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FLYING SAFETY

UNITED STATES AIR FORCE

tornado bailout
page two

FLYING SAFETY

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SUBSCRIPTIONS

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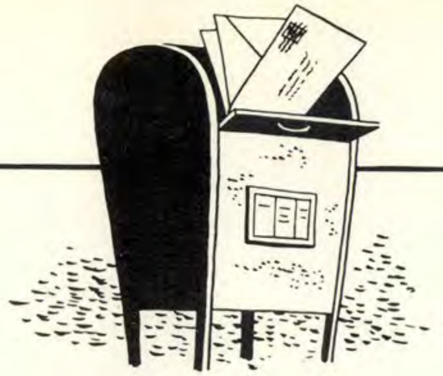


CROSSFEED

LETTERS TO THE EDITOR

Safety Records

Local Flying Safety plaques were presented recently to Sections I and II of the Pilot Training Group at Williams AFB, Arizona. As the Wing Flying Safety Officer I am very proud of the records established by these two sections while training aviation cadets in T-33 and T-28 type aircraft.

Section II compiled 11,297 accident-free hours between the periods of 14 May 53 and 12 January 54.

Section I compiled an equally fine record of approximately 10,685 accident-free hours between the periods 3 July 53 and 10 January 54.

The term accident-free hours includes both major and minor aircraft accidents.

Capt. William E. Davis, Jr.
Wing FSO, Williams AFB, Ariz.

★

We thought FLYING SAFETY might be interested in the safety record chalked up by our outfit. During the two years the 6520th Flight Test Squadron has been operating at Hanscom Field, it has flown more than 11,000 hours accident-free. And this, despite the fact that the squadron is using six types of aircraft including the B-29, B-17, C-97, C-54, C-82 and C-47; is operating from a 5000-foot runway and is flying in all kinds of weather for which this area is famous. (As the natives say: "If you don't like the weather, wait a minute!")

None of us here claim that our Flight Test Squadron has set a flying safety record, but we're all mighty proud of our accomplishment of flying two years without an accident of any kind.

Capt. George M. Khoury
FSO, 6520th Flt Test Sq
Hanscom Fld, Bedford, Mass.

★

On the 20th of March 1954 the Fourth Tow Target Squadron at George AFB, Calif., passed a milestone in safety. After 9,642:50 hours of flying since 20 March 1953 there was not a single accident during the one-year period.

There have been 15,171:20 hours flown since the last major accident on 10 June 1952. This accident was caused by a gunner's top escape hatch coming loose in flight, after two hours in the air. The accident was classified as a major by virtue of cost and manhours involving repairs. There were no injuries.

During the past year the squadron has flown a total of 8,253:00 hours day, 943:00 hours night, and 446:50 hours weather. This record can be directly attributed to the quality of maintenance, and efficiency of the pilots and aircrews.

Four different type aircraft are flown by the Fourth Tow Target Squadron: B-26, B-29, B-45 and C-47. Its missions include towing, tracking, ferrying, training and administrative operations.

FLYING SAFETY is proud of these records, also!

★ ★ ★

Tape for Escape

Being an extremely safety-conscious outfit, the 31st Air Transport Squadron (H) of the 1600th AT Gp (MATS), has found great interest in the article, "Detection through Reflection" (FLYING SAFETY, Oct. 1953), by the 4th Troop Carrier Squadron at Larson AFB, on the use of reflection tape as inexpensive insurance against aircraft accidents.

We are in complete agreement with the 4th TC Squadron's use of the tape and have found an additional use of this magic material; that of marking emergency escape panels on aircraft.

In August 1953 this squadron had the misfortune of suffering a major aircraft accident to one of its C-97s at Keflavik, Iceland. The plane crashed on landing and immediately was enveloped in flames. Rescue attempts of the personnel aboard were hampered greatly because the rescue team couldn't locate the emergency "cut here" escape panels. Three attempts were made before rescue was finally accomplished. It was dark and each time the firemen cut into the skin of the aircraft, they'd strike a stringer or beam of the fuselage. Although escape was finally successful for the three members of the crew entrapped in the plane, time available to them will not always be there.

Since this happening, the 31st AT Squadron has been experimenting with reflection tape to outline the yellow "cut here" corners of the escape panels. In the picture here, the panels marked "silver" and "gold" have backgrounds of black paint to cut down reflection of the aircraft skin during photography.

The tape used is not the red color that is found on automobile rear bumpers; it's either gold or silver applied with an applicator material which has been found to withstand weather, sun and aircraft washings.

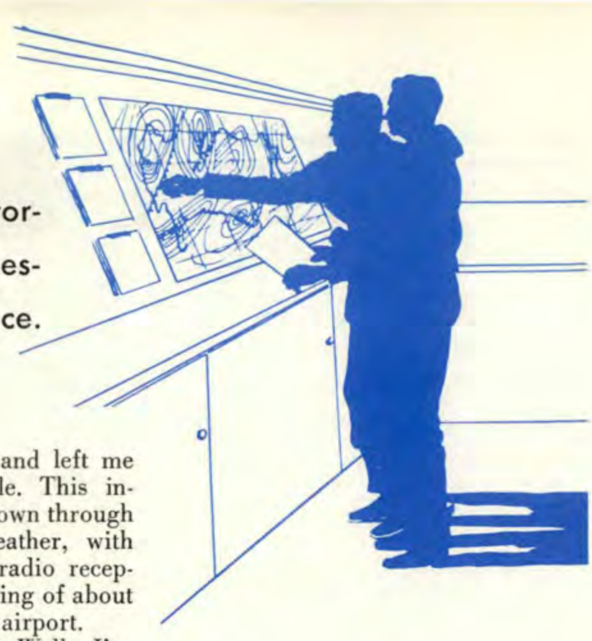
Like the 4th TC Squadron, we of the 31st, equipped now with C-124s, feel that our project is an added safety feature and should be included on all aircraft in today's bigger and safer Air Force.

Maj. William E. Yeates
Commander, 31st ATS(H)
Westover AFB, Mass.


T-Bird in

a Tempest....

What happens when a pilot gets caught in a tornado? A veteran USAF pilot answers this question with a factual account of his own experience.



As told to FLYING SAFETY by Col. Harrison R. Thyng
Deputy Chief of Staff/Operations, WADF, Hamilton AFB.

Flying Safety Magazine believes that this story is of significant import to all USAF crewmembers. To our knowledge this is the first time a pilot has made a successful evacuation of an aircraft when in the middle of tornadic activity.

Col. Harrison Thyng told this story to Flying Safety Magazine in the belief that his experience should receive the widest possible dissemination in the USAF. In view of Colonel Thyng's extensive flying background as a fighter pilot in WW II and Korea, his recommendations aimed at precluding a recurrence of this accident are particularly valid.

★ ★ ★

I'VE always heard that cats are supposed to have nine lives, and maybe that applies to pilots, too. Possibly not nine, but two or three anyway. Now I'm beginning to wonder how many I have left.

I remember the day that I suddenly found myself in mid-air without an airplane. That was during World War II, when people were playing for keeps. Somebody got a bead on me and literally blew my airplane apart, and there I was, tumbling through space and wondering what had happened to my plane. I could visualize a Kraut gun crew congratulating each other on some fine shooting, but soon I forgot the enemy for a moment and got busy and opened my chute.

About a year ago I used up another of those multiple lives when the engine of a Mustang quit and left me with nothing but trouble. This included an instrument letdown through 21,000 feet of solid weather, with severe icing, almost no radio reception and an *estimated* ceiling of about 700 feet at the Cheyenne airport.

Why didn't I jump? Well, I've spent years trying to perfect myself in the art of good instrument flying. I knew exactly where I was and felt thoroughly competent to make a precision letdown to an altitude where I could restart the engine and then continue on in. I felt sure that I had allowed the mill to ice up and that as soon as I got down into warmer air it would be easy to get it going.

That just goes to show how wrong a guy can be. Try as I would, I couldn't get even a burp out of that engine. At 2000 feet, just as I was getting ready to leave the Mustang, a hole opened up momentarily and I got a glimpse of the ground. There was a beautiful four-lane highway below. "That's for me," I said and kited the old '51 up on a wingtip and went cranking down.

Old Lady Luck was riding along on that flight, too. Just as I broke out in the clear at 700 feet I got a quick glimpse of a runway almost directly behind. I still had a hatful of speed so I yanked the plane around in a fast 180 and aimed toward the near end of that hard-surface strip.

I came over the fence at about 50 feet, slammed the gear handle down and hoped. Just as the wheels touched, the down-locks chunked into place. I got the plane stopped and let my breath out. This was the Cheyenne Municipal airport!

Maybe you've already guessed the source of my trouble upstairs. It wasn't ice. It wasn't lack of fuel. It was one of those things that make corpses of pilot-type people. Somebody had forgotten a cotter pin in the throttle linkage system, right at the carburetor. The nut vibrated off, the bolt fell out and that, to coin a phrase, is all she wrote.

After this episode I decided that I would play it a bit cool. There are certain limitations to both men and machines and they must be observed. Careful flight planning and careful preflight inspections all point to greater flight safety. I began to take these two factors more seriously than ever before.

Just recently, after I thought my luck had just about been used up, I managed to get involved in a jet, right in the middle of a tornado.

The flight started late in April of this year, from Wright-Patterson Air Force Base. I was attempting to get back to my home base, Hamilton Field. I was with Major Hubert C. Vantrease in a T-33. We could not clear direct to Denver and then to Hamilton since headwinds were forecast as being too strong, so we decided to go into Omaha, Salt Lake and then Hamilton. However, when we started to plot the weather changes it was determined that Salt Lake would be under poor instrument conditions for a letdown by the time we would arrive there, so we decided to fly the southern route.

We were assured at Wright-Pat that the weather was absolutely fine for Oklahoma City, so we took off. Major Vantrease flew to Tinker.

About half way between St. Louis and Tinker, we received a report from St. Louis radio that a tornado was southeast of Oklahoma City, moving northeast. We plotted this on our maps and decided that it would still be best to go on in, as planned.

En route we checked in with Springfield and Tulsa radio and both reporting stations assured us that the weather at Tinker was still good. As we passed Tulsa we could see the base, and just southeast of the field was a tremendous black cloud. It looked like a huge thunderstorm.

We arrived without further incident, refueled, had a bite of supper and then checked the weather.

The storm that the forecasters were watching very closely on their scopes, was still to the southeast of the base.

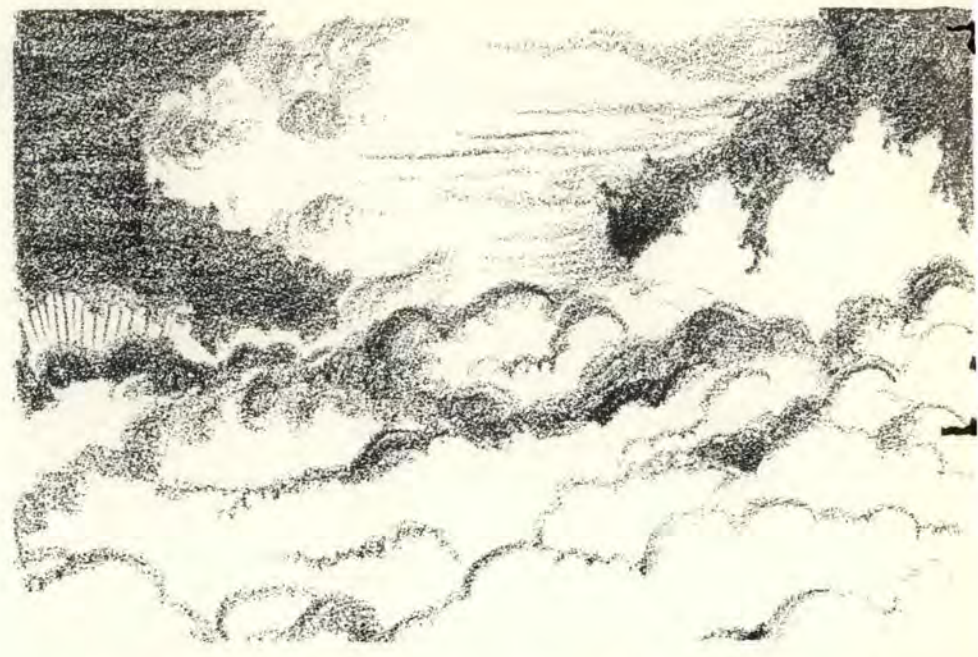
As it was my turn to fly, I took off and stayed VFR until we'd gone about 10 miles west of Oke City and then climbed up through the overcast, as specified by our IFR clearance, to get on top. At 21,000 feet we were not on top and the radio static was very bad. I tried, but could not contact Oklahoma City Radio.

At about 24,000 feet we were suddenly in very, very dark clouds. We had been flying on instruments without cockpit lights, but now they were necessary. This was about 1920 hours, and we were starting to get what we then considered to be thunderstorm turbulence.

The instruments were steady as a rock. We were climbing at about 240 knots and both turn and bank and gyro horizon were as they should be. However, the rate-of-climb pegged itself at 6000 feet per minute, *UP!* We could feel the tremendous updraft.

I had both my hands on the stick and had my harness and belt tightened up, expecting very shortly to hit a downdraft and then be in the clear.

We'd been airborne then about 20 minutes, so we must have been about



". . . we received a report from St. Louis that a tornado was southeast of Tinker, moving northeast."

80 to 100 miles out and I felt by now we should have been VFR.

At this time the airplane suddenly snap-rolled to the right and then continued into a series of very violent snaps, first to the right and then to the left. Next we found ourselves in what appeared to be a crazy twirling motion maneuver.

Incidentally, we definitely were not spinning; a twirling or twisting motion is the only way I can describe it. Strangely enough the instruments were still indicating normally except for the rate of climb and the altimeter. The latter was showing a decided drop in altitude, although the rate-of-climb was still holding at 6000 feet, up! I couldn't understand how there could be such a tremendous pressure change so quickly.

Along with the twirling motion, we were still getting those violent snaps that threw us around in the cockpit. This was certainly the strangest maneuver I'd ever been in, and I've flown through many thunderstorms.

Major Vantrease, in the rear cockpit, asked me if I thought we should blow the canopy and said he thought we had received some structural damage to the aircraft. After a few seconds I answered him and said, "Van, I think you'd better blow the canopy, and if this continues, you get out of the airplane whenever you want to."

Somehow, he was able to reach up against the tremendous G forces and actuate the canopy jettison system. The moment this was done, we lost our helmets and oxygen masks. This was between 20,000 and 25,000 feet.

We were still experiencing this twirling motion and then the plane would suddenly snap and then keep snapping. I was fighting the controls and trying to fly the plane when it suddenly flamed out. This was undoubtedly due to the tremendous negative G forces that we were being subjected to. I do not believe any airplane could have withstood such stresses without flaming out.

I was finally able to roll over into what I thought was a level attitude. However, I couldn't hold any semblance of an upright position, because the plane, in spite of control pressures, would snap first to the right and then left. But, between rolls I managed to get my fingers on the air-start ignition switch. I was able to get my left hand from the throttle just long enough to throw it in. We immediately got an amber warning light, indicating a hot start, for I had not been able to get the throttle in the cut-off position or know whether or not the tailpipe had drained at all. But, in spite of the hot start we did have power again. I hoped now that we could push ourselves through this terribly turbulent condition.

However, it was of no use. The airplane was starting to break up and the hail was absolutely terrific in the cockpit. My face was being cut to ribbons. I couldn't see much, since

About the Author

Harrison R. Thyng was born in Laconia, N. H., on April 12, 1918. His flying career started in 1939 when he entered the cadets.

In World War II, as a squadron commander flying Spitfires, he knocked down eight German aircraft and later transferred to the Pacific where he bagged one Japanese plane.

In the Korean action, Col. Thyng became one of America's oldest jet aces, shooting down five MIG's, at the age of 34.

This story deals with another kind of enemy that he recently encountered. A deadly one, too.

"I took off . . . climbed through the overcast."

my right eye was closed and the left one was simply a slit. I could just barely make out one or two of the instruments. We were unable to communicate with each other now, but I felt sure that Van was getting out. At about 10,000 feet there was a momentary lull in the turbulence and I sensed that Van was out of the airplane.

I now tried to eject myself but was unable to get my right hand off the stick and over onto the ejection seat handle. The centrifugal forces were so great that I just couldn't move in that cockpit. My left hand was still on the throttle, my feet were on the rudder pedals and I could not move them. Finally, I managed to get my right hand into a position where I could reach and catch hold of the seat handle.

I pulled up on the handle and immediately was blown out of the cockpit without ever squeezing the ejection seat trigger, to my knowledge.

As I hit the slipstream, the seat was torn off and I thought then that it had ripped off my parachute, too. I knew that I was tumbling violently and felt sure that I was falling to my death for I just *knew* that the parachute had been carried away with the seat.

The rain and hail sort of brought me to clearer consciousness for a few seconds and a tremendous flash of lightning revealed that my ripcord was hanging by my left side. I reached for the D ring, pulled it and was the most surprised man in the world when I suddenly felt a terrific tug on my shoulders as my parachute opened.

I started floating now, instead of falling, and the chute stopped a lot of the hail from cutting my face and beating into my eyes. However, the turbulence of the air kept me swinging in great arcs of about 180 degrees and the parachute was so wet that it would collapse as I was swung from one side to the other and then would puff and open as I'd hit the bottom of each wild swing. Because of the turbulence, the chute started to twist and twirl, and fight as I would, I couldn't do a thing about it. At this point I firmly believed I'd never come out of this nightmare alive.

Somewhere below, I knew the ground was rushing to meet me. I couldn't see it though, for both eyes had swollen shut, and it suddenly dawned on me that this billowing parachute was just prolonging the inevitable. I *knew* that my number had finally been called.

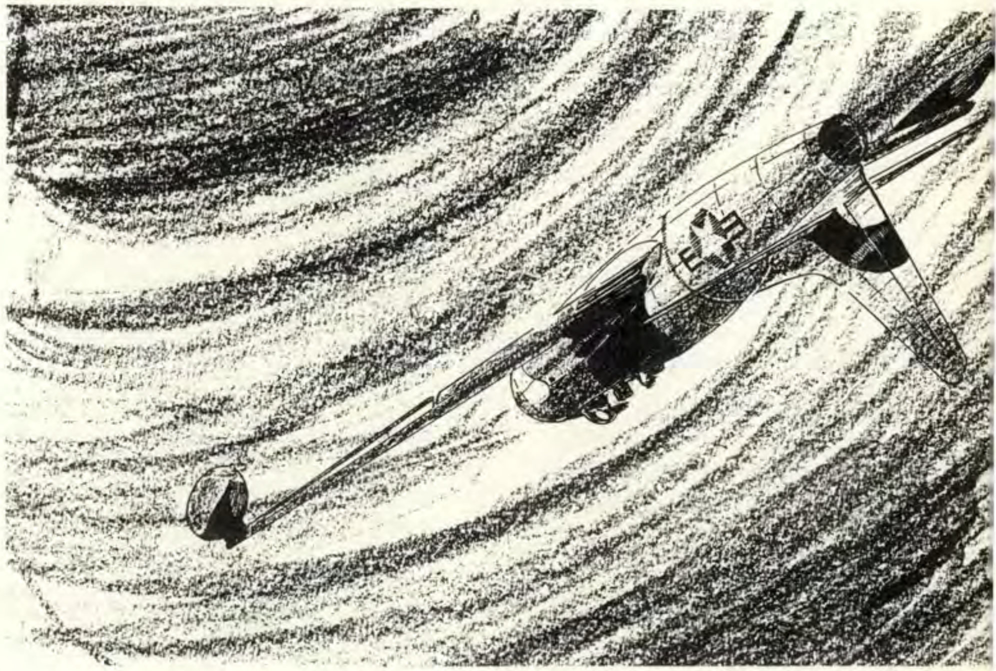
Suddenly my feet slammed into the ground, followed immediately by the rest of my body. This, of course, was no controlled landing, and I had the wind knocked out on impact. It felt as though a Missouri mule had just kicked me in the back.

In a couple of moments I got back a bit of wind and tried to stand up. Just as I staggered to my feet, the wind in howling fury snatched the parachute, and for the next minute or two I was dragged first one way and then the other. I didn't have a quick-release harness and probably wouldn't have been able to use it anyway, unless it had been a chest type.

I finally managed to release the chest strap and right leg snap and then was able to slide out of the harness. I stood up and was gratified to find that I could walk, but it was a supreme effort, believe me.

Fortunately, I had a bit of vision left in one eye and through the darkness saw a light in the distance. How far, I had no idea. I guessed that it might be a quarter of a mile or so. My guess was pretty good at that but I did a great deal more staggering

". . . we definitely were not spinning; a twirling or twisting motion is the only description."



". . . I did more staggering than walking before I got to the house, the journey seemed endless."

than walking before I got near the house. Distance doesn't mean much in the middle of Oklahoma under normal circumstances, and now this journey seemed endless.

Reaching the ranch I knocked on the door but received no response. No human response, that is. Two dogs suddenly appeared from out of the darkness and both tore into me viciously, barking and snapping and lending nothing to my peace of mind. I guess the scare must have given my system an additional shot of adrenalin for I was able to muster enough strength to kick them away a couple times before my beaten and bruised body gave way.

At this moment, I heard a shout and a man appeared from around the corner of the house. He ordered the dogs off and then approached me cautiously. Not that I blame him. Between the darkness and my bloody appearance, I must have presented a rather gruesome spectacle.

Even after he got close to me there was some doubt in his mind as to whether or not I was a human being. My face was so cut up and swollen I'm sure I would have scared most anyone. Evidently this gentleman had never been in the service for he did not recognize my flying gear. I tried to explain to him that I was an Air Force pilot and had just bailed out of a jet. I told him that I just wanted to use his telephone.

He was still undecided what to do when his wife appeared. They both had been holed up in their storm cellar, waiting for the tornado to go on past. She took one look at me and decided that I needed medical attention right away. She, bless her heart, told her husband to get me in the house and immediately turned to and started to heat some water on the old country stove.

After the water was warm, she bathed my face as much as I could stand, but every touch of the wet pads brought on excruciating pain from the cuts and bruises inflicted by the hail. But, it was a wonderful relief to be in the care of human beings.

I asked again about a phone. They both told me not to touch the instrument. The bell kept jangling and they said that lightning was keeping the line too hot to make a phone call safe. Probably they were right, too.

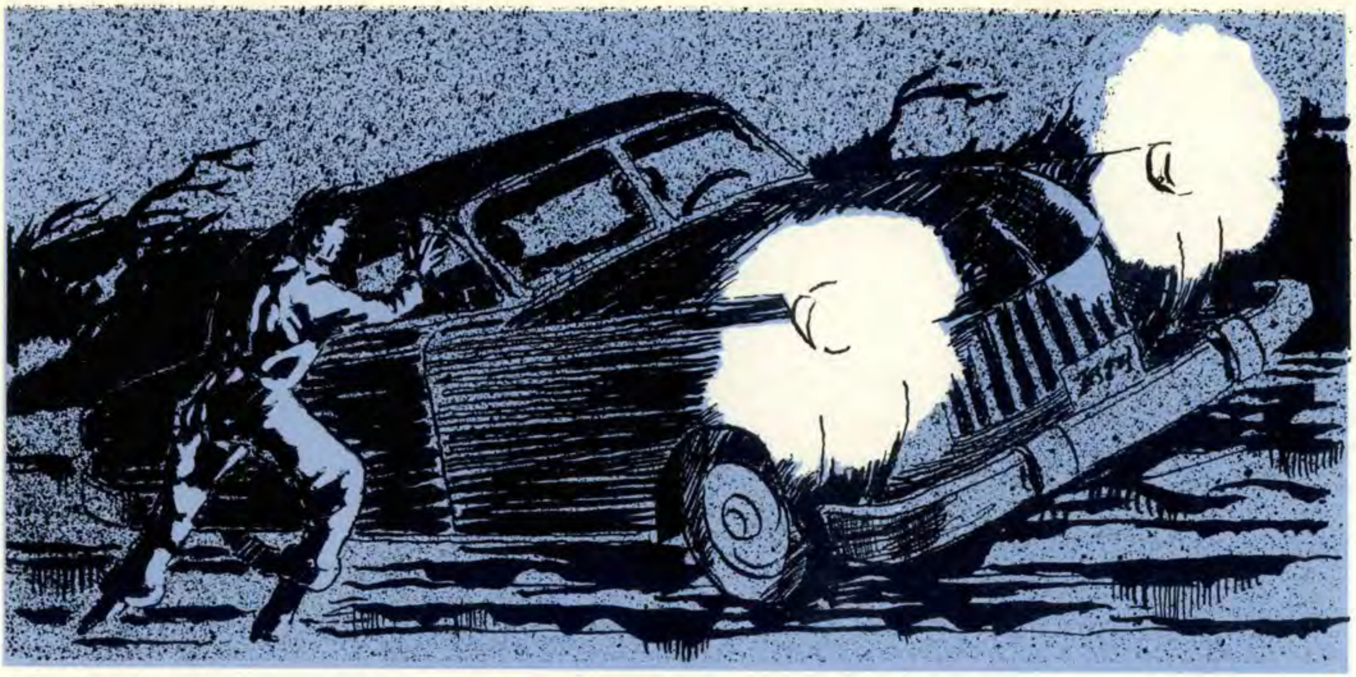
About this time I began to wonder if we all shouldn't be in the storm cellar. The wind was screaming around the corners of the house and great sheets of rain were slashing across the open country like waves of the sea. I guess I was still too dazed to realize that I'd chuted down in completely impossible weather.

They dug out some dry clothing for me and the man of the house helped me peel off my soaking flight gear. Every move I made hurt a great deal but I finally got through that change and immediately began to feel better.

They told me it was eight miles to the nearest town and, in spite of the weather, insisted that they were going to take me to the hospital. My protests did no good and soon they had me loaded aboard their old automobile and away into the wet darkness we chugged.

The first two and a half miles were hellish. Between the crowned dirt road and the mud and the rain it was impossible to keep the machine in the rutted tracks. It would slip and slither toward the ditch each time the rancher let out on the clutch. Finally his wife took over the wheel and he got out and pushed and steadied the car until we got to a hard topped highway. For two and a half long miles he tugged

". . . two dogs appeared from the blackness, and tore into me viciously, snarling and snapping."



". . . for 2½ long miles he tugged and strained and pushed to keep the car going, while I sat inside, miserable and ashamed that I couldn't help."

and strained and pushed to keep the car going, while I sat inside, miserable and ashamed that I didn't have enough stuff left to be out there in the rain helping him.

Finally, after what seemed hours, we chugged into Weatherford, Oklahoma, where I was promptly hustled into the hospital. There, I was able to get a phone and report my plight to Tinker AFB. Immediately thereafter the hospital attendants bundled me into bed where I rather ungracefully, but thankfully, collapsed.

Although I haven't mentioned it so far, you may assume correctly that I had been doing a great deal of speculating and worrying as to the whereabouts of Major Vantrease. My benefactor at the ranch had immediately discounted any suggestions of search that night because he knew that once away from the farm, the chances of getting back again would be almost nil. I had no idea whether Van had bailed out immediately before I had ejected or whether he had managed to get away long before. Somehow I had faith that he was down and safe, but where I had absolutely no idea.

The next day I learned that Van was safe and in a hospital at Clinton, Oklahoma. He had landed about three miles from where I touched down so he must have gotten out of the plane just seconds before I went.

Later he told me that somehow he had slipped from the sling of his chute just before landing and then slammed into the side of a hill and had hurt his back. He found he was unable to walk, though he could see a light in the distance.

He realized his injuries precluded further movement so he wrapped his chute around himself and sat it out for the rest of the night, shivering and cold. Toward dawn he could make out a nearby highway and finally crawled to it and succeeded in stopping a passing motorist, who took him to the Clinton hospital.

Well, that's about all there is to tell. We both healed and mended in short order and were glad to get another plane and hop home. I'll clarify that statement. It was good to be flown home! It is better yet to be flying again, myself.

You're probably wondering how I feel about tornado flying. That's an easy one to answer. Flying hasn't changed a bit. Neither has my love for it. I can say though, that from here on out I'll know that it is impossible to fly safely through areas of tornado activity. And this statement includes *all* pilots, regardless of experience level.

Naturally after an experience like this I have reached some firm conclusions that I'd like to pass on to other pilots and operations personnel.

• In areas of great seasonal unstable weather conditions, special emphasis should be placed on obtaining an adequate weather briefing by the pilot. I was my own clearing authority as a green card pilot. To my regret I signed off the weather section of Form 175 as "Weather Checked by Pilot." I recommend to all pilots, including those with green cards, that they have competent Air Weather Service personnel fill in the weather section for them. Then there can be no misunderstanding. If necessary, I'd like to see an extra forecaster on duty during periods of extreme weather conditions.

• A pilot should remember that while flying at dusk, during the hours of darkness or within thunderstorm areas, it will be impossible for him to see a tornado; consequently he can inadvertently fly right into one. If there is a possibility of tornado activity, it is best to wait for an improvement in weather along the proposed flight route.

• If a pilot is flying in or through an area for which tornado activity is forecast, he should not assume that every black cloud is just a thunderstorm. Play it safe and do one of two things: Either climb above such activity while still in the clear, OR make a 180 degree turn and get out of the area, right now, before actually making a penetration. It's that simple. Don't do what I did.

• I would like to stress the value of proper protective clothing. My flight jacket really helped a lot. I was wearing a regulation jacket over my flying suit and as always, was wearing gloves. As a result of such protection, my hands, arms and upper body suffered almost no damage from hail. Major Vantrease, on the other hand, was considerably bruised over these same areas. His only protection was a light flying suit. ●

MAY I RIDE WITH YOU?

Non-rated passengers have an interest in the flight, too. Sometimes they wonder when faced with the non-briefing, get 'em aboard, let's go type crew.

I'M a ground type, ground pounder, paddle foot...I'm non-rated. Why? Because some flying instructor back in 1940 told me after 10:28 hours of PT-17 time that I couldn't hit the ground with my hat — let alone land an airplane. I met the board. They said it's been nice and thanks, but no thanks for any more. But I had the last word.

"Yes, Sir."

Come fall this year I'll have 14 years in the Air Force, a comforting rank, and — in the ZI and overseas — a lot of passenger flying time. A little in jets but mostly in gooneys, B-25s, C-45s, T-6s, C-54s, B-17s, C-121s, C-74s, L-20s and the likes of that. Some years I averaged 12 to 15 hours a month in the blue on various TDY assignments.

I've ridden with all types of pilots and aircrews. Today I have a clear-cut picture of the guys I like to ride with and an equally vivid memory of those who made me wish I'd been shopping with the wife — something I detest.

Suppose you are flying to Timbuctoo tomorrow. I call you the day before the flight to find out if you have room for me.

You say, "Be at operations at 0615."

I show up at 0600 and find you've already started your clearance. This I like (and I know you like my being there early). I've come to respect the pilot who has set a takeoff time and expects to meet it. The entire ride will reflect the same precision. You ask me if I care to get the weather with you. I chalk up another bonus point because you're the type who appreciates the interest every passenger has in the entire flight plan.

I realize, by the way, that passengers are not ordinarily allowed in either ops or the weather office. Hence, I don't expect the plush treatment and accept it only on invitation and when I won't be adding to the confusion.

The paper work is all handled and we walk out to the airplane. You introduce me to the rest of your crew and that's important to me . . . that personal interest in the people I'm sharing the adventure with. The opposite, all too familiar scene goes something like this:

"Who is going on 3256? Joe, have you got any maps? Who has the clearance? Sergeant, how many 'chutes are there? Let's leap."

Brother, think I, this is another one of those real gone rides. They want to get off the ground before someone cancels their cross-country. That gal simply will not be kept waiting. Bet they want to get us peasants off at the first stop.

This isn't meant to be the latest chapter in Emily Post on the niceties to be observed when traveling by military air. Rather, it's another impression to help define an attitude or frame of mind that ultimately adds up to the professional airmanship we all respect.

But to get back to where we were walking out to the airplane. I follow you around as you make a visual inspection. You pay particular attention to the controls, step up on a tire for a close look in the wheel well. I don't know what you're looking for but I'm becoming confident that you do.

Before starting engines you get the attention of all the passengers and explain the flight plan. The crew chief begins passing out the parachutes. You ask everyone to try his on.

The Sergeant says, "Colonel, your leg strap is a little loose. May I tighten it for you?"

He helps me and I think, "They're leaving nothing to chance. These guys are good."

"How many of you have ever used a parachute?" No reply.

"I've never had to jump either, but here are some things to remember. Keep your head down when and if you jump. Look at the D-ring, but don't put your hand on it until you're out. Turn around and watch the plane, a gimmick to assure that you are well cleared. You know how to turn over in the water while swimming. It's just the same in the air. Twist your body and you'll turn. Keep your feet together. It keeps the shroud lines from between your legs."

After this he continues through the routine and then explains alarm signals, emergency exits and procedures.

I have never been comfortable with an aircraft commander who takes all these explanations for granted . . . anymore comfortable than I would be on a ship that failed to pull the customary lifeboat drill. I've been through the procedures many times and I want to hear them many times again. Not so much for my sake after all these years, but for the benefit of the young clerk-typist who is going home on his first leave; the cute little WAF with the engagement ring (somebody should have told her about parachutes and skirts); and the sailor going to Kentucky after two years of sea duty.

Sure, all of us like to act like seasoned space hoppers. *Ever heard a passenger ask for a briefing on emergency procedures?* Down in the heart we know something is missing when the commander does not solve the mysteries that each passenger is thinking about.

A little knowledge is a hazard to a ground pounder's peace of mind. He learns a smattering about engines, about flying techniques — picks up a little weather lingo, realizes that there is an air traffic control agency, that some planes fly farther on a given amount of fuel than others and that there are needle-ball and airspeed indicators plus a gaggle of other gadgets and gages to make like a bird. Most of all he knows that there is a lot he doesn't know and hopes and trusts that the crew does.

Flying along, do you sometimes put down the magazine you're reading and begin wondering about it all? Especially when everything shudders in a steep climb or turn, when the props get out of synchronization, when power and pitch settings suddenly change, and when the furniture for the new NCO club stampedes down on you in severe turbulence (this has happened).

"... . PASSENGERS ARE HOLDING A TRACK MEET IN THE REAR!"

When these random thoughts pass by, you realize that you are automatically doomed to the uneasiness which a little knowledge breeds.

Little things count . . . like seeing the pilot walk back occasionally. On a recent flight on a foreign airline my seatmate, obviously a well-traveled European, said "What I don't like about this airline is that I never see the Captain. I like the airline where the skipper introduces himself to the passengers, tells about our flight and then tells us each time he makes a change."

His remarks reminded me of another airline that attached to my timetable and ticket a booklet that explained why the atmosphere is sometimes rough and compared its effect on an airplane to a ship in heavy seas.

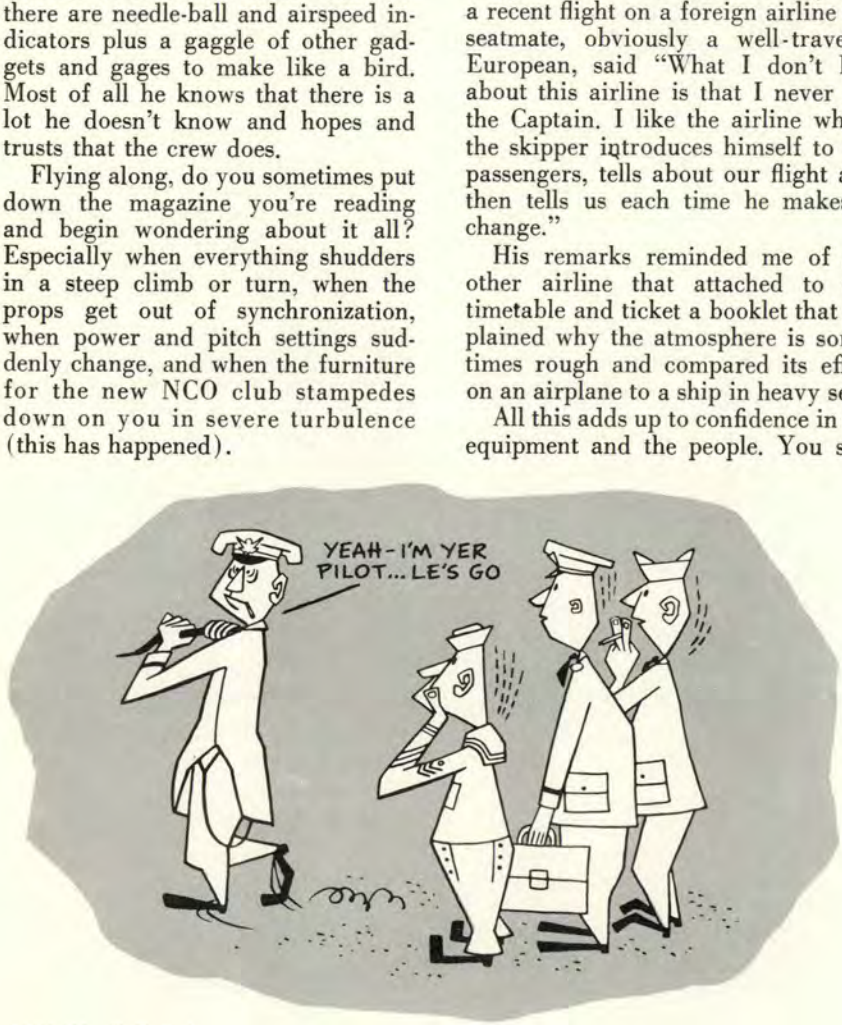
All this adds up to confidence in the equipment and the people. You say, "You're getting a free ride — you want a free book too?"

No, but I figure the effort the commander takes to let his brood know he's aboard and really in command shatters uneasiness, and reflects well on himself and my branch of the service. Should an emergency arise (this his happened, too), the confident group of passengers will be less a problem than a group that was mystified and perhaps slightly apprehensive at takeoff.

I have also come to appreciate that aircrews make equally valid observations of their passengers.

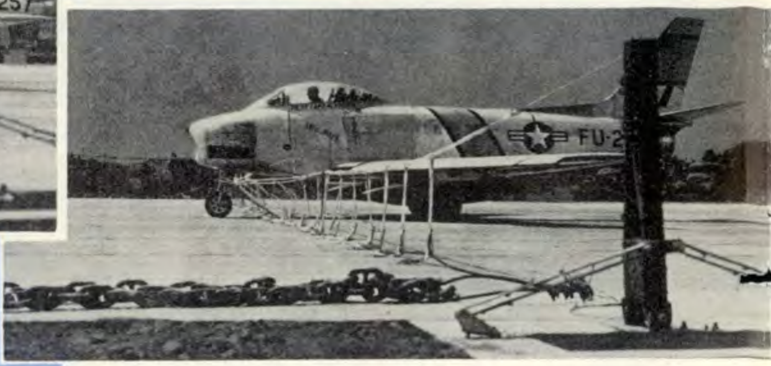
I wince with the aircraft commander when passengers expect his crew to hop bells for baggage; suffer with the pilot who keeps one hand on the elevator trim because passengers are holding a track meet in the rear. But most embarrassed am I with the rider who thinks safety belts are for sports cars, parachutes for a beauty-rest and Mae Wests a cushion for precious personal baggage. Another pet peeve is the sick passenger who's ashamed to reach for a paper bag — or even his hat — and the matador who gets that gored expression when told to quite monkeying around with the door handle.

The above statement is written for the benefit of all us types that frequent the passenger lounges, asking the proverbial question, "May I ride with you?" Bargaining that the travel time we save is worth taking on any and all comers as a crew and not always appreciating the usually competent airmanship that gets us from here to there. ●



An F-86, moving down the runway at 140 mph, is shown about to make initial contact with nylon webbing of the landing barrier.

Nose gear has gone through barrier, triggering arresting cable which will spring up to engage the main gear of the plane.



Ask The Man Who HITS One!

The Korean War established the value of the jet barrier. Now a unit at Nellis AFB shows how it has saved defense dollars.

Barrier!

That's a word that is coming into everyday usage more and more. You mention barrier to hot-rock Charlie or John Q. Public and they both think of that invisible wall. The sonic barrier is fast becoming an open door in spite of its name.

There is another type of barrier though, that isn't quite as well known, and this one is plainly visible. These barriers, unlike the sonic type, do not present any particular problem when an airplane slams into them. It's exactly what they are intended for. As a matter of fact, driving headlong into one of these arresting gears can mean the difference between a successful stop or a badly mangled aircraft. That is, if a pilot overshoots a flameout landing, suddenly runs out of brakes during the landing roll or happens to lose the fire-pot on a takeoff.

In terms of dollars saved, the few units now in operation have paid for themselves many, many times over. Within the next few months many new ones will be springing up all over the world until eventually almost every USAF air base will be sporting such accident prevention devices.

Recently FLYING SAFETY was alerted to the fact that Nellis AFB had started a barrier program. While not the first, it is one of the first in the ZI. Consequently, we elected to give their unit a look-see.

The Flying Safety Officer, Major Hugh Bodiford, jumped at a chance to extol the virtues of their glorified tennis net. We say "their" advisedly, for with the full approval and backing of Crew Training Air Force and Brig. Gen. James E. Roberts, Commander at Nellis, base personnel managed to push through the construction of their first barrier.

The Korean conflict had established the value of barriers. As a fighter pilot in that theater, Bodiford was familiar with the operation and capabilities of such units. Upon his return to the States and assignment at Nellis, he was determined to get a similar program going.

It wasn't easy at first. There were many obstacles. It took a lot of scrounging to dig up the necessary materials. Fortunately, the U. S. Navy came through and made it possible for Major Bodiford to secure many necessary parts for the first barrier.

It is interesting to note that as this issue goes to press, five aircraft have been saved from almost certain destruction by the Nellis barrier. Add that up in good old dollars and you'll see that the $5,000 or so spent on its construction is but a drop in the proverbial bucket.

We do not intend to go into any of the finer details of the emergency arresting gear in this article. That is strictly an Air Installations problem and will be so handled by bases scheduled for these units. However, we do want to alert pilots of fighter aircraft to the fact that an extensive program is already under way and point out a few operational factors that are worth remembering.

Main Barrier Features

A brief rundown on the main features of the barrier should help to better understand its operation.

In general, the following components make up a typical arresting gear:

Webbing Assembly: This assembly consists of an actuator strap to which are attached a number of vertical lifter straps. Each lifter strap is rigged

Nylon webbing is torn away and arresting cable has now made contact with the main landing gear, reducing the aircraft's speed.

With arresting cable now pulled taut, the F-86 begins to drag the heavy, linked chains stretched along the sides of the runway.

to the arresting gear cable by means of six special lock type snap fasteners. These fasteners are capable of carrying a high load. The restraining strap, which is secured to the anchor end of the vertical lifter strap by two conventional glove type snap fasteners, is incorporated as a part of each lifter strap to insure that only a load of high magnitude will have a tendency to open the six main fasteners.

Five gets you ten that we lost you on that one. But, as it's not our intention to add confusion to this article just think of a nylon net, anywhere from 150 to 400 feet long and 40 inches high. That is a rough picture of the webbing assembly.

Releases: Two release devices are used to attach the ends of the actuator straps of the webbing assembly to the tension mechanisms of the arresting gear stanchions. A replaceable shear pin is incorporated in the release and upon shearing, the actuator strap is freed from the release assembly.

Runway Anchors: These anchors provide a means of anchoring the lifter straps to the runway. It is from these points that the restraining force is applied that unsnaps the six main fasteners on each lifter strap thus releasing the arresting gear cable during engagement.

Arresting Gear Cable: A flexible steel wire rope cable, $\frac{7}{8}$ inch, uncoated, improved plow steel, fibre core, is utilized as the arresting gear cable. This is the little gem that snaps up and grabs the blow-torch firmly by the landing gear. Each end of this cable is attached to the arresting chains.

Arresting Chain: This is the part of the barrier assembly that does the actual slowing down and stopping of an aircraft. The chain is placed parallel to both sides of the runway. In the case of the Nellis installation, they are using 273 feet of chain on each side and as each link weighs 57 pounds, it is apparent that any engagement means dragging a lot of weight.

Main Stanchions: The stanchions mounted on concrete foundations, serve as end supports for the actuator and arresting cables. Each stanchion incorporates a hand operated winch for positioning and tensioning the actuator pendants. These stanchions, hinged at their bases, incorporate a set of bungee cords for damping stanchion motion and aid in raising or lowering the posts as necessary. The stanchions can be laid flat when the barrier is not in use.

The arresting chains are laid parallel to the overrun. At Nellis the 273-foot chain is made up of links each weighing 57 lbs., and over a foot long.

Intermediate Stanchions: The intermediate stanchions serve as support for the webbing assembly so that the actuator straps may be raised to a height of approximately 40 inches at any point along the width of the runway between the lifter straps. These intermediate stanchions are designed to collapse on engagement.

Barrier Operation

You're probably wondering at this point just how this little beauty works. We'll try to keep it simple. Between this copy and the pictures, you should be able to get a pretty fair idea.

As the nosewheel passes over the arresting gear cable lying on the runway, the webbing assembly is engaged by either the nosewheel strut fairing or the nosewheel well doors.

Continued forward motion results in the arresting gear cable being lifted off the runway by four lifter straps in such a fashion that the arresting gear cable rises *behind* the nosewheel, but *in front of* the main landing gear.

The four active lifter straps continue to lift and pull forward on the cable until they are taut between the nosewheel fairing and the anchors. Further forward motion of the aircraft unsnaps the retaining snap fasteners, pulls the lifter straps through the inertia flaps, then unsnaps the six main snap fasteners attached to each lifter strap.

At this point, the arresting cable is off the runway, moving upward and slightly forward between the nosewheel and the main gear and is now completely free of the lifter straps.

As the aircraft continues forward, the arresting gear cable is engaged by the main landing gear struts and further forward motion is restrained by pull on the cable transmitted from the arresting chain. The airplane then progressively moves more mass by reeling out the heavy doubled chain during the remainder of the arresting run. We did a bit of research and asked a lot of questions on the actual operation of the Nellis AFB barrier. Here is a description of the five saves made there.

A hand winch is used to position the barrier.

Stanchions serve as end supports for webbing.

• The pilot of an F-86F started his takeoff roll as the No. 2 man of an element. He ran power to 98 per cent and went wheeling up the runway.

As the leader became airborne the No. 2 man noted that his plane was dropping back. He glanced at the tailpipe temperature gage and saw that it was rising above the red line (700°). The pilot immediately stopcocked the throttle and aborted the takeoff. The airspeed indicator was crowding 150 knots at this time.

As brakes were applied, the plane began to slow somewhat, but it was evident that insufficient runway was left for a safe stop. At 100 knots the F-86 slammed into the crash barrier and decelerated to a stop with only minor damage inflicted by the barrier cable. Chalk up one save for the runway arresting gear.

FLYING SAFETY does not propose to get into the cause factors of these cited incidents. The important thing is that the barrier saved these planes from almost certain destruction.

• The pilot of an F-86F was returning to the base from an air-to-air gunnery mission. His landing was fast because he inadvertently left the emergency switch in the standby position. This forced an idle condition of approximately 42 per cent and the pilot found it impossible to slow the plane to normal touchdown speed.

Mobile Control observing the fast approach, instructed the pilot to "take it around." However, on advancing the throttle a compressor stall occurred and a forced landing suddenly became a reality.

The F-86 engaged the crash barrier at an estimated 70 knots. Only the right gear connected with the cable but in spite of this the pilot was able to maintain straight directional control and the plane was stopped without any appreciable damage.

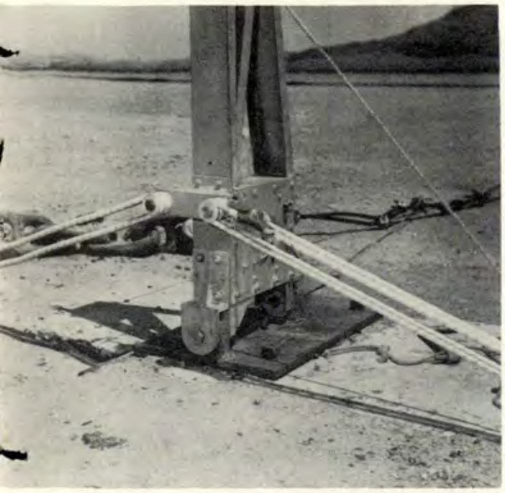
Chalk up another on the plus side for the crash barrier.

• The pilot of this F-86F was No. 3 in a flight of four Sabre Jets that had

Note arresting cable across main landing gear.

Aim for center of barrier to get best results.

Anchor, lifter strap combine to lift cable.



Bungee cords keep hinged stanchions upright.

Intermediate stanchions keep web 40" high.

Initial contact.

Cable hooks gear.

Plane drags chain!

just completed a routine training mission. His troubles began on the first landing attempt. Somehow he messed up the pattern and Mobile sent him around for another shot at it.

While tooling around the pattern on his second landing attempt, the pilot noticed that the throttle was not functioning properly. On final he discovered that power could not be reduced below 70 per cent rpm. This was like having the well-known tiger by the tail and from this point on the pilot was committed to land regardless of any personal desires.

The plane touched down at about the midpoint of the runway and went steaming into the barrier at 140 knots. It was stopped in less than 500 feet with only minor damage to the fairings. After the dust settled the pilot finally cut the master fuel switch to stop the engine. Obviously, the value of the Nellis barrier is increasing.

• This one was a bit different in that it involved a T-33A and the plane went sizzling into the barrier with the speed brakes down. Normally you'd expect the speed brakes to force

Replaceable shear pin releases actuator strap.

the barrier cable down and below the main gear. Fortunately this didn't happen as the cable was forced downward and then snapped up again to engage just the tips of the wheel fairings. 'Twas enough though, and the plane was stopped successfully.

• In the fifth instance, an F-86 hit the crash barrier while traveling at high speed and a successful engagement was made. In this case, however, the pilot did not get rid of the external tanks prior to barrier impact and the arresting cable wrapped around the pylons instead of the landing gear, but damage was negligible.

Quick Stop Tips

There are a few things that the pilot can do to insure maximum effectiveness when engaging the crash barrier:

★ If an emergency develops in the landing roll-out or on a takeoff run, the pilot should make every effort to strike the center of the barrier, holding the airplane on a heading as closely parallel to the runway as possible.

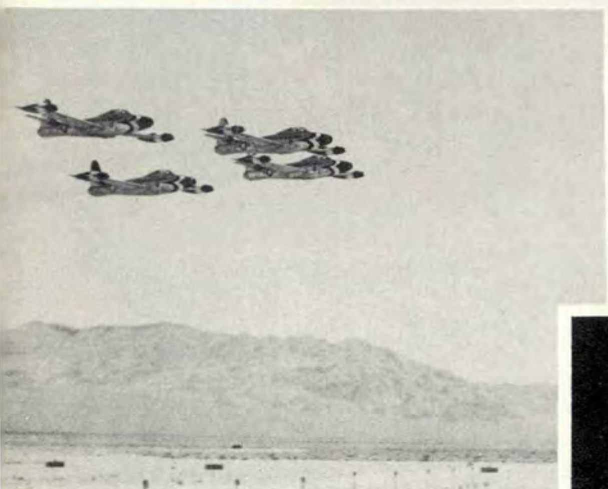
★ Excessive braking action to a point where a tire may blow out or the plane swerve should not be used as this may result in improper stopping action by the barrier. In other words, tests indicate that a high speed impact has a distinct advantage over a slow speed roll-in in picking up the arresting cable.

★ F-84s and F-86s with external tanks should be cleaned up prior to impact if possible, i.e., drop external tanks and stores.

★ Pilots flying F-80s, T-33s or other types with speed brakes located below the fuselage should make every effort to retract the speed brakes prior to impact.

Remember, the crash barrier will save the day for you in an emergency. Keep the few simple steps for engagement filed away in your mind. Work *with* the barrier when the chips are down and it'll take care of you. ●

Desert Turkey Shoot



Above, Luke Thunderbirds make a low-level, close formation pass by the reviewing stands.

JET WORLD SERIES

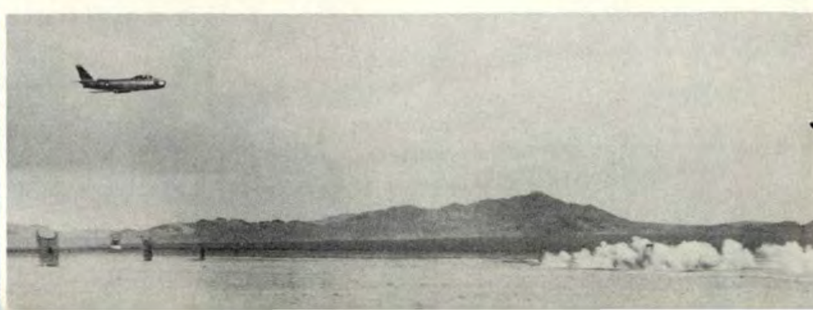
The 1954 Air Force-wide Gunnery Meet, held at Nellis Air Force Base, was entirely free of accidents both in the air and on the ground. This was the second time that such a record was established at Nellis and speaks volumes for all personnel participating in the meet. FLYING SAFETY salutes all who made this record possible.

Left, the Hamilton Sabre Knights thrilled spectators with exhibition of precision acrobatics.

Above, salvo of 12 rockets with warheads is on target in the F-94C firepower demonstration.

Above right, fire blossoms on desert when four 160 gal. napalm tanks, eight rockets let go.

Right, F-86 jockey builds team points by being "in the bull" on low-angle strafing mission.



Left and below, F-84Fs impressed the crowd with a firepower demonstration which included napalm drops and rocket runs.

Above, the F-100 showed how it got the tag of "mach buster" by bouncing several booms off the hills from level flight. Below, Tony LeVier, flying the new T-33B, dazzled the troops.

Four generations of fighters spanning 36 years and three wars, are represented by 110 mph Spad, F-51, F-86, F-100.

Below, rockets streak away from F-84F during "convoy attack" at the Indian Springs range.

F-84G heads one for bullseye on skip-bomb mission, a part of air-to-ground competition.

The SHORT  BETWEEN . . .

By CAPT. ALTON A. PENDLETON

"THE accident was caused by a short circuit between the stick and the seat."

This famous saying is widely known in both old and modern-day Air Force parlance, but few pilots really have taken the time to analyze the meaning. Just for kicks, let's make a short analysis of the 1954 military pilot. Normally this specimen is at his best when appropriately clad with red scarf, F-86 in vertical dive, power at 100 per cent and slapping sonic booms toward an unsuspecting public.

To start with, this fine specimen is composed largely of water, 87 per cent to be exact. That leaves 13 per cent minerals, providing we had the participation of the full 100 per cent to start with. In view of the high cost of living and inflated new car prices, he is valued at approximately $1.67. Considering the going price of today's modern aircraft, he has a terrific responsibility and, believe me, that is putting it mildly.

Now for the sake of the record we should make it very clear that the particular *type* of pilot we're analyzing is a real hot rock and admittedly a peculiar breed of individual. But, like the rest of us, he has discovered that although it isn't necessary to be nuts in this business, it helps. However, lest you leap to completely erroneous conclusions, this same mental attitude has been found extremely helpful in other lines of endeavor, such as zither stringing, swinett playing, chiropody or sausage stuffing. To each his own. So—back to pilots.

Let's consider some basic psychological factors. Stimuli and motivation are the primary factors in any individual wanting to be a pilot. Physical fitness, mental alertness and coordination (he can scratch his right elbow with his right hand . . . neat trick, mind you), give him the title, *Cream of the Crop.*

During pilot training, a student is concentrating on the basic fundamentals of learning to fly an airplane. The instructor pilot is pulling his hair (his own hair, that is), making decisions and doing most of the thinking. (We all have our problems.)

During this training process it takes concentration and repetition to learn good pilot technique. After a sufficient quantity of repetition the technique is mastered and becomes habit. This is a very important step. By the grace of God and these good flying habits, the student pilot graduates a 2d Lt. with silver wings. (Parade rest!)

After logging a couple hundred hours as a rated pilot and just when that new air-conditioned Buick is practically paid for, all might seem rosy; but, this is the time to beware of the aforementioned short between the stick and the seat. If a pilot is taught the proper habit patterns and how to apply them to his everyday flying, he will complete the circuit between the seat and the stick. But if the silver wings metamorphosize this student into a smouldering boulder in a couple hundred flying hours, it's Katie bar the door, we've got a stranger in our midst!

Under normal conditions an experienced pilot flies mostly from habit. A habit is a fixed way of responding.

It is a definite way of reacting or thinking whenever the stimulus is given which usually touches off that particular way of responding. For example, two jet aircraft are approaching head on at high speed. Each pilot should *automatically* alter course to the right. That is habit.

We quote Charles R. Foster, University of Florida: "Thinking usually does not occur until the individual runs across some problem. He may become aware of a problem by many methods. Vision, sound and feel are some of the basic methods; therefore, if a pilot is alert, he will realize a problem exists in ample time to recognize it as such."

Solutions are the next step in thinking. After a problem has been felt or recognized, then comes the act of considering possible answers or solutions. Those pilots who are unfortunate enough to have met an accident investigation board probably can tell you: "The board thought of 19 solutions and I thought of only one." Namely, notify the tower and proceed to PRANG.

The accident investigation board has the advantage of time and knowledge. (Also technical data for research, if necessary.) The pilot is further handicapped by emotional stresses. Let's face it. It is the pilot's responsibility to know the answers and to be able to cope with any situation or emergency that may arise. (Needless to mention, his safety depends on completing a good circuit between the stick and the seat.)

Maybe we've sounded as though we were kidding a bit in this article. In a sense we were. Sometimes we all need a dash of humor to spice up a particularly serious subject and this business of flight safety is genuinely serious. We do urge you to remember this; no matter whether you go tooling around the blue in a blow torch or a frantic palm tree, *you* are the connection between the seat and the stick, so, DO be a good connection.

Knowledge is your salvation. Know your aircraft. Know your procedures. Know your limitations. Form safe flying habits and keep current.

Note: Any reference toward heads up and locked accidents, living or otherwise, is purely intentional. ●

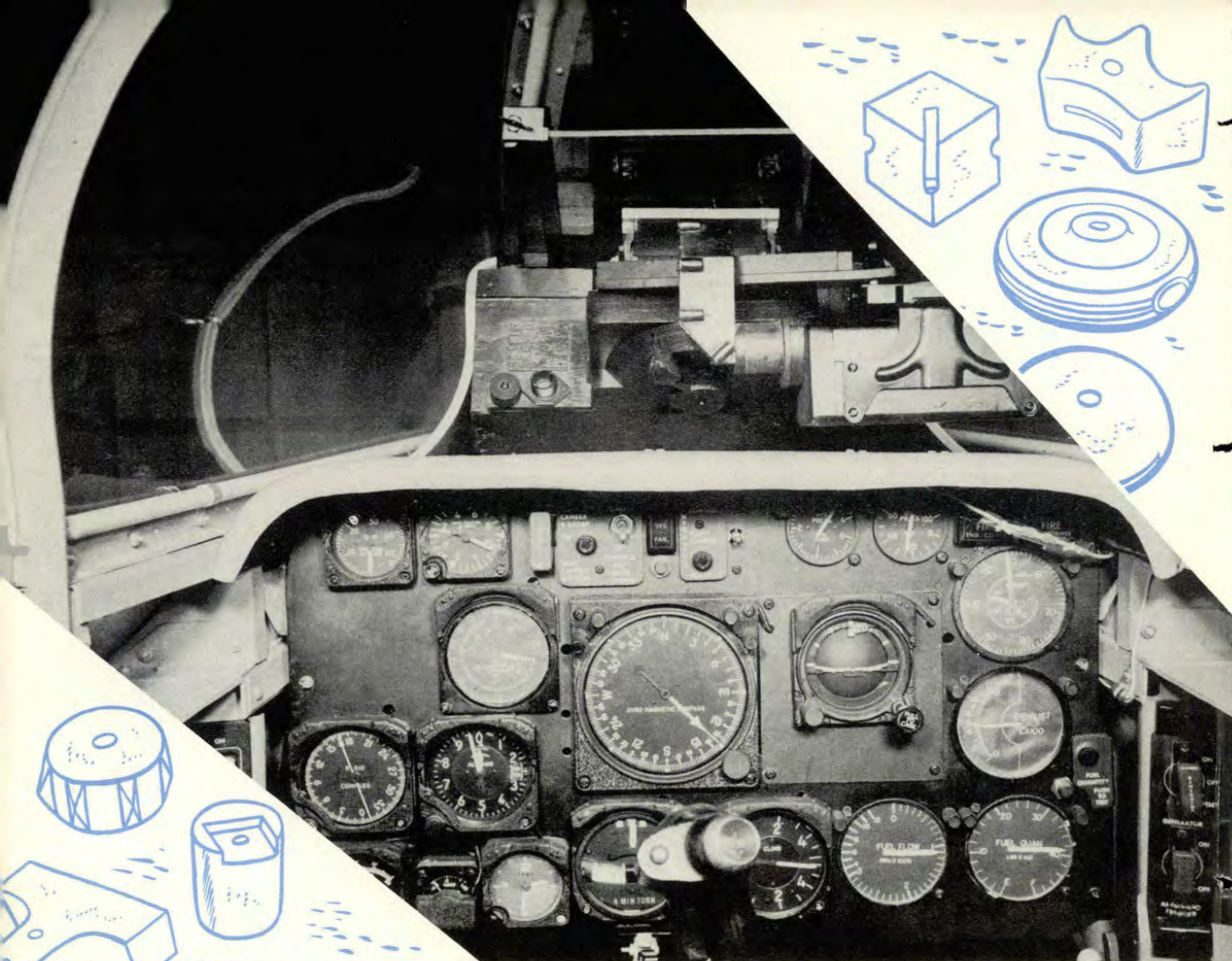
WELL DONE

Capt. Samuel W. Tyson, Aircraft Commander, 374th Troop Carrier Wing (H), FEAF

WHILE flying a C-124 on a passenger run, Captain Tyson was informed that the No. 1 engine was running rough, with a 50-pound fluctuation on the fuel flow meter. After he went to the engineer's panel to check on the engine, the roughness increased and the fuel flow meter registered a 200-pound jump. A decision was made to abort the mission but as Captain Tyson turned toward his seat there was a loud explosion and the aircraft yawed violently and vibrated severely.

Tyson made it back to the pilot's seat. It took both pilots on the controls to maintain any semblance of a heading or attitude. An emergency was declared, stating that the aircraft was turning off airways and was in an uncontrollable descent, under IFR conditions.

Altitude was held at 4000 feet and a straight-in approach was authorized at a field where the weather was no problem. Ten degrees of flaps were lowered when 25 miles from the station and the vibration lessened considerably. However, the flaps had to be raised as 155 knots could not be maintained without increasing power. This was inadvisable as the No. 3 engine temperature was being kept within limits only by priming. A GCA run was made, gear and flaps were lowered on the final and a normal three engine landing made. By regaining control of the aircraft and by his fine technique, Captain Tyson safely landed 122 passengers and crew. Well Done!



"Operation Standard"

Much time and effort is being expended by the USAF to make all cockpits STANDARD

THE setting was a small room in one of the many huge buildings that shadow the nation's capital. A panel was in session for the 33rd time. The atmosphere was quiet . . . and serious. Representatives of the USAF, Army, Navy and leading aircraft industries were there. They were talking about the aircrewman—his safety and comfort.

The subject of cockpit standardization has been kicked around many times when pilots have gathered to bat the breeze. It is often laughed at and more often cursed. The time has come, as the walrus said, for some clarification on the problems and progress of the standard cockpit.

During World War II the high rate of pilot error in aircraft accidents focussed attention on the problem of cockpit design. Although some research efforts were directed toward this problem during the war, cockpit design for maximum pilot efficiency and safety first received serious consideration early in 1946.

When the Cockpit Layout Subcommittee of the Aeronautical Board was established in 1946, one of the first items to be considered was the standardization of instrument panel layout. It was thought at the time that the easiest approach to the problem would be to poll a large number of pilots to obtain their ideas on just how the instruments should be arranged with relation to each other. Several hundred pilots answered these questionnaires. After examining quite a few of these, it was pretty obvious that the solution could not be obtained by this method, since there were almost as many variations of arrangements presented as there were pilots answering the questionnaires.

Next it was decided to evaluate the various instrument arrangements in military and commercial aircraft to discover if any one particular arrangement had been given precedence over all the others. This proved a complete waste of time also, since although there was some semblance of standardization evident in aircraft designed by the same manufacturer, there was little or no standardization between aircraft produced by different companies.

A lengthy program of experimentation, survey and testing has been under way ever since. A large number of results have been attained and more are on the way.

Typical of the early surveys was one on "Pilot Preference Regarding Knob Shapes to be Used in Coding Aircraft Controls," made in February 1947. Sixty pilots were presented with models of 11 knob shapes and asked to note on a questionnaire (1) any shape which they considered impractical and (2) which controls they would prefer to have coded and which knob shapes should be used on these controls.

In general, the pilots agreed on which controls were most in the need of shape coding and to some extent agreed as to which knob shapes should be on which control. However, disagreement on preferences has always been a problem for the people concerned with cockpit design. Thus, surveys have not always proved practical to determine the principles of standardization. But it is interesting to note that some of the shapes preferred by the pilots in this early survey are now standard for the cockpit.

Experiments and Studies

Many valuable studies were completed in these formative years. In April of 1947 the Aero Med Lab completed one on "Direction of Movement in the Use of Control Knobs to Position Visual Indicators." Two separate experiments were undertaken. The first study was conducted to determine the preferred control response to deviations of simulated linear indicators in five common control indicator arrangements. The second study was conducted to determine the effect on speed and accuracy of reversing the motion relationship in two control indicator arrangements.

It was found that in the arrangement where the indicator and the control were in the same plane, with the indicator perpendicular to and centered about an extended radius of the knob, operators consistently responded as though they expected the indicator to move in the same direction as the portion of the control knob adjacent to the indicator. It was found that in two other arrangements where the indicator and control were not in the same plane, the operator's responses were inconsistent.

The effect of pointer alignment on check reading of engine instrument panels was studied and published in a Memorandum Report in 1948. Four experiments were conducted using a panel of 16 simulated aircraft engine instruments, $1\frac{3}{4}$ inches in diameter, mounted in a fixed link trainer fuselage. When the panel was exposed, individuals were required to check read the panel and take appropriate action by positioning one or more toggle switches. Six pointer alignment positions were examined, alignment at the cardinal 9, 12 and 3 o'clock positions, and mixed alignment about each of these positions. Two types of test situations were used. In one situation the subject merely indicated whether or not there was a deviation of any instrument. In the other situation each subject was required to identify any deviating instrument and the direction of deviation from a desired reading.

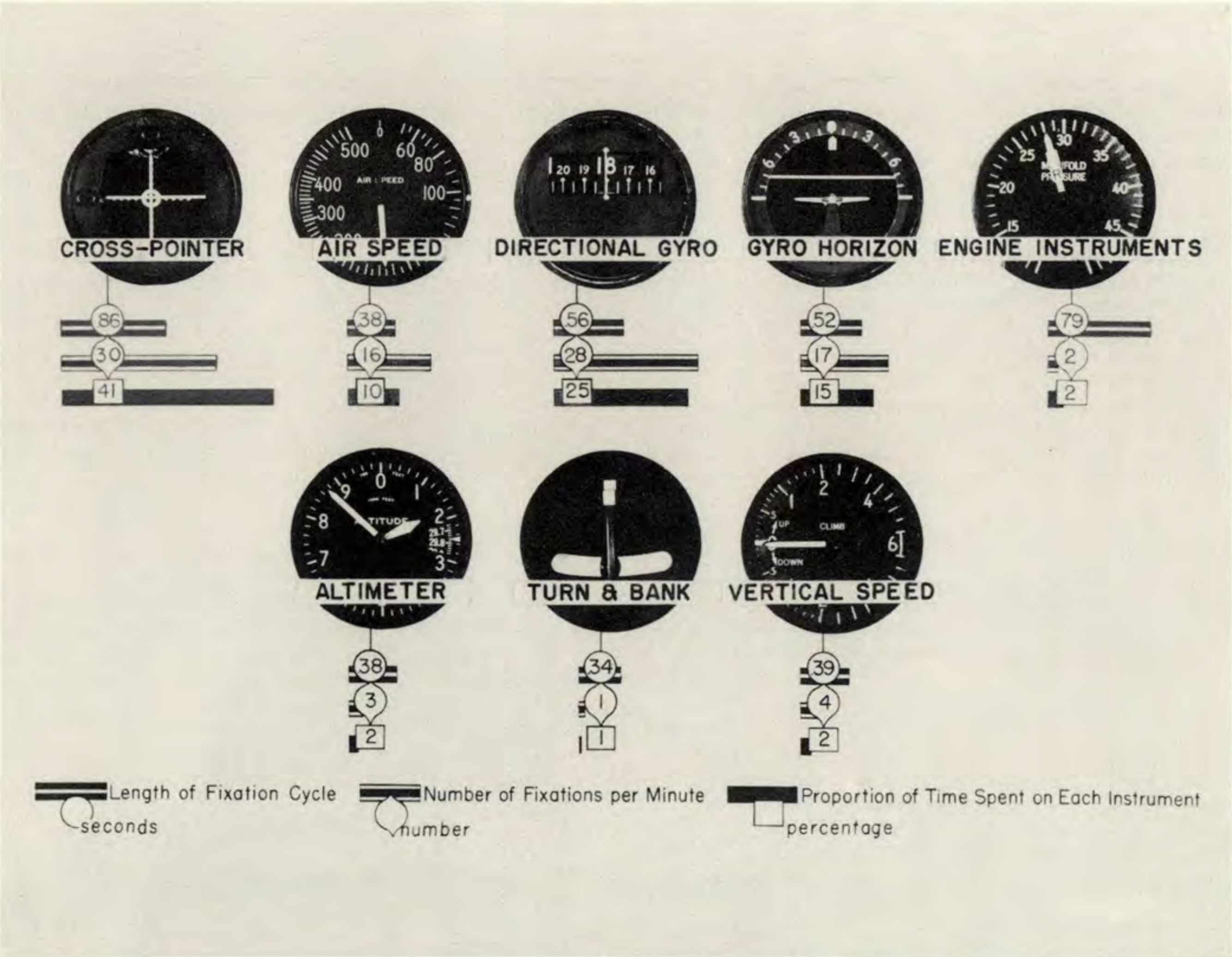
Conclusions drawn from the results of these experiments were as follows:

a. The rectangular arrangement of small engine instruments on multiengine aircraft will result in favorable speed and accuracy in check reading of engine instrument panels.

b. The use of rotatable instruments or rows of instruments, making possible uniform pointer alignment under any flight condition, will provide a significant advantage in speed and accuracy of check reading, although this advantage may be outweighed by the mechanical difficulties or other objectionable features of such adjustment provisions.

c. The judgment of the meaning of an instrument deviation will be more

On the page to the left is a photo of the instrument panel of the F-100. Note the simplicity and the standard location of the "basic six." Above and below are right and left consoles.



Length of eye fixations and number of fixations on aircraft instruments during ILAS approaches.

rapid and accurate with pointer alignment in the 9 or 12 o'clock position than in the 3 o'clock position. The experiment also showed that the 9 o'clock position is slightly superior to the 12 o'clock position.

In order to solve the instrument arrangement problem, a program of eye movement studies was initiated. The program consisted of a series of studies of pilots' eye movements while flying instruments under various conditions.

Eye Movements

A typical example is the sixth of a series of investigations of eye movements of pilots during instrument flight which illustrates the manner of conducting these tests as well as their results. In this test the frequency, duration and sequence of eye fixations made by 15 pilots when flying day and night ILAS approaches with a new panel arrangement are summarized. For purposes of comparison, data previously obtained with the standard Air Force panel arrangement during ILAS approaches under day conditions are included. All conditions investigated showed that the cross-pointer, directional gyro, gyro horizon and airspeed indicator are the most used instruments.

Significantly, more fixations and shorter fixations were made for day approaches than for night approaches. The total number of fixations and the average length of all fixations were approximately the same for both the standard and new panel, although there were some significant differences between individual instruments. More experienced pilots tended to make slightly more and shorter fixations than less experienced pilots. From the standpoint of the distance between the most frequent eye fixations, the new panel appears to have a better arrangement of instruments for ILAS approaches than the standard panel.

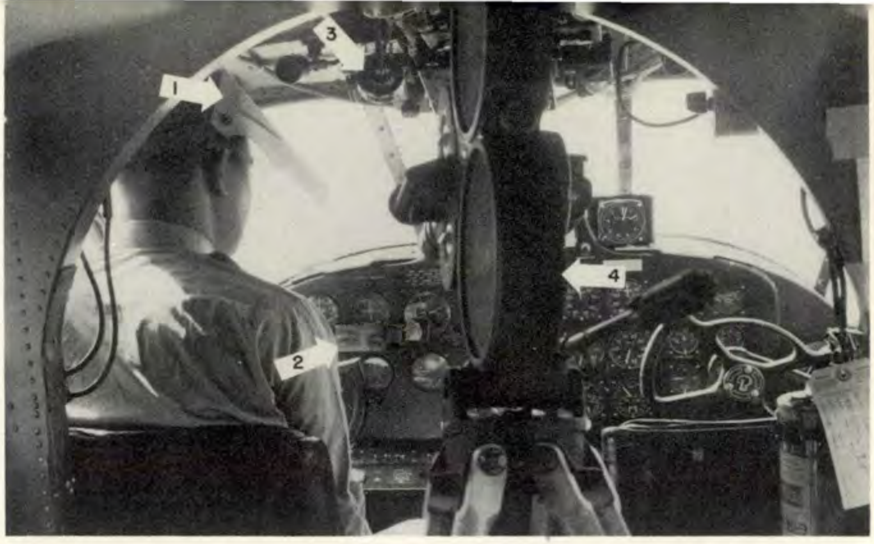
These tests were accomplished by mounting a movie camera in a C-45. The camera recorded pictures of a small mirror which reflected the pilot's eyes. The movies were then developed and studied to determine which instruments were looked at, how frequently, for what length of time and so on. Various types of flight conditions were included in the studies under simulated conditions.

Eye movement studies were also conducted under contact takeoffs, night straight and level flights, night and day level turns, zero reader approaches, straight descents and climbing turns.

The time and effort expended on these various studies and experiments have not been wasted. They gave the cockpit standardization people a great insight into not only what the pilot wants in the cockpit but also what he should have. In fact, one major problem is that the *wants* and the *needs* are often not the same. However, the people in charge of the program, many of whom are pilots, know what should be in the cockpit and the way it should be arranged.

Instruments Markings

Information provided the pilot by his instruments, to be useful must first be visible. Markings must be of adequate size and properly lighted. However, the shortage of panel space limits the size of instruments and markings and the need for the pilot to see outside at night limits the permissible intensity of instrument illumination. Instrument reading time and errors are little affected until the brightness of the instrument markings falls to about .01 foot lamberts. On the other hand instrument reading performance deteriorates rapidly as the brightness falls below this value. Other data have been obtained in flight concerning the lighting intensity chosen by pilots for different reading requirements using three different lighting systems. For red flood lighting the pilots selected .003 foot lamberts as the minimum value for maintaining safe flight, and .02 as the normal value for adequate observation of the instruments while at the same time maintaining outside vision.



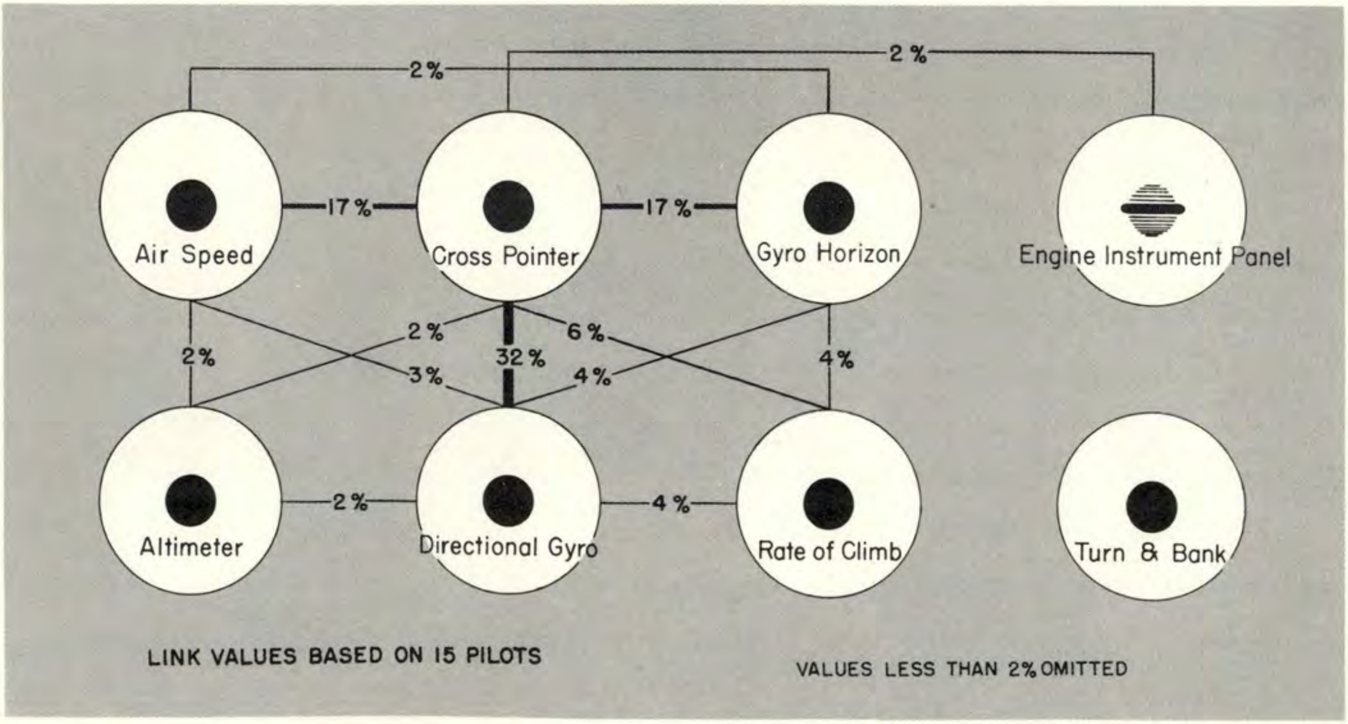
Equipment used to make eye movement studies: 1. Hood, 2. Mirror, 3. Stop Watch, 4. Camera.

There are several different sizes of engine and flight instruments. For instance, the attitude and directional indicators are much larger than the conventional $3\frac{1}{4}$ inch airspeed indicator and other flight instruments. The fact that these instruments are larger and occupy a much greater volume of instrument panel space is recognized as a major problem of the aircraft designer. The large type attitude and directional indicators are required to adequately present small changes in attitude which can be immediately recognized by the pilot. They were developed as a result of pilots' complaints concerning their inability to obtain this information from the smaller dial face.

Basic Instrument Types

A variety of factors have to be considered in order to present the information in the best form for the pilot's use. One of these is the basic

Eye movement links values between instruments during night ILAS approaches. Instruments were moved from grouping arrangement for test purposes.



METHOD OF USE	MOVING POINTER	MOVING SCALE	COUNTER
1. Quantitative Reading	Fair	Fair	Good Minimum time and error in obtaining exact numerical value.
2. Qualitative and Check Reading	Good Location of pointer easily detected. Numbers, scale need not be read. Change in position easily detected.	Poor Difficult to judge direction and magnitude of deviation without reading numbers and scale.	Poor Must read numbers. No easily detected position changes.
3. Setting	Good Simple and direct relation of pointer motion to motion of setting knob. Pointer position change aids monitoring.	Fair Somewhat ambiguous relation to motion of setting knob. No pointer position change to aid monitoring. Not readable during rapid setting.	Good Most accurate monitoring of numerical setting. Relation to motion of setting knob less direct. Not readable during rapid setting.
4. Tracking	Good Pointer position readily monitored and controlled. Most simple relation to manual control motion.	Fair No pointer position changes to aid monitoring. Somewhat ambiguous relation to control motion. Not readable during rapid changes.	Poor No gross position changes to aid monitoring. Ambiguous relation to control motion. Not readable during rapid changes.
5. Miscellaneous	Requires greatest exposed area, which must be illuminated. Scale length limited unless multiple pointers are used.	Saves panel space. Only small section of scale need be exposed and illuminated. Long scale possible by use of tape.	Most economical of space and illuminated area. Scale length limited only by number of counter drums.

Table of Recommended Indicators According to Use

manner of indication. Conventional instruments used in aircraft to give quantitative information can be grouped into three general types: (1) moving pointer, fixed scale; (2) fixed pointer, moving scale, and (3) direct reading counter. Within these broad types there are many variations and subtypes including circular, curved and straight scales. Curved and straight scales may be mounted horizontally or vertically.

Uses to which an instrument can be put:

Quantitative reading — reading to an exact numerical value.

Qualitative reading — judging in a qualitative way the approximate value, the approximate deviation from a null or desired value and the direction from a null or desired value.

Check reading — verifying that a null or desired value is being properly indicated.

Setting — adjusting an indicator to a desired value, usually an exact numerical value, or adjusting it to match another indicator.

Tracking — intermittent or continuous adjustment of an instrument to maintain a null or desired value (compensatory tracking) or to follow a moving reference (pursuit tracking).

The above classification serves two purposes in that it provides a framework within which to carry out experiments on instrument design and that it assists the designer in the selection of the most suitable instrument for his purpose on the basis of research data. Table I illustrates some of the data available on the merits of the three basic types of instruments.

To or From?

One of the most fundamental and frequently argued questions concerning control-instrument movement relationships centers around whether the moving element of the instrument should represent the aircraft or the earth. For example, on the gyro horizon should the moving element be a miniature airplane moving in relation to a fixed bar? This is referred to as "airplane reference" or "fly from." Or should the horizon bar move to simulate movements of the true horizon as seen through the windshield, as on the gyro in current use? This is referred to as "earth reference" or "fly to."

Among our present aircraft flight instruments most are of the airplane reference type. Exceptions are the conventional gyro horizon and cross pointer indicators. Many believe that an intermingling of the types of presentations in a cockpit adds much to the work load of the pilot.

Also, all research directed toward determining which of the two types of presentation is superior has pointed to the "fly from" type. In spite of the consistency of the research data on this question, pilots are still flying with gyro horizons and cross pointers using the "fly to" principle. However, to reverse the indicating principle on these two controls could be expected to confuse already trained pilots during the lengthy change-over period. For the gyro horizon there are additional difficulties of engineering, unless the instrument display is driven electrically from a remote gyro. This general problem is now receiving very serious attention and it is quite possible that further tests to be conducted in the near future will point the way to changes in these two instruments.

Engine instruments are used primarily for check and qualitative reading. Several years ago a new design and arrangement of engine instruments was developed to facilitate the type of reading required. This new system has been installed in all new multi-engine aircraft produced for the USAF of late.

In this system the instruments are arranged in columns for each engine and in rows for each function. At takeoff power the pointers are aligned horizontally at the 9 o'clock position. Should any pointer deviate from the horizontal line of pointers it can be detected readily as to engine and type of malfunction. Eight times as many instruments may be read in the same amount of time with this new system. Pilots and engineers on multi-engine aircraft have received this system very enthusiastically.

The Basic Six

The basic six is a term by which standardization people refer to the gyro horizon, directional gyro, airspeed, altimeter, turn and bank and vertical speed instruments. (For aircraft equipped with ILAS, the turn and bank is replaced in the standard arrangement by the cross pointer.) Not only is this standard accepted by the USAF but by the Navy, U. S. airlines and the military aviation services of Great Britain and Canada, as well.

Of course, problems arise even for the basic six. Certain types of aircraft must be equipped with gunsights or, perhaps, scopes that must be placed in a given position which often conflicts with the standard arrangement. Compromises must be effected which accomplish the mission of the aircraft with as little deviation from the standard as possible.

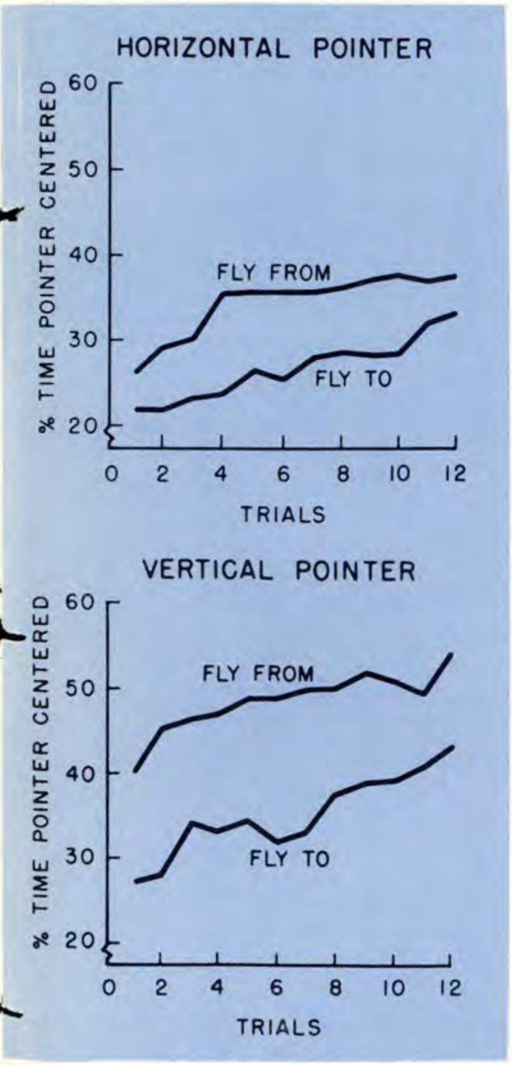
Standardization of engine and navigational instruments has not progressed as far. The Air Force has published specific requirements for the location of engine instruments but in some cases the other services do not agree to these requirements. The USAF requires that navigational instruments be located functionally about the basic six. Again inter-service standardization has not been completed. It should be remembered, however, that even at this very moment studies and meetings are being conducted to meet this end.

Standardization of Controls

There are three means which must be considered in the standardization of controls — design, location and method of actuation. Many cockpit controls have already been standardized in these three characteristics.

Take for example the landing gear and flap controls which, in older aircraft, were sometimes confused. Under the new system the gear control is shaped like a gear and the flap control like an airfoil section. The landing gear control is always forward of the throttle and the flap control aft of the throttle. This provides maximum economy of hand movement during takeoffs and landings. This standardized arrangement first began to appear in production aircraft in 1950. An examination of accident data has failed to uncover a single case of gear and flap confusion in aircraft having this arrangement.

Direction of control movement is also an important item in standardization. Gear and flap controls move in the same direction as the aircraft component to which they relate. Direction of movement principles have been specified which apply to all controls. For instance: all switches should move forward or upward, for ON; all knobs should rotate clockwise for increase; and a control (such as the throttle) should move forward for increase of aircraft performance.



Tracking performance shows a comparison of "Fly To" and "Fly From" presentation on cross pointer indicator for ILAS and zero reader. "Fly From" was preferred by 21 of 24 cadets.

Warning Lights

One of the most controversial subjects of all is that of warning lights. The warning light must gain the pilot's attention quickly and stimulate him to emergency action. On the other hand, he must not become so alarmed that he cannot continue his normal flying activities. In spite of continuous efforts to limit the number of cockpit warning lights, the number has reached alarming proportions in some of the newest cockpits. One such cockpit contains about 80 warning lights in the pilot and copilot positions.

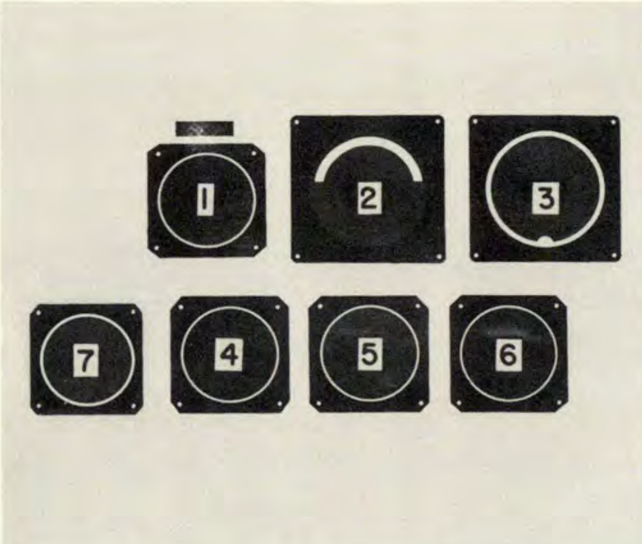
If the number of warning lights is too great the pilot has difficulty in identifying the particular malfunction. Warning lights which do not signify real emergencies will, until identified, be just as disturbing as critical lights. This serves to reduce the effectiveness of the important warnings. There is a wide variance of opinion among pilots on this subject. Some want a minimum of lights, others want not only many warning lights but also affirmative lights to show that nothing is wrong.

At the present time the standardization people are leaning toward a master warning light which will refer the pilot to a lighted panel. The panel will tell the pilot by lighted words what is wrong. The master warning may be turned off by the pilot after he sees on the panel what is wrong. When another emergency condition arises, he will be warned again. However, the light on the panel will stay on until the condition has been corrected. Also under consideration are the pop-up flag warnings and auditory warnings.

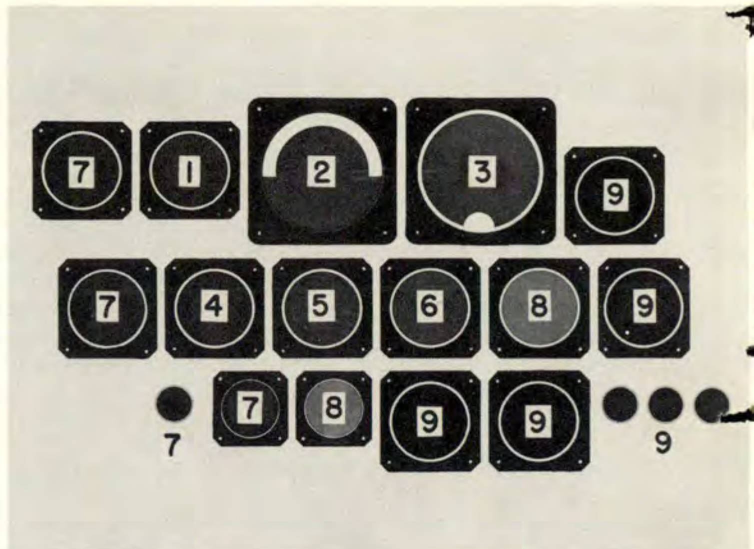
This subject is still in the experimental and study period. Here again, standardization will be difficult because of the great differences in aircraft and their functions.

The Military Standard

In spite of all these accomplishments the aircrewman may still ask, "What does all this mean to me? I



Standard Basic Flight Group Arrangement.



Standard Instrument Arrangement — Jet Fighter.

am still not flying a standard cockpit." Inevitably, there is a delay between research and application of the results to the design of production equipment. For this reason it has only been in the last few years that applications of human engineering research and cockpit standardization have begun to appear in production USAF aircraft. Improvement in cockpit design and arrangement has been quite significant. Pilot transition from one type of aircraft to another has been vastly improved.

To check this the aircrewman has only to look at two documents that are the direct result of the efforts toward cockpit standardization. These are the Military Standards, which lays down the standard for location and actuation of cockpit controls, and the Handbook of Instruction for Aircraft Designers which sets down the requirements the builders and designers of aircraft must follow.

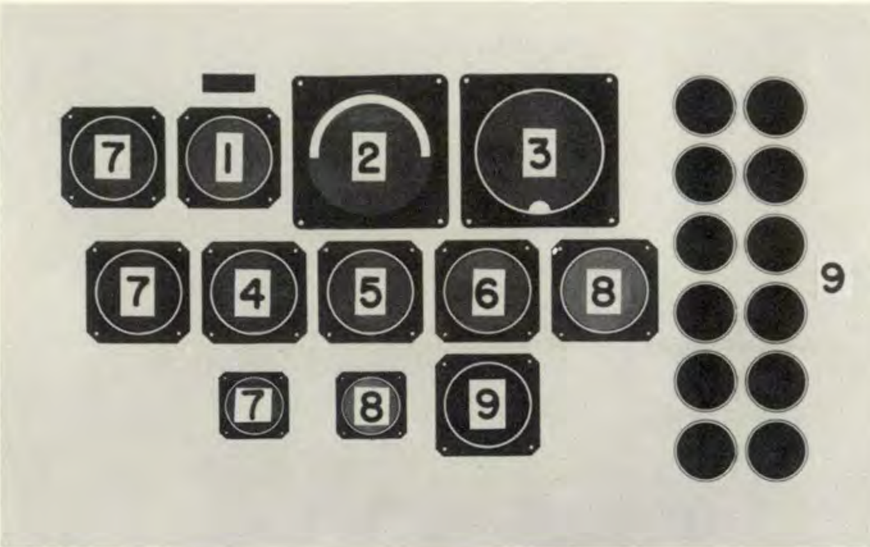
This document defines three types of cockpits: the single pilot, the tandem pilot and the side-by-side pilot. It goes into detail on where controls will be located as well as how they will be actuated. Shapes of control knobs and cockpit dimensional requirements are set down. Location and comments are established on all ground and flight controls from the check-off lists to the nose wheel steering control for all three types of cockpits. Power plant controls, fire fighting controls, electrical and radio controls, instrument panels, armament controls and miscellaneous controls and equipment are all broken down specifically. The assignment of all controls to crewmembers by classes is accomplished.

The Handbook of Instruction for Aircraft Designers (HIAD) serves for much the same purpose as the Military Standard except that it goes into greater detail. The criteria of this document were established for the development of standard functional aircrew stations with the intention of reducing to a minimum pilot error, pilot transition time, pilot fatigue and such other factors that impede the completion of a mission and are detrimental to flying safety. Chapter 6A.0 is devoted to the accommodation of all aircrew members with particular emphasis on the flight station or cockpit. Location and actuation of cockpit controls, instrument arrangement and lighting, and the dimensional requirements of the cockpit necessary for the accommodation of a large percentage of USAF pilots are among the items listed.

To illustrate the detail and thoroughness of this publication the following extraction was made as a typical example:

b. Carburetor Air Control
The carburetor air control

At times scopes must be placed in a given position which conflicts with standard arrangement.



Standard Instrument Arrangement — Multi-engine Jet Aircraft.

1. Airspeed Indicator
2. Directional Indicator
3. Attitude Indicator
4. Altimeter
5. Cross Pointer
6. Rate-of-Climb
7. Other Flight Instruments
8. Navigational Instruments
9. Engine Instruments

Key to instruments in standard arrangements.

shall be located at the lower aft position of the power quadrant outboard and aft or below the oil cooler control.

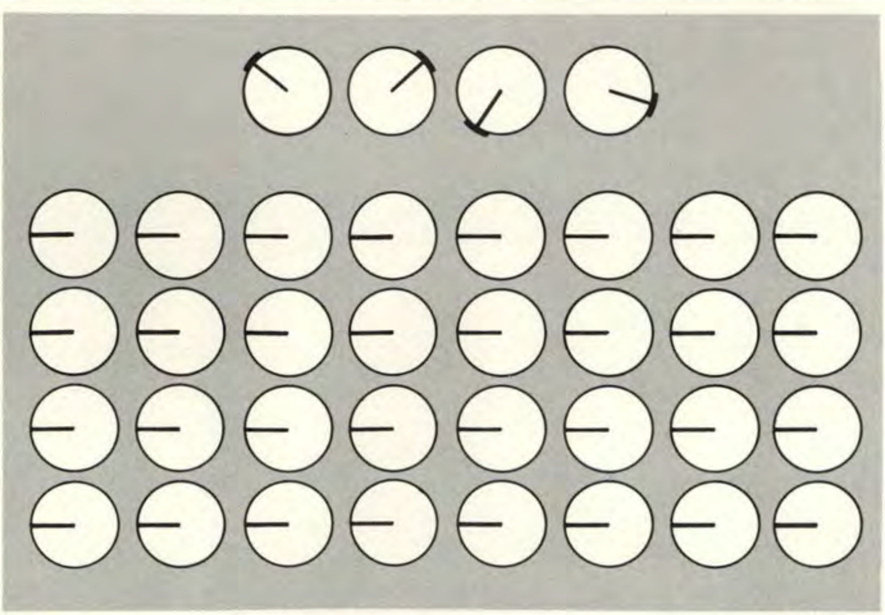
The actuating motion for the carburetor air controls shall be forward or upward for RAM AIR, the middle position for FILTERED AIR and the aft or bottom position for HEATED AIR.

In the event a two position hot-cold switch is used, the actuation shall be up or forward for COLD and down or aft for HOT.

The shape of the carburetor air control knob shall comply with the configuration and dimensional requirements set forth in Drawing AD26.

Designers for the aircraft corporation must follow these requirements. Before a new aircraft goes into production it is subject to minute scrutiny on mock-up boards by representatives of the cockpit standardization panels and the using activity. At times compromises must be worked out. These occur only when requirements are conflicting or cannot possibly be met. The matter is then referred to experts in that particular area of the USAF and the problem is worked out with as little deviation from the standard as possible.

Instrument check reading time is decreased by pointer alignment in the 9 o'clock position.



Helicopter Standards

Much work and effort are being expended to standardize the helicopter. However, the instruments presently installed in the 'copter are inadequate. For the most part these instruments were designed primarily for fixed wing aircraft with flight characteristics radically different from normal helicopter flight. Specifically, improvement of attitude indicators with large pitch and dive displacements is badly needed.

Studies and experiments are under way to gather all pertinent data on the helicopter cockpit. An eye study similar to the one on fixed wing aircraft already mentioned, is being conducted and should prove invaluable. In the meantime, an HIAD section for rotary wing aircraft has been published with specific requirements broken down in detail.

The work on cockpit standardization is by no means completed. Giant strides have been made in the last few years and the view into the future is bright. As flight becomes more complicated by greater speeds and higher altitudes, it is vitally important that the cockpit is becoming standard and, thus, simpler.

Operational efficiency of aircraft should never exceed the efficiency of the crew. Standardized aircrew stations mean higher quality of flying and a reduced accident potential. ●

No Sweat for ARS – Recently, radar again played the leading role in another successful rescue performance at Narsarssuak Air Base, Greenland. Situated at the head of the 45-mile-long Tunugdliarfik Fjord, Narsarssuak Air Base is one of the few fields in the world that has practically no instrument letdown procedure. Letdown to 1300 feet must be made at Simiutak, an island at the mouth of the winding fjord, and then it's a VFR approach all the way. If the fjord is closed and the ceiling at Narsarssuak is less than 7000 feet, there is no approved letdown. ADF is available for letdown to 4500 but can only be used if the pilot has specific orders authorizing such a letdown procedure.

In this instance, a DC-3 was inbound to Narsarssuak from Keflavik, Iceland. Approach Control advised Air Rescue that the aircraft had passed the point of no return and would continue on to Narsarssuak. The weather was steadily falling below minimums, and high winds were being forecast.

The DC-3 arrived at Simiutak, let down to 500 feet and started up the twisting fjord.

At Narsak village, visibility was completely obscured so the aircraft made a 180 and headed back for Simiutak. Weather reports from Simiutak, Narsarssuak and a weather station between, Narsak, were as follows: Narsarssuak had 500 feet obscured, with 3/4 mile visibility and snow showers. Simiutak reported 1200 feet overcast, with five mile visibility in snow. Narsak reported total obscuration in heavy snow. Not only was the fjord impassable but the DC-3 reported only one hour of fuel remaining.

Shortly after the last contact with the distressed aircraft, an Air Rescue SA-16 took off to attempt interception. At this time the ceiling had raised to 1000 feet over Narsarssuak but the fjord was still closed.

The SA-16 plunged into the fjord and proceeded toward its rendezvous with the other aircraft. The ceiling descended lower and lower. Ten miles away from the base and at 100 feet, the ground could barely be seen -- forward visibility was 1/8 mile. Radar steers had to be used to guide the aircraft through the next 20 miles of the closed fjord and narrow passes.

Breaking into the clear in the lower part of the fjord, with a ceiling of 500 feet, an immediate visual intercept was made with the distressed DC-3. Radio contact had been established previously on an emergency frequency while the SA-16 was on its radar run. Upon interception, a 180 was made and as the distressed aircraft tacked on to the SA-16, the run back up the fjord was started.

The Rescue aircraft, with the DC-3 in trail, descended to 100 feet. As the first radar run started, an immediate breakaway became necessary to avoid low island hills that loomed up through the storm. Contact was again made and another radar run started. The hazardous trip through the narrow defile was again accomplished, although at times visibility was so poor that the DC-3 almost lost sight of the Rescue aircraft. A few miles from Narsarssuak, where the fjord widens, the ceiling lifted and visibility improved considerably.

At this point the fuel supply problem had become somewhat acute. However, supplied with precise information as to runway heading, distance to the base and other essential details for a straight-in approach, the DC-3 made a safe landing.

One of the DC-3 crew stated:

"All words are inadequate in describing one's feelings concerning the job being done by the Air Rescue Service. Only after having personally gone through the experience of being bottled up in the iceberg-ridden fjords of Greenland, can one begin to realize the slim chances of survival without them and their radar equipped aircraft to lead you in. There is no more overwhelming feeling than when you sight them coming to your aid, and to know your troubles are almost over. It is a very comforting thought to know these men are on the spot to assist any and all aircraft in trouble in this treacherous area."

★ ★ ★

New Jet Tanker-Transport– Boeing Airplane Company's new prototype jet tanker-transport was unveiled in May. Primarily, the huge aircraft was built as a multi-purpose fuel tanker-troop transport for the armed forces. It is designed to increase the range, striking power and mobility of the Air Force's present and future jet air fleets.

Multi-purpose fuel tanker-troop transport is designed to increase USAF range, striking power.

With a cruising speed in the 550 mph class, bettering by some 100 mph the fastest jet transport yet built, the new plane will be capable of transcontinental non-stop flights in less than five hours, and non-stop New York-to-London flights in less than seven hours. It will be capable of carrying over 100 passengers and will cruise between 30,000 and 40,000 feet.

The prototype's swept-back wings have a span of 130 feet; with a length of 128 feet, tail height of 38 feet and a gross weight of 190,000 pounds. It is powered by four Pratt & Whitney JT3-L engines, each rated in the 10,000 pounds of thrust class, mounted individually in pods.

★ ★ ★

Special Notice to Airmen – Effective July 1, 1954, ATC will no longer use the term "nonstandard pattern" when issuing holding instructions to IFR flights. The standard elliptical holding pattern, as described in the Flight Information Manual, is made up of right-turns and is two minutes long. Any holding pattern becomes a nonstandard pattern if either or both of these two components are different. Clearences for holding in nonstandard patterns will contain a brief description of the nonstandard features of the pattern. Absence of instructions regarding the direction of turns will mean that right-turns should be flown. Absence of instructions regarding the length of the pattern will mean that a two-minute pattern should be flown.

A clearance for holding in a right-turn, one-minute pattern will only contain the length of pattern, i.e., "ONE-MINUTE PATTERN."

A clearance for holding in a left-turn, two-minute pattern will only contain the direction of turns, i.e., "LEFT-TURNS."

A clearance for holding in a left-turn, one-minute pattern will contain both the direction of turns and length of pattern, i.e., "LEFT-TURNS, ONE-MINUTE PATTERN."

★ ★ ★

An innovation on B-47E is the stinger tail.

B-47E Takeoff Assists – New B-47Es now being delivered to SAC are provided with an increase in available takeoff power through a new external rocket arrangement and a water injection system in the six engines. The B-47E has a maximum gross weight of 200,000 pounds, 15,000 pounds more than earlier models.

The water injection process consists of spraying a mixture of water and alcohol into the combustion chambers of the J-47 engines to increase the mass flow through the engines and the velocity of the jet gases.

Also, a new collar-type rack, mounted beneath the fuselage, has positions for 33 ATO units of 1000 pounds thrust apiece. This new rack, which has 15 more positions than any previous arrangement, can be dropped from the plane after the power has been expended. This arrangement means that additional equipment can be carried in the compartments which formerly contained the internal ATO units.

The additional power means that the B-47E can be operated from shorter fields and can lift maximum loads from existing runways. Using both water injection and ATO, today's production models can cut many feet off an ordinary takeoff run, depending on atmospheric conditions. However, Boeing engineers have pointed out that only under extreme conditions would both the systems be used simultaneously. Takeoff with a normal load calls for neither system but the value of their availability is obvious. If needed, the added power is there at the flick of a switch.

Another innovation of the B-47E features a new stinger tail. This remotely controlled tail turret system is capable of knocking down enemy interceptors at night or in cloud cover. Guided by radar, the turret was especially adapted for high-speed jet aircraft operation. The gun firing system is designed so that radar and an electric brain do most of the firing.

Water injection, 33 ATO units enable B-47E to use shorter fields with maximum loads.

The radar is switched on to "search" in danger areas to maintain a watch to the rear. When the radar picks up an attacking plane, a pip shows on the screen. Once the target is centered in the crosshairs it is tracked automatically. The tracking action supplies the system's computer with the necessary information, and when the attacking plane gets within range the guns are fired.

The system consists essentially of a tail turret mounting twin 20 mm. cannon, a computer, control equipment and search-track radar.

A simple preflight check of demand oxygen regulators for outward leakage that should be SOP for every pilot and crewmember.

BEST TEST

ALL demand and pressure type regulators are designed around the principle of a demand diaphragm for controlling the flow of oxygen and a diluter valve for diluting the oxygen with atmospheric air to provide the required ratio of air and oxygen to the user.

The demand diaphragm operates the demand valve and controls the flow of oxygen according to the amount of suction created in the regulator by the user.

The diluter valve controls the flow of air into the regulator, decreasing the flow with increasing altitude so that the suction in the regulator creates a greater load on the demand diaphragm, thus giving more oxygen.

Possibly you know all of this. However, a brief recap of this critical subject can never be amiss.

A damaged diaphragm will allow excess air to enter the regulator during inhalation thus decreasing the oxygen-to-air ratio. In fact a diaphragm having a large hole in it may prevent any oxygen from being delivered to the crewmember.

On a pressure demand oxygen regulator, a damaged diaphragm or faulty diluter air valve will allow oxygen to leak out the regulator during positive pressure breathing.

From the above, it can be seen that the condition of the demand diaphragm and diluter air valve of oxygen demand regulators is important to insure proper operation of the regulator for the user.

Before takeoff each crewman should check regulator for outward leakage by blow-back test.

Before takeoff on each flight, each crewmember should check the regulator for outward leakage by a blow back test. This check cannot be accomplished while wearing a mask but must be done by blowing into the end of the oxygen regulator hose.

If there is resistance to blowing, it indicates that the demand diaphragm and diluter air valve are satisfactory. Little or no resistance to blowing indicates a faulty demand diaphragm or diluter air valve.

During the blow back test, do not throw yourself into the act with reckless abandon. If you overdo this blowing test, a pressure relief valve in the regulator opens, thus giving the impression of a bad leak. It is also possible for too much air pressure to temporarily seat a leaky diluter valve. Need we say more?

The blow back test with the diluter valve in NORMAL OXYGEN position will check the demand diaphragm and the diluter air valve on most regulators in service today. However, on a few types of regulators, including *all* A-14s, the blow back test with the diluter valve in NORMAL OXYGEN position will only check the diluter air valve. This is because at sea level the demand chamber is separated from the air chamber to supply normal atmospheric air to the user as there is sufficient oxygen in the air without adding oxygen.

Therefore, to check the demand diaphragm on many types, the blow back test must be conducted also with the diluter valve set in the 100% OXYGEN position.

At this point you may be somewhat confused and rather than print a long list of the various types now in service, let this be your guide. Regardless of the type, make two blow back tests. First on NORMAL OXYGEN and then on 100% OXYGEN. Make all of your tests by blowing gently into the regulator hose as during normal exhalation. If there is little or no resistance to this gentle blow back pressure, the regulator or the regulator hose is faulty.

The foregoing information was supplied by the Aero Medical Laboratory, Directorate of Research at Wright-Patterson AFB. We believe that such information is worth passing on to the field even though it may be old hat to some of you. This business of carelessness with personal equipment, and failure to make adequate precautionary checks is reflected too often on our statistical charts.

Again we say, *read* and *heed*. ●

Don't Strafe On This Pass!

Any Air Force type that picks up a target like this in his gunsight or even on a radar screen is very likely to be a little shook up about the whole caper. We are happy to state that at the June Gunnery Meet at Nellis AFB, the targets were all GI, consequently no one was carried away by target fixation as well might have occurred if the passes had been made on this little doll.

In fact, congratulations are in order for all those who participated in the accident-free meet. See our picture spread on pages 14 and 15.

Mal Function

Mal attends the Gunnery Meet
Claims that he cannot be beat

Sensible Commander has read of Mal
Plays it cool and grounds our pal.

In August issue, if luck holds good
We'll brief the Meet the way we should.