the surface of water!
- Gunpowder and alcohol are a volatile mixture!
- Keep your finger out of the trigger guard until the target is in your sights!
- Leaning on the barrel of a loaded gun may bring a doctor on the run.

Happy and safe hunting! (Colorado Dept of Natural Resources)

A long recognized problem worthy of increased emphasis concerns finger injuries relating to the **wearing of rings** with or without gloves. Aerospace medicine and professional activities reports from medical facilities continue to point up the hazard of wearing rings **while on duty.** One base alone had seven AF members who had to have a finger amputated as the result of hand injuries sustained while wearing rings on duty. Four had jumped to the ground from trucks, and one from an aircraft loading ramp, catching their rings as they went. The other two had caught their rings while working around machinery. Of particular note was the fact that two of the individuals had worn gloves. More than one aircrew member has sustained similar injuries while in the performance of their duties involving flying. This hazard should be periodically stressed to all personnel whose duties make them vulnerable to this type of injury. (TIG Brief)

T-33 Jocks: In spite of the finest engineering efforts possible, nothing is perfect. The WASPALOY turbine bucket retrofit of the J-33 engine some years back provided our T-33 fleet with an added degree of engine reliability. A recent accident, however, involved WASPALOY turbine bucket failure approximately ¾ inch above the bucket platform. The missing portion of the bucket was found 5500 feet down the takeoff runway. (ADCSA)

The ADC Supplement to AFR 161-13 requires that all ADC aircrews be current for immunizations required for alert forces. Have you checked to see if you're current? (ADCSG)

After adulthood is reached, the basal metabolic rate decreases per unit of body weight. This means that if you consume 100 excess calories a day (equal to 8 ounces of beef or 1 ounce of fudge), you will gain ten pounds of extra weight per year. (ADCSG)

Hunters: One state that big game hunters flock to has an interesting system for notifying hunters of emergency messages. Contained in the seasonal hunting brochure is a listing of statewide radio stations, and the time periods during which messages will be broadcast. It is referred to as the Buckskin Network and has proven to be most effective in disseminating urgent or emergency messages. (ADCSA)

BLUE ZOO

"Night fly! You must be outta your mind!"

safety officers'

FIELD REPORTS

T-33A, GEAR MALFUNCTION. Unusual attitudes were being accomplished on an instrument mission, when the left main gear extended from the up and locked position. The gear was recycled to the up position and the left main immediately indicated "UP". Suspecting an uncocked uplock, the pilot used the emergency extension system for 10 seconds, per checklist procedure. When the gear handle was placed to the up position, the gear remained down (as determined by shadows on the drop tanks), but indicated up and locked. An emergency was declared and a return to base initiated. Normal extension was attempted on final approach and all gear indicated down and locked. A pass by Mobile confirmed their position and a safe landing was made. Post-flight retraction tests revealed the left main gear uplock mechanism out of adjustment. Following adjustment, no other discrepancies were found.

F-102A, FOD. The pilot completed landing roll and taxied off runway. While on taxiway he opened canopy and immediately thereafter existing gusty winds swirled inside of the cockpit. Pilot's blue flight cap with lieutenant rank insignia attached was lying on right side of windshield above the instrument panel. When the canopy was being raised to half position, pilot's flight cap was blown out of the cockpit and into the right hand air intake duct. Throttle was immediately stopcocked from idle position.

F-101B, TRAPPED FUEL. The number one fuel cell would not feed out the last 1200 pounds of fuel. After finding the 1200 pounds of fuel in Cell I was unavailable, the pilot declared emergency fuel and landed. He shut down with 1500 pounds of fuel in Cell 2. The transfer pump in Cell I had blown all protective fuses and, due to the arrangement of fuel cells, the last 1000 to 1200 pounds in Cell I would not gravity feed. After the fuses were replaced, the malfunction was duplicated. The fuel quantity selector panel was replaced, along with the pump fuses, and the system was operationally checked OK.

F-104A, ENGINE STALL. Mission was high speed intercept. Pilot broke off target at 40,000 feet and Mach 1.2. During breakaway with 45 degree bank angle and 2 to 2½ Gs, throttle was retarded from afterburner to military. Duct buzz was heard and was followed by a muffled engine chug and noticeable loss of thrust. Rpm dropped to 74% with EGT at 600 degrees C. Throttle was then retarded from military to idle with no effect on engine rpm. Throttle was advanced back to military again with no rpm response. Pilot had to shut down the engine to clear the stall. Airstart was normal and precautionary landing completed without further incident. Stall was repeated on the run-up pad. FOD inspection was negative. Main fuel control replaced as a precautionary measure.

F-104A, TRAILING EDGE FLAP FAILURE. During night exercise, pilot noted unsafe indication on trailing edge flaps with flap handle in either takeoff or land positions. Leading edge flaps indicated normally. Wingman confirmed that trailing edge flaps remained up at all times. Successful no-flap landing was accomplished. Maintenance found a loose screw on the terminal lead on the trailing edge flap control.

F-106A, HEADING INDICATOR. Immediately after takeoff on a night flight in the weather, the heading indicator rotated continuously in the MAG position. For a short period of time, the heading indicator worked properly in the DG position and then stopped functioning. Standby compass was completely unreliable. A recovery was made on the wing of another F-106. Investigation revealed that the B phase fuse holder was loose causing the compass system to malfunction. The standby compass system was unreliable because a TOC had not been complied with.

F-89J, AB BLOWOUT. The left afterburner blew out at 4,000' in the climbout. The pilot could not relight it. Upon landing it was discovered that the center section of the flameholder was missing. Corrective action: Afterburner was removed and replaced in accordance with T. O. 2J-J-35-6.

ANSWERS TO PHOTO QUIZ PAGES 4 & 5

1.	A. 20 miles	B. 10,000 ft	C. 3° slope
2.	A. 20 miles	B. 10,000 ft	C. 1.5° slope
3.	A. 34 miles	B. 15,840 ft	C. 3° slope
4.	A. 20 miles	B. 15,840 ft	C. flat
5.	A. 34 miles	B. 15,840 ft	C. flat

THE WAY THE BALL Bounces

ON TOP OF THE HEAP

MO	ADC	MO	ADC	MO	ANG
59	62 FIS	41	18 FIS	80	132 Ftr Gp
52	48 FIS	40	408 Ftr Gp	67	162 Ftr Gp
50	4600 AB Wg	40	4677 DSES	65	112 Ftr Gp
50	87 FIS	32	95 FIS	55	141 Ftr Gp

ACCIDENT FREE

ACCIDENT RATE

1 JAN THRU 31 AUGUST 1968

	ADC	ANG
Thru August 1968	3.5	5.7

MAJOR — ALL AIRCRAFT

CUMULATIVE RATE

1 JAN THRU 31 AUGUST 1968

	ADC	ANG
JET	4.5	6.2
CONVENTIONAL	1.2	0

BY AIRCRAFT	ADC	ANG
T-33	1.4	0
F-89		0
F-100	0	
F-101	7.2	
F TF-102	9.1	8.2
F-104	28.6	
F-106	5.4	
B-57	0	
EC-121	0	

RATE: MAJOR ACCIDENTS PER 100,000 FLYING HOURS

BOX SCORE

ACCIDENTS FOR Aug / CUM TOTAL	1st AF	4th AF	10th AF	ADWC	4600	ANG
CONV	/ 1					
T-33		/ 1				
F-100						
F-101	1 / 2	/ 1				
F TF-102	/ 2					2 / 5
F-104	1 / 1					
F-106	/ 1			/ 1		
B-57						
F-89						
EC-121						

MINOR ACCIDENTS THIS PERIOD — 2
MINOR ACCIDENTS CUMULATIVE — 6

we point with PRIDE

Major Harold E. Pemberton
95 Ftr Intcp Sq
Dover AFB, Delaware

F-106 MULTIPLE EMERGENCIES

Major Pemberton was flying an F-106 when he was beset by a series of emergencies that were compounded by inclement weather. The first emergency occurred when the throttle stuck at 93% rpm. The weather at Dover AFB was IFR and the nearest VFR alternate was Griffiss AFB which is 250 miles north of Dover, the designated home recovery base.

After a Center handoff to Dover RAPCON, the pilot advised that he would be fast on final and would shut the engine down by use of the fuel shutoff valves when landing was assured. The weather at that time was reported as 1200 feet broken and 3 miles visibility. By judicious use of the speed brakes and maneuvering of the aircraft, the airspeed was reduced to 230 KIAS. An attempt was then made to lower the landing gear; however, the right main gear indicated unsafe. The gear was recycled, but no change was indicated. The emergency gear extension system was then utilized and the right main gear continued to indicate an unsafe condition.

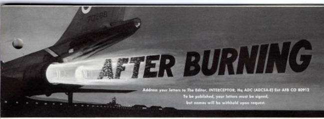
To compound the situation, RAPCON advised the pilot when 6 miles on final that their precision radar was off the air. Their surveillance scope was used to keep the aircraft aligned with the final approach course. The pilot sighted the runway at 200 feet altitude and began a go-around to receive a visual gear check; however, rain had shorted out Mobile Control's radios.

The pilot was able to keep the field in sight by flying around thunderstorms at 200 feet. The fuel quantity gauge began fluctuating. A circling approach to Runway 19 was initiated at 200 feet due to heavy rain restricting forward visibility. The pilot then noticed some throttle response.

The tower advised that there was a T-33 on a 4-mile final with minimum fuel. He made another go-around to allow the T-33 to land first since there was a good possibility his gear would collapse on landing, denying use of the runway to other traffic.

Maj Pemberton began another pattern, but visual contact with the field was lost and the AC generator failed with no transfer of AC power to the air turbine generator. He then headed east at 1500 feet. At this time he was in the weather, gear blown down, fuel quantity gauge unreliable, boost pumps inoperative, navaids inoperative, and no RAPCON precision available. The airfield was at minimums and no alternate within reach of the fuel remaining. He performed a radar letdown over Delaware Bay, breaking out at 200 feet, turned back toward the field, sighted a canal which leads to the approach end of Runway 31, and followed it until seeing the ramp. He then followed the field perimeter until the overrun for Runway 19 could be seen. He rolled out on the runway heading and by yawing the aircraft to the right at touchdown, forced the right gear outboard, effecting a successful landing with no damage to the aircraft.

The events that occurred on this mission and the uncommon manner in which they were handled speak for themselves. To Major Harold E. Pemberton the Aerospace Defense Command points with pride.



AFTER BURNING

Address your letters to The Editor, INTERCEPTOR, Hq ADC (ADCSA-E) Ent AFB CO 80912
To be published, your letters must be signed,
but names will be withheld upon request.

FIGHTER PILOTS IN SEA

I have been receiving my copy of INTERCEPTOR for several months. My troops in the 14th Special Operations Wing have shown a lot of interest in it so please send eight copies so that each unit can be afforded an opportunity to continue to read it. In addition I would appreciate several copies of Roy Tucker's "The Fighter Pilot."

We are presently flying the ever faithful "Gooney Bird" or Spooky as it is affectionately referred to by the "Grunts" and it is still doing a fine job for the Air Force. In addition, our Super-Spook (AC-130), the A-1 Superspads and other activities are keeping us busy and affording us the opportunity to keep our hand in the game. ADC is well represented in the conflict and I am intensely proud of their performance and contribution both in the air and on the ground, specifically weapons and command and control.

My best wishes to our old heads, our new heads, and to our very fine Air Guard units.

Colonel Fred Webster
14th Special Operations Wing
"The Old Blue Fox"
APO San Francisco 96205

***Your request is our command — please give our regards and best wishes to all of the ADC troops over there and tell them the people at home are real proud of the great job they're doing also.**

FACTS ON THE BLACK WIDOW

I just finished reading the August 1968 issue of the INTERCEPTOR, and, being an old P-61 pilot, I have to remark on the item concerning that fine airplane in the Check Point section.

The P-61 was equipped with the SCR-720 radar and in addition to the four 20MM guns, was designed for a turret of four 50 caliber machine guns. As I recall this was the same turret that the B-29 used and because there was such a demand for it, most of them were sent to the field without the turret. However, a number of B and C models were put into the field with the turret. Also, I believe by 1959 the 61 was long gone to the bone yard. I may be wrong, but I think the last of them went out of service in 1947 or 1948. In fact, the 5th Squadron of the 52nd Fighter Group at Schweinfurt, Germany probably was one of the last air defense units to use it operationally. That was in 1947.

Colonel Jack K. Gamble
Commander
52 Fighter Wing
Suffolk County AFB, NY

***Thanks for keeping us honest, Colonel. Additional research into ADC historical data disclosed a typographical error in ADC Historical Study No. 19. The P-61 "Black Widow" interceptor was equipped with the SCR 720 radar system, not the SCR-270. The aircraft was equipped with 4 forward firing 20MM cannons as basic armament. The top turret, with four .50 caliber machine guns, was deleted after the first 37 birds came off the line due to buffeting. Slightly more than 700 of these aircraft were manufactured, and the last 250 of them had the top turret restored. The phase-out date of 1959 was a typographical error on our part. ADC historical records indicate that the "Black Widow" was phased out of the air defense inventory in 1949, not 1959.**

PARACHUTING TRAINING

With the ever-increasing interest and emphasis that is placed on Life Support, coupled with the continuing change in equipment and procedures, I feel that there should be some changes made in the Local Continuation Training Program which is a continuing program of the Life Support Training Schools (LSTS). LSTS is required by ADC aircrews once every three years (ADCR 501-2). These schools are geared toward personnel flying ejection seat equipped aircraft, with the exception of the C-121 personnel. Students at LSTS are taught and are able to practice Life Support techniques and procedures. For the two years preceding LSTS, crew members attend their Local Continuation Training Programs.

Now, how about the newly assigned personnel, and those personnel who do not get the opportunity to attend LSTS? In our particular unit, we have personnel who fly the T-29 aircraft and are not eligible for LSTS. I feel that the Local Continuation Training Programs be geared so that complete coverage of parachuting procedures be covered. This probably sounds self-centered, but, for an example, we have two qualified parachutists assigned who, by presenting live jump demonstrations to the students (as they do at LSTS), doubts in many of their minds could be cleared up, and keep the graduates of LSTS more informed and current. The suspended harness type trainers are fine training aids in teaching canopy control (turns, etc.), but a live demonstration would show body position, chute opening, canopy modification, turning the canopy, parachute descent, and parachute landing falls, with an opportunity for on-the-spot questions and answers.

Wouldn't a better understanding of the equipment and how it works clear up much of the doubt in the crew members' minds, and instill in them a confidence in their equipment? Also, why should an instructor who has been trained in parachuting procedures not be allowed to stay current? Would a math professor teach math to someone with only one year of Algebra under his belt?

Maybe you can tell me why, and eliminate a year-long question and waiting period.

MSgt Glendon B. Dustin
NCOIC Life Support Continuation Training
Ent AFB, Colorado

***Rog, we agree with your feelings on the subject and have "sleuthed" out the following as to why. It's a two part answer. Part I. USAF says NO! Part II. Since yours is a base function, by allowing your people to jump, it would establish a precedent which would then allow all base level refresher-type school people to jump. Sorry about that.**

the Cold Hard Facts..

AFR 55-42 and T.O. 35E8 series offer some enlightening information on barriers.

The aircraft arresting system is designed primarily to stop **in an emergency** jet aircraft having an arresting capability. It consists of a method of engagement and an energy absorber. There are three basic types in use in the Air Force today:

1. The MA-1/MA-1A "Anchor Chain"
2. The BAK-6 "Water Squeezer"
3. The BAK-9 and BAK-12 "Rotary Friction Brake"

The configurations and equipment vary at different bases according to the circumstances surrounding the local runway layout and primary base mission, but of particular interest is where more than one system is installed at a base. **Some systems are not compatible with certain aircraft.**

Normally an aircraft arresting system will be provided for the main instrument runway only. At bases where the primary mission involves pilot training or transition, an additional system is authorized for the secondary runways.

Jet aircraft with an arresting capability will land and take off toward a **compatible** available arresting system during normal operations. Operational conditions, such as crosswinds, safety of flight, or peculiar operation conditions may justify exception to this policy.

Pilots using arresting systems must be thoroughly familiar with the capabilities and limitations of the various systems installed. The T.O. 35E8 series contain specific data on these systems. Further guidance is offered in the pilot's Dash One, and in AFR 55-42. The pilot must understand the following general information which is neither all-inclusive nor a substitute for detailed study of the appropriate T.O.s:

1. He will request that the MA-1/MA-1A net type barrier be lowered during "gear up" landings.
2. He will request the desired barrier position prior to takeoff and before changing from tower or ground control to departure frequency.
3. He will use the standard emergency radio phraseology, "Barrier, barrier, barrier," when emergency conditions require raising the net.
4. He must be aware of the effect of various aircraft configurations on the probability of a successful engagement, such as speed, weight, external stores, dive brakes, flaps, and tail hooks. For example, some tail hook equipped aircraft may have to drop their external stores if an MA-1A webbing engagement was imminent.

KNOW THE ENGAGEMENT CAPABILITIES AND LIMITATIONS OF YOUR AIRCRAFT AND THE SYSTEMS IT IS COMPATIBLE WITH!

90114

AIRCRAFT ARRESTING SYSTEMS