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FLYING SAFETY

UNITED STATES AIR FORCE

THE CARE OF MAN AND HIS PERSONAL EQUIPMENT

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No! A Form 14 won't be necessary on this accident, Smirdley.

CONTENTS

FILE THIRTEEN....

Unauthorized use of the emergency UHF and VHF channels has been occurring consistently. Pilots are reporting that it is sometimes necessary to discontinue monitoring "guard" channel because of excessive congestion. This in itself can contribute to accidents as a pilot might be denied extremely useful information while he is thus "in the dark" as to other inflight emergencies. In recognition of this fact, the Navy, in September of 1958 found it necessary to issue the following limitations on the use of guard channel. In part their OPNAV Instruction went like this: "The military emergency and distress frequencies will be used only to provide a communications channel to and from airborne and ground stations involved in an actual emergency or distress condition . . . This includes immediate assistance by other aircraft in the vicinity, but does not include communications incident to a coordinated search and rescue operation." Commanders should know that action is now pending to make this matter a special subject for inspection . . . Take a look at the NEW High Altitude Letdown and Terminal Area Charts. You'll see something brand new and different about the picture for Cannon AFB, Clovis, N. M. Various points are shown around the station from which penetration can begin from altitudes higher than the standard you've been used to. One other is shown in this edition. All bases are in the process of formulating similar procedures, hence lots of changes coming in the near future. Regardless of how well you think you know it, it's best to check before you descend . . . There are some fantastic stories coming in about pilots who have used the low altitude parachute lanyard properly. They're still around to tell it themselves . . . Who said it department: "Fly Safely—because 100 per cent of all people killed in aircraft accidents are still dead" . . . The history shows that 90 per cent of ejections performed above 2000 feet have been successful. By contrast, 70 per cent of ejections below 1000 feet have been fatal.

Vernon R. Stutts

CROSSFEED

LETTERS TO THE EDITOR

Confusedly Yours

Several years ago the Navy Pilots' Lobby coerced the USAF into using the nautical mile and knot units of measurement in place of the statute mile and MPH system which we had been using so well since Orville and Wilbur first dreamed it up. Since then I haven't known how far I have traveled, or how fast I have done it.

Then the communists, or some other foreign body, got into the act and changed our alphabet from "able, baker, etc.," to alpha, bravo and maybe you know the rest. Since then I haven't been able to talk.

But this last one's the real dazzler! Now, I not only don't know how far I am going or how fast I am doing it, and am not able to talk about it, but I don't know when I'm doing it! Probably the RAF types love it, but why did we have to go on this Zebra, er, I mean, Zulu, time kick?

Just kidding about the knots and the ICAO alphabet, and for the most part about Zulu time. However, occasionally a Pilot to Forecaster Service call-up results in an answer that the latest observation for East Mukluk Air Force Base is for such and such a time Zulu, which in some cases may not always be late weather. If a pilot is not really on his toes, and fails to convert this time to local time, he may be caught with a changed weather condition when he gets to destination. I realize that there are many easy ways to keep track of Zulu time, like wearing lots of watches, and carrying three or four flip charts full of time zone maps, but let's face it. The guy on the ground has got more room in his office than we've got in the cockpit. So if he has to use Zulu time, then let him follow it up with the time also in local zonal time. Real small point, but less margin for error this way. Can you put in a word where it will do the most good?

S. Lowe Lerner
Major USAF

First and foremost, never forget "the latest observation for East Mukluk AFB" is useful ONLY to the guy who is already there. Be advised you'd be better off to interrogate the Channel 13 prophet for an ETA weather forecast. However, your point on the use of Greenwich time is well taken. We shall pass your criticism to those concerned for opinion and possible action.

★ ★ ★

More on Humor

The ultimate purpose, and result, of FLYING SAFETY Magazine is to get "premium reducing information" across to us, where the profusion of "seriously written" publications hasn't done it. Many of us just plain don't have time to distill the mass of technical information for its practical content, good intentions notwithstanding. So we compromise; read what we can and keep a depressing knowledge that there is too much we don't know.

Its style is an added inducement to read "FLYING SAFETY," and I get a lot more out of it than I do from all the "serious" publications that I don't get to. Homer is supposed to have said, "A man learns more quickly, and remembers more easily that which he laughs at than that which he approves and reveres."—and no commander ever lost stature in my eyes because he told me the most, in the shortest time, in words that appealed, about what I should do for his good and mine.

A steak is no less nourishing because it has been thawed, cooked, and seasoned—and you'll get a lot more repeat customers.

No credits please.
Major USAF

'Nuf sed.

★ ★ ★

Runway Areas

I wish to congratulate the staff of FLYING SAFETY Magazine for the current campaign against slipshod maintenance of runway areas. A failure to recognize or act upon reported runway booby-traps has added materially to the aircraft accident costs. These unsuspecting booby-traps lurking in the vicinity of the runway often convert a simple tire blowout into a total aircraft loss.

As an active member of many aircraft accident boards I have witnessed many minor incidents become major accidents, as result of this lack of proper airfield maintenance. Drainage ditches alongside, or at the approach end of the runway continue to take a heavy toll of lives.

Keep up your fine campaign until it becomes sacrilegious to find so much as a small stone near the runway areas.

I'm with you!

Major H. D. Rigney, USAF
USAF Mission to Bolivia
American Embassy
La Paz, Bolivia

We couldn't agree with you more. Thanks for giving us another opportunity to plug the problem.

★ ★ ★

Well Done Awards

One of the squadrons here wishes to submit a pilot for a Well Done which I feel is justified. Do we send the write-up direct to you or through channels?

Captain Ollie H. Clark
Wing Flying Safety Officer
354th Tactical Fighter Wing (TAC)
Myrtle Beach Air Force Base, S.C.

Nominations for "Well Done Awards" must go through channels for major command approval.

★ ★ ★

The Old and the New

Where, but where, did you find that old obsolete WO insignia shown on the front cover of the January issue? And since the issue in question deals with supervision, where are the E-8 and E-9 stripes?

M/Sgt. Richard M. Valentine
3640th M. and S. Group
Laredo AFB, Texas.

Believe it or not, our photographer found them in the BX—and no E-8/9 stripes. Who said, "Events o'ertake us?"

. . . says he's been assigned to attend the FSO course!

Can we guarantee that crew members are provided with the proper amount of properly designed and fitted equipment? And further, that they are so indoctrinated that they can not fail to use it properly? This is primarily . . .

A Problem for

In comparing the status of the personal equipment program today with the status, say two years ago, it cannot be denied that there has been a marked improvement in the equipment itself and in its availability to the user. In comparison with this period in 1956, let me briefly review these improvements.

In September 1956, Headquarters USAF approved and ordered implementation of a policy long sought by my command, that of individual issue and retention of personal equipment. Unfortunately, the Air Force supply resources were in no position to support the significant increase in the amount of personal equipment that such a policy generated. High priority tactical units in ADC during that period had on hand only 74 per cent of the personal equipment that they were authorized and required. In one Fighter-Interceptor Squadron, 13 pilots did not have helmets and the backorders on oxygen masks, Air Force-Wide, were over 60,000. Similar severe shortages existed in practically every essential item of personal equipment. Today, although ADC is only 80 per cent equipped, practically none of these shortages can be classed as safety of flight items.

In the field of development during this same two years, significant improvements have been realized ranging from a vastly improved oxygen mask suspension to a quick-donning pressure suit.

It is apparent then, that in the areas of personal equipment development and procurement, an awakening to the increased importance of this area has caused some real progress. While we are far from well, this increased understanding, interest and effort is certainly worthy of acknowledgement. Unfortunately, a similar understanding and interest with the resulting improvement has not taken place in the logistical and operational problems which are involved in the use of personal equipment. As a result, an alarming lack of surveillance of the personal equipment program continues to exist. Investigation of personal equipment problems in the past two years, by a committee from Headquarters, USAF, has shown that unit and staff surveillance of the personal equipment program throughout the Air Force was woefully inadequate. The problem is the lack of properly trained officers with a full-time duty as unit and staff personal equipment officers. I find it difficult to understand the lack of a personal equipment officer's career field to provide the proper guidance without which, the most basic rules of management predict that any program is doomed to failure. Let me illustrate why I believe that establishment of this career field is an urgent necessity and tell you what we have done or intend doing in ADC to improve the situation.

It would be foolish, I think, for me to attempt to explain the impact that personal equipment has had and will continue to have on flying safety. Not only is the hypoxia problem still with us, but we are faced with the vastly increased part that personal equipment plays in aircrew efficiency and survival in high-altitude, high-speed operation.

I predict that the percentage of attempted ejections will markedly increase. This prediction is based first on the fact that with the low level escape systems now available, crew members will eject where heretofore they had no choice but to attempt a crash landing. Second, I think an appropriate statement in jet pilots' handbooks would state "This Aircraft does not lend itself to a successful crash-landing." This increase in bailouts will place increased emphasis on the requirement that the personal equipment function properly and is properly used. Can we depend on untrained officers with other additional duties to insure




Management

Major General J. V. Crabbe
Chief of Staff
Air Defense Command

that personal equipment of the proper type, in the proper amounts, in the proper place, is available at the proper time, to meet this requirement? Can we assure that proper storage, fitting, inspection and maintenance measures have been taken to insure its reliability? Can we guarantee that crew members receive such a thorough indoctrination in its use that, even befuddled by the shock of an emergency or injury, they will instinctively use it effectively? I don't think so.

In spite of the fact that personal equipment, in the past few years, has increased enormously in complexity with a resultant increase in the knowledge and time required to support it, the officer's career field has not only been abolished but the authorizations for airmen, both in numbers and skill levels, have been reduced.

I have, up to now, stressed the increase in the technology and the importance of personal equipment. In contrast, purely from the standpoint of management, let us take a look at the program and see if management is not indicated.

It is a fact that power plant failure has represented the largest percentage of mechanical failures. I am also aware that certain extreme altitude projects have experienced an enormous increase in the percentage of engine failures at these extreme altitudes. These failures mean, of course, loss of cockpit pressure.

Commands, such as ADC, then face a hazard with which we have had little or no experience and have received no official guidance, in, for example, the problems and the hazards to be expected in operational use of partial pressure suits and related high-altitude survival equipment. Most of us in the Air Force has neither taken cognizance of, nor provided for, the numbers and skill levels needed to support personal equipment for high-altitude flight.

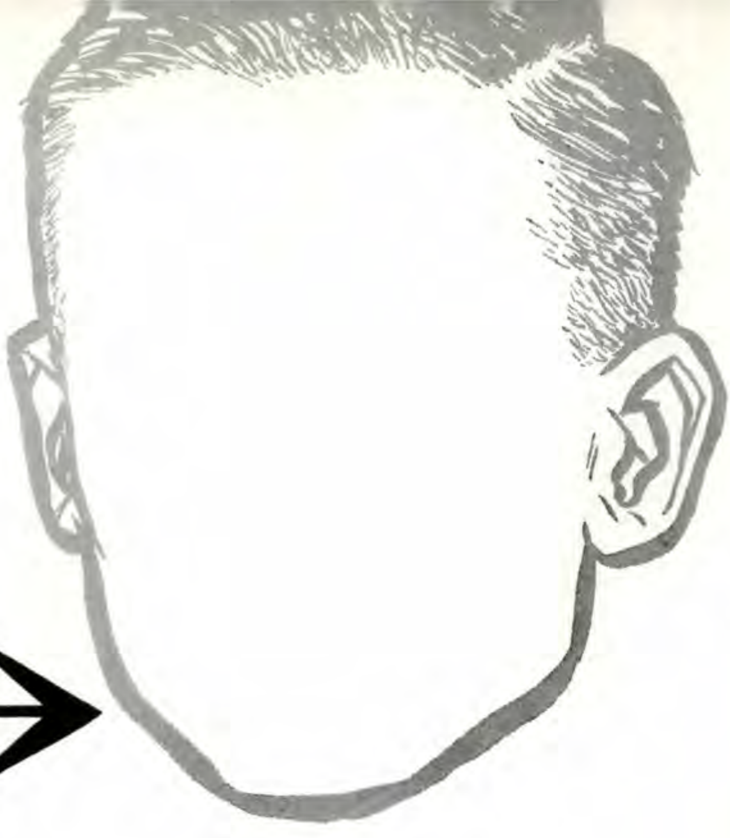
I have pointed out the enormous increase in the workload involved in operating the personal equipment program at unit and staff levels; the specialized knowledge required to intelligently supervise the program; and, the huge increase in the cost of this program.

If we agree with the essentials of good management, then we must conclude that the personal equipment program certainly fits the following criteria. Whenever any program significantly increases in dollar value, increases in importance to the end product, becomes more complex in character or in its operation and/or production, enlarges the area of its operation, then a corresponding increase in both the quality and quantity of its supervision is a necessity.

Because of concern over the problem the following action is being taken or has been taken in ADC.

- Full time personal equipment officers have been appointed at Fighter-Interceptor Squadrons and staff levels throughout ADC from within our own officer resources. Formal training, not only in personal equipment but the physiology of high-altitude flight, is programmed for them.
- Other major commands have been requested to take formal action on the personal equipment officer's career field.
- A study is being conducted on the personal equipment technicians field to develop requirements for necessary increases in numbers and skill levels in this area.
- Many other actions have been taken in specific equipment problems and personal equipment facilities. I realize that some of the problems in my command will not be similar in many respects to the problems in other commands, but anytime you can lick the problem of overall management, you have automatically provided the remedy for all the little ills. ▲

Others cannot judge your fitness to fly when your emotions take up more than their share of the cockpit.



YOU are the doctor . . . . .

Dr. Thomas F. Staton, Educational Advisor, Air University.

"We'll send the children to Mother's," Tess had said. "The Doctor says it will be at least a couple of weeks before I can come home." "She means it will be a couple of weeks *if* she ever comes home," thought Major Logan. Tess wouldn't say that, but they both knew it. He had talked to the Doctor himself. He turned the switch on and held the key hard over a couple of seconds before he remembered that it was the other car that started that way. You mashed the accelerator all the way down to start this one.

Driving on to the Base he absent-mindedly went straight ahead instead of turning left and was almost at his old office before he noticed what he was doing and turned back to his new location. After a quick check-through of his desk, he went down to Operations and started preparations for his scheduled proficiency flight.

Major Logan was safety-conscious. He had never scratched a T-Bird and had only a few minor incidents in prop aircraft. He believed in standardization, so he conscientiously went through the full pre-flight routine—forms, clearances, checks — the old routine you can do in your sleep after logging a thousand hours in jets, on top of Lord-knows-how-many in everything from F-80's to KC-97's.

Jim Logan made his flight. He rode out to the coast and back, but his usually keen enjoyment of flying just wasn't there. Thoughts of his wife and worries about her kept him preoccupied and unhappy. As he came in to land he went through the old, familiar routine: Clearance from the tower, gear down and locked, flaps down, line up on the runway, ease her down . . . down . . . Down doggonit! Too long. Pull her up for a go-around. Gear up—flaps up—and away.

Back around again. Coming in—turning final, leveling out over the approach end, and a scream from the tower piercing his brain, "Pull-up! Pull-up!! YOUR WHEELS AREN'T DOWN!"

Wheels not down? Of course the wheels were down. The tower itself had told him so just a minute ago . . . a minute ago? *A minute ago?* Hit the throttle! Ease back on the stick! But before speed can be gained and altitude changed, SCREEEEEEEAAAAACCCCCC.

Major Logan doesn't have a clear accident record on his jet flying any more. In fact he's lucky he's still around to log jet time or any other time. His T-Bird certainly won't log any more time, that's for sure!

Logan, one of the most safety-conscious pilots that ever restarted a flame-out, barely squeezed past his brush with an insidious killer that stalks the cockpits.

Emotions . . . Feelings. . . . The deep, primitive, animal response to unusual situations, which nature built into humans to help them cope with the demands of life, almost killed Major Logan. He couldn't help his feelings. Even less could he stop the glandular changes of his body which accompanied those feelings and which had the general effect of keying him up physically and depressing his mental effectiveness.

Jim was luckier than many whose emotionally-caused mental lapses have them flirting with the undertaker. He was out of the hospital by the time his wife had to enter it.

The lineman on an electric light pole who grabbed a hot wire ("after fifteen years working on power lines why did Slim do THAT?" his friends asked) didn't even get to the hospital. They took him directly to the funeral home. His closest friend, with whom he had a brief, violent quarrel that morning at the plant, always hated it that their last parting was in anger. Mercifully he never suspected the connection between Slim's raging anger and his inexplicable blunder.

Then there was the kid who got a new car as his High School graduation present. The gang piled in after the graduation program that night. He could spot Fangio twenty lengths and beat him. He was sitting on top of the world with an adoring chick beside him. He was a curly wolf and it was his night to howl, just like his tires howled (trying vainly to hold the road), as they gave up the struggle and shot over the side of the curve into a sixty foot ravine.

Emotions killed that lineman and those kids, just as they almost killed Major Logan. Emotions kill hundreds of people each year. They cause a large proportion of the accidents that seem incredible, that just should not have happened, that happened because someone did something that seems absolutely unreasonable, insane.

Emotions kill by dulling mental acuity. When a person is in the grip of a strong emotion (fear, grief, rage, joy) the physiological functionings of his body change. The very chemistry of his blood changes! Internal glands,

usually quiescent, spring into action and put the body on an emergency status. The heart, lungs, and muscles are toned up to their highest peak of efficiency, just as if they had received a shot of some powerful stimulant. And in reality, they have: adrenalin—from the Adrenal Glands which pump that potent secretion into the blood stream when emotion grips a person. It puts one in the physical pink to do things. You can run faster, hit harder, you feel pain less, even your blood coagulates faster and you don't bleed as much if you are hit or cut.

But one of the immutable laws of nature says that you never get something for nothing. This physical superman is created at the cost of the mental man. As the body channels all its resources to key you up to peak physical efficiency, your mind is subtly dulled. Even though you feel you are thinking clearly, you are really far below your mental par. Your brain is on a starvation diet, a war-time rationing which nature established to pour your vital resources into an emergency physical program. No matter how hard you try, when emotionally aroused you simply can't think with peak efficiency any more than an automobile engine can exert its full power with the fuel mixture leaned down to a fraction of its normal richness.

An emotionally aroused person is literally as unfit to fly an aircraft as a person running a fever. It is as dangerous to him to fly as it would be if his nasal passages were congested—more dangerous in fact, because when the emotionally unsettled person is flying a plane, his life, not merely his ear drums, is jeopardized.

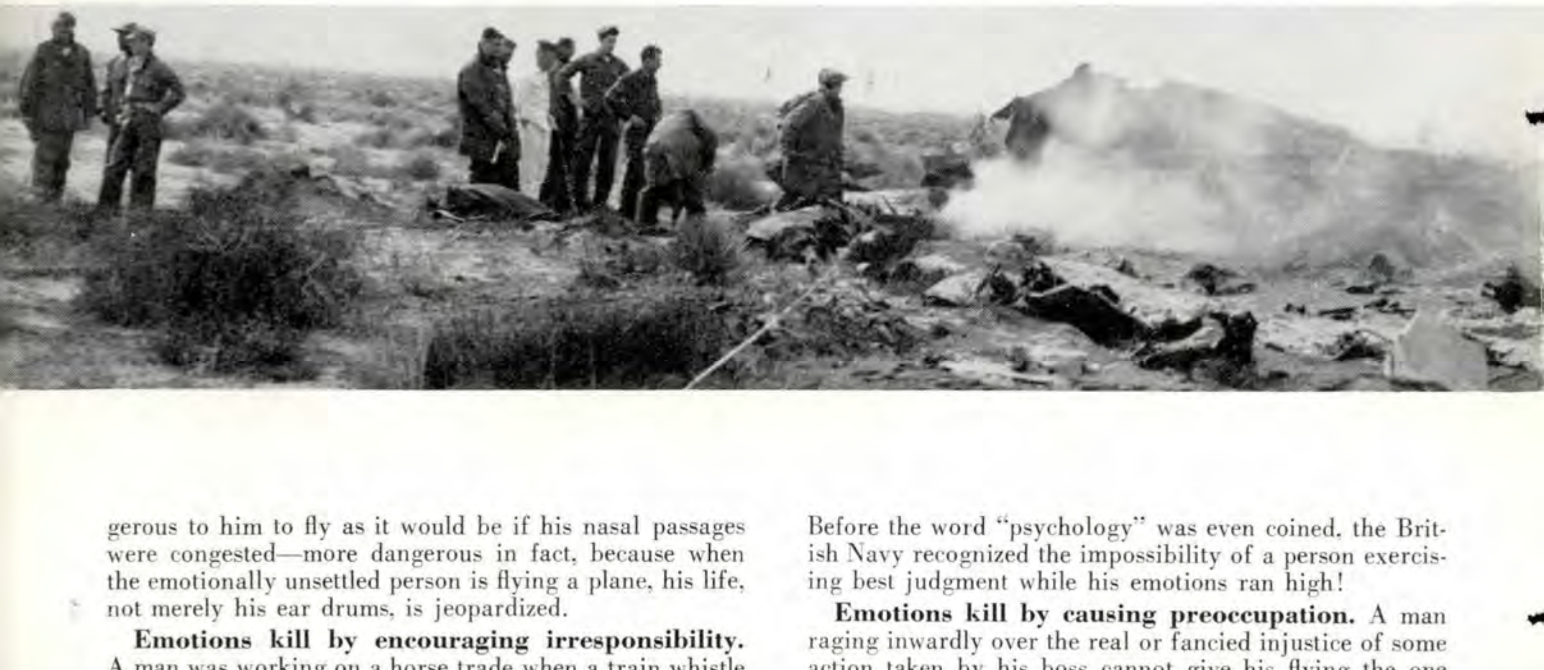
Emotions kill by encouraging irresponsibility. A man was working on a horse trade when a train whistle caused the horse in question to dash madly across the pasture, finally charging full tilt into a tree. The prospective customer turned angrily on the trader. "You said that horse was sound as a bell. He's blind as a bat!" The trader meditated a moment and replied, "Naw, that horse ain't blind. He just don't give a damn." We get that way under the influence of emotions. When you are angry you will try to bluff another driver out of the right-of-way where you would not under ordinary circumstances. It is a safe bet that the disconsolate suitor who jumps off the bridge after his fiancee gives him the gate, would have looked several times before he leaped, if he had waited until his first rush of despair had waned.

And speaking of safe bets! Men who would be insulted if someone wanted them to bet even money that a crapshooter would make eight the hard way, have been known to be so intoxicated by news of a promotion or orders home, that they slammed a plane into the air without even checking to see if the aircraft had been fueled up!

This irresponsible rashness produced by emotions goes beyond mere dulling of mental abilities and even beyond preoccupation. Under its influence, normally safe pilots will often *notice* the things they should do, *recognize* the things they shouldn't do, *understand* the danger of an action, *but do the wrong thing anyway!*

"Whom the Gods would destroy they first make mad." You never realize the truth in that old saying so vividly as when you see an emotionally upset man do something he would never think of doing if he were in possession of his best senses.

The British Navy of a century ago was not noted for being a humanitarian organization specializing in coddling its men. But even then a regulation was on the books requiring a ship's captain to wait a day before sentencing a man convicted by court-martial, because, the regulation stated, the emotions aroused by the trial would lessen his judgment and discretion in establishing a punishment. Before the word "psychology" was even coined, the British Navy recognized the impossibility of a person exercising best judgment while his emotions ran high!



Emotions kill by causing preoccupation. A man raging inwardly over the real or fancied injustice of some action taken by his boss cannot give his flying the one hundred per cent concentration it deserves. Every person has had the experience, many times, of being so angry over something that his mind insisted on dwelling on that thing, returning to it when momentarily distracted, filling the bright center of consciousness with it and letting other thoughts intrude only hazily and temporarily. Grief will cause the same preoccupation. Fear, or even delirious happiness over some good fortune, can do it.

In short, any emotion that is so intense that it stirs a person deeply is going to insist on attention, on battering its way into the thoughts and consciousness of its owner even when all his mental faculties should be focused on

You can't have your own Flight Surgeon following you around to see if you are emotionally fit for every flight. This is your responsibility.

the business at hand. It tends to make him oblivious to what is going on around him. Things that he would ordinarily note, think of or consider, pass by without his ever being aware of them. Remember the time you were thinking so hard about the smart comeback you should have made in the argument you lost that you drove right by your own driveway? Remember how your wife called you to dinner three times and you never heard her because your Alma Mater had the ball on the opponent's three yard line? Remember how you failed to keep an eye on the kid and he got into the ink—because you were trying to figure why the representative from the Department of Internal Revenue wanted you to come down to his office?

Your emotions had a hand in all those things. Certainly your mind was occupied, you "just didn't think." But a person's mind is a lot more likely to be completely roped and hog-tied in its preoccupation with a subject, if his emotions are tied up with the subject than if he merely possesses an intellectual interest in it.

Emotions may give an unconscious death-wish opportunity for expression. Psychologists and psychiatrists have found strong evidence that every person has within him desires for death (his own or someone else's) as well as desires for life. Ordinarily these death wishes are locked securely in the innermost dungeons of the mind. But emotions, especially rage, anxiety or grief, sometimes allow these dark urges to escape from confinement and subtly touch the judgment of a person in such a manner as to produce a disastrous decision or action at a time of grave crisis. How often does this happen? No one knows, but psychological examinations of numerous "accident-prone" persons suggest that it may kill many more people than some well-known, dreaded physical disorders.

What can be done about emotions? Education is the first step. Education of rated personnel, most especially pilots, on the grim danger of undertaking the responsibility of flying while disturbed by an intense emotional state. It took years of education between the time when it was well-known that certain minor physical disabilities could be grave dangers to a flyer and the time when young, self-confident men became generally convinced that their skill and determination could not wipe out the handicap imposed by such a disability. It was many years after scientists discovered that diseases were caused by germs, before the medical profession at large would credit the ridiculous idea that things so-small-you-couldn't-even-see-them could haul a strong man down to the grave. Psychologists and psychiatrists know perfectly well that a pilot's emotional state can cause him to make mistakes which will kill him. But it will take years of education before most flyers will accept the fact that piloting a plane while in the grip of a disturbing emotion is as fraught with danger, and is irresponsibly foolish.

When, through years of a systematic educational program, pilots *do* accept completely the fact that even co-piloting a plane with an emotional upheaval is as dangerous as flying it while suffering from influenza and when they guide their flying habits on the basis of that knowledge, the aircraft accident rate will drop. You can find plenty of Flight Surgeons who will confirm this fact. It won't cut the accident rate to half what it is now, maybe not even to two thirds. But it will cause a significant drop.

Education must be supplemented by self-discipline to be effective. Flight Surgeons can detect a heart condition which would disqualify a man from piloting a plane. They can detect an anxiety neurosis or a manic-depressive psychosis which would disqualify him. But they are not in position to detect every passing physical ailment which renders it temporarily inadvisable for a man to fly, and they are not in position to detect every emotional condition which makes him temporarily a poor safety risk. Detection of these transitory disabilities, and refraining from flying while suffering from them, is and must be the responsibility of the individual.

The tragic part of it is that every year flying men are going to die because they will not *believe* that they are not in full mastery of themselves regardless of the blazing anger or other emotion they feel over some recent quarrel or happening. They are going to take off in the future, as in the past, to work the anger out of their systems by aerial acrobatics or to leave their anxiety or grief behind in the contrail of their century-series planes. And some will die who would have lived—if they had waited until they possessed more peace of mind before they flew. The Grim Reaper, wearing the label of Rage, Grief, Fear, or (ironically) Exuberance, will continue to reap his harvest until pilots realize that flying with one of those emotions in their minds is as dangerous as flying with Martinis in their stomachs!

It is hard to get strong, confident men to accord proper fear and respect to an abstract influence, one they can't touch or see. It is even harder to get them to face the fact that they are NOT masters of their minds and feelings to anything like the extent they are masters of their bodies. They just hold a tenuous control over the surface activities of their psychological beings, and are particularly hard put to discipline their own strong internal and unconscious emotional conflicts. It is difficult to get men to recognize these things, but it needs to be done!

It will take a lot of education to get men to give proper consideration to their emotional state before taking off on a flight. It will take the steady, positive emphasis of a well-conceived and well-conducted program of education on this aspect of flying to impress flying personnel with the necessity for staying on the ground when their minds are under the influence of strong emotion. But a Flying Safety Program emphasizing the need for psychological equilibrium—a calm and undisturbed mind—before a flight will save lives if continued over a period of time.

Remember this, you Flying Safety Officers, you Inspectors, you Commanders: Educating your personnel to stay on the ground until emotional upsets subside will save lives as surely as will persuading them to make like a dodo until alcohol fades out of their systems!

Sometimes you may think that you can't afford to ground yourself just because you are emotionally upset. When you feel that way, ask yourself, "Would I fly today if my nose were stopped up tight?" If the mission is important enough that the answer would be, "Yes!" you might consider making the flight. But remember that you are taking a lot bigger risk than you would be if only your ear drums were at stake. If the answer is "No!", stay on the ground!

Naturally the question arises, "What about combat flying? Every combat mission is made with fear, anxiety, rage, or other consuming feeling burning inside flyers. Would you ground the whole Air Force because it is dangerous to fly when all clogged up with emotions?" Of course not. When the mission requires it, the mission is flown, regardless! Flying with an emotional disturbance is not as dangerous as flying into an interceptor aircraft net. It is not as dangerous as flying through missile-defended enemy skies. A mission is not abandoned because of those dangers, and obviously it would not be abandoned because personnel were scared or mad. But no person in his right mind, and understanding the danger, would fly into hostile interceptor aircraft or subject himself to hostile anti-aircraft action if it were not necessary. Similarly, good sense argues against flying while preoccupied with a strong emotion in normal, peacetime conditions when flying-regardless-of-circumstances is not necessary.

One day a pilot said to me, "Doc, what if you are in the middle of a flight and get blind mad about something that happens? That's the way I usually get mad. Under those circumstances it isn't a case of not flying. You're already up there, as mad as a cat with its tail in a lawn mower. Whaddaya do then, huh?"

Do two things; do them *any* time you have to fly despite being in an emotional state.

First, double-check everything you do. Remember that with any emotion nagging at your mind you will not remember as well, think as lucidly, or notice things as carefully as you ordinarily do. Absent-mindedness will occur. You will make mistakes in reading and in physical coordination which you would not ordinarily make. Things that you would ordinarily spot and consider, you will overlook. Your best life insurance is to force yourself to look twice at, and think the second time about everything you do, consciously trying to make up for decreased mental efficiency by extra effort and caution.

Second, make every decision toward the side that is safest. In every situation which has a safer and a less safe alternative, take the safer. This is good advice any time. When emotion is dulling your keenest intellect and finest physical coordination and inclining you to irresponsible action, it is more than good advice. It is an essential of survival! The unconscious death wish, the exuberance that gives the false feeling of omnipotence, the grief that makes you think, "What's the difference? Who cares now, anyway?", the rage or fear that makes rash actions seem reasonable. They'll kill you, Mister, if you don't block them by always choosing the safest course. The decreased ability to perceive accurately what is the safest course is bad enough. Don't compound it by figuring that you can afford to take the chancier path!

Any Flight Surgeon or clinical psychologist observing Major Logan's absent-minded errors in starting his car and driving to his office could have certified that the major was temporarily unfit to fly. Rage, extreme happiness, any strong emotion, will manifest its symptoms in a person's everyday activities. But you can't have a clinical psychologist (or what is even more likely, your own Flight Surgeon) following you around watching to see if you are emotionally fit for every flight (perish the thought!). You have to accept the responsibility yourself. Here is a little guideline for you:

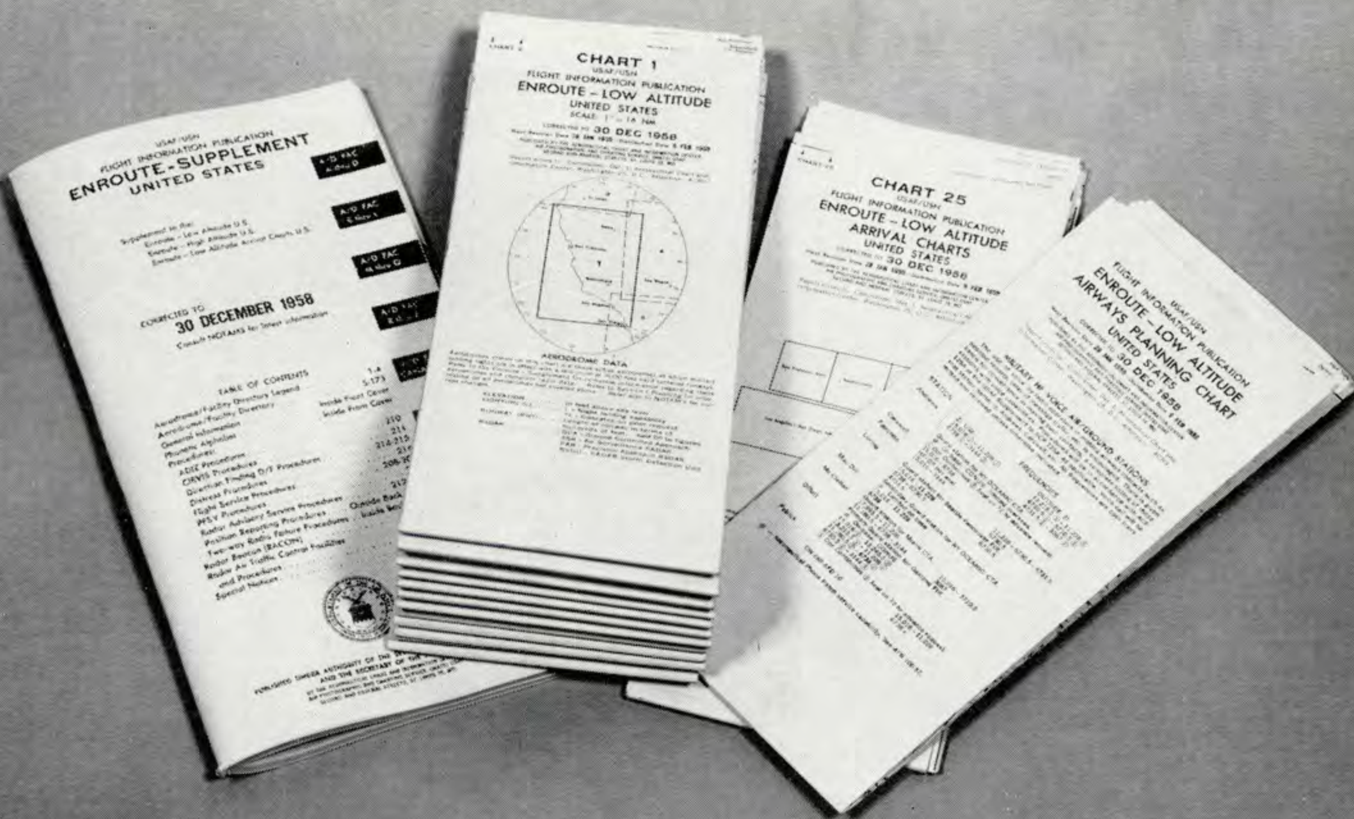
If your anger's running strong,
If you put some dates down wrong,
And make errors all along,
Brother, stay on the ground!

If you feel your world is crumbling,
If your air castles are tumbling,
And in black despair you're stumbling,
Brother, stay on the ground!

If your feeling nine feet tall,
If you think, "Give me the ball.
I'll walk right through or over 'em all."
Brother, stay on the ground!

If your mind's preoccupied,
If you just can't keep it tied
To your work—it slips aside,
Brother, stay on the ground!

If you figure you can kick it,
This psycho stuff just isn't cricket;
Your ol' will power can lick it.
Brother—you're headed—UNDER—ground!



More Chart Chatter

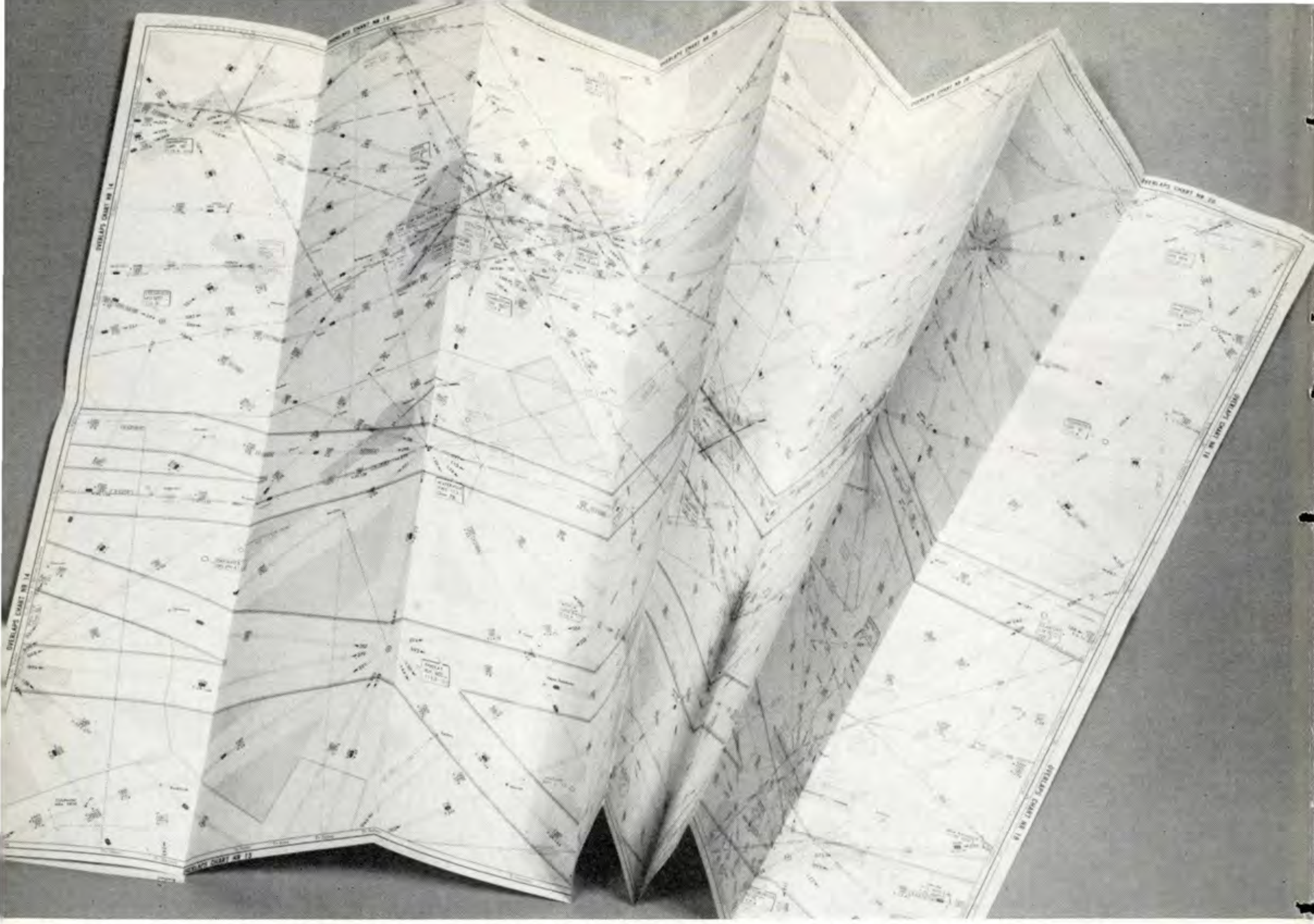
C. J. Moebus, Aeronautical Chart and Information Center

With air traffic control encouraging the use of split clearances it would appear necessary to show both low frequency and VOR airway systems on the same side of the navigational charts. Furthermore planes are now flying at speeds which make the book type Radio Facility Charts (RFC) obsolete. (You're constantly flying off the edge of the chart). Therefore it's high time the Air Force did something about the situation and so they have. The new year has brought forth more than Season's Greetings. A brand new publication was released around mid-January which replaced the sheet and bound LF/MF and VOR RFCs.

This new publication is a sheet-type facility chart called "Flight Information Publication Enroute—Low Altitude, U.S." Take a good gander at that title. "It's what's up front that counts." The title tells you that the product is designed for enroute use, at low altitude, and in the United States.

There is a whole family of names for the new air information publications now making their debut, all of which have titles reflecting primary use of the product. For instance, a few months ago the "Flight Planning Document" was introduced to you as a product intended for use in the planning phase of flight. It contains information not normally needed while in flight. Then very recently, the High Altitude Facility Chart name was changed to "Flight Information Publication Enroute—High Altitude, U.S." Last October the Pilot's Handbook (Jet) was introduced in bound form in the U.S. (three volumes), and its name was changed to "Terminal Flight in Formation (High Altitude)." Now comes the "Flight Information Publication Enroute—Low Altitude, U.S." All of these titles stem from the fact that there is a logical break-down of air information into the three basic phases of flight: Planning, Enroute, and Terminal. A training film covering these new publications is being prepared for release in the near future.

Although no absolutely clear, well-



The new publication is a sheet-type facility chart called "Flight Information Publication Enroute-Low Altitude, U.S."

defined lines separate the three basic phases of flight, a separation of sorts does exist and has been exploited. The primary result of this effort in separation of information was to remove from the cockpit that information not needed while in flight — at least for those single piloted aircraft not having ample space for "desk and daybed" aboard.

Air Force planners have been aware that problems have existed in the use of the bound or book type RFC. A complete study and review of the existing publications was undertaken to determine where the problem areas were and what might be done about it. The "Victor" Airways system has really grown. This resulted in an expanded publication. To handle the increased air traffic, the FAA has designated more airways and intersections of airways as reporting points. Consequently, the book type Facility Chart became almost unreadable. You can only print so much readable information in a given amount of space. An improved portrayal seemed to be the only solution.

It takes time to develop a new publication. There is a maze of varied, detailed items to be considered in design: what to show, how to portray the information, time required to publish and maintain, how the information is to be used, etc. The most important detail of which is "What do *you, the user*, need?" The new Flight Information Publication Enroute—Low Altitude, U.S. should more than satisfy your requirements. For some, the sheet type product will be a new experience. Those who have been using the RFC (Sheet), however, won't notice a big difference in use of the new product. You will have to learn some new symbols and familiarize yourself with the proper, easy way to find the information you need. Some close study is indicated for all. For this case group study and discussion is highly recommended.

This new product is made up of 24 charts, covering the entire U.S. and printed on 12 sheets of paper, each of which is folded somewhat like a road map (so you can imagine you're on a turnpike while in flight). Both airway systems are printed on one side of the paper. The VOR (or VORTAC-

★ ★ ★

Keeping pace with procedures is no easy task for anyone who flies, but up-to-date charts will help. The secret is knowing how to use the data that has been provided.

TACAN) information on these charts has been accentuated. The two navigation systems on the same side of the paper are purposely not given equal emphasis. Every attempt has been made, however, to give you a clear, concise picture of the information you do need. The colors selected (black and green) have evolved after considerable research. They were selected to provide maximum differentiation between the two airways systems and associated data under white and red light conditions.

Each chart has been prepared at a separate scale, dependent upon the amount of information required to be portrayed in any given area. This scale is now defined in terms of miles per inch on each chart, rather than the old-fashioned terms, such as "1: 1,250,000."

Several innovations of portrayal have been introduced on this product. They are designed to make your job easier. Among these items are the new NAVAID symbols, portrayal of only those airfields available to military aircraft having hard surface runways (over 3000 feet), a new color combination, removal of linework from the chart where possible, and selection of a chart scale with improved readability. Information on airfields with runways less than 3000 feet or not having a hard surface runway, may be found in the "FLIP"-Planning.

Note how the absence of the compass rose on the chart has relieved the clutter without sacrificing use of the product while flying airways. If you want to fly off airways, better call on your WAC's or topographic charts. They're building TV towers pretty high nowadays.

Give the new publication a good, long look and see if you don't agree with other "experts" who have decreed that it is, in familiar parlance, the "greatest thing since sliced bread."

To supplement these charts, a 5″ x 10″ data booklet of about 200 pages is provided, which contains all the "garbage" you need to know about frequencies, facilities, airfields, and last minute procedures. An "informal format" is introduced which saves a great deal of space and provides a ready reference through a straight alphabetical listing. Radio facilities and airfields (over 3000 feet, hard

surface) are described in the Aerodrome/Facility Directory. You no longer need to know in what state the facility happens to be. If you know what letter it begins with and can spell fairly accurately, you should have no trouble; however, here again you will have to become accustomed to the format. This booklet provides additional information about radar, special notices, and procedures necessary for enroute use. It would be great to be able to say "Here is one product which will answer all your questions while airborne," sort of an E-6B which goes all the way (or is it now an MB-4). At this particular time, however, it just "ain't" possible, but to coin an original phrase "It's being given every consideration."

Supplementing these charts is a separate arrival chart containing "blowups" of congested areas. These blowups are intended to give you the detailed information you need which cannot be portrayed on the enroute chart. The enroute chart itself contains sufficient information for overflying the area, so you don't have to refer to the Arrival Chart unless you originate or terminate your flight at that point.

There is still another item in this new low altitude package. That is the Airways Planning Chart portraying the airways systems in an abbreviated form. There is not enough information on this chart to plan your flight completely, but there is enough information so that you can see the "big picture," and determine roughly how far you have to go and what enroute charts you will need. Your detailed planning will have to come from the Flight Information Publication—Planning, the enroute graphic, the supplement, and the Flight Information Publication—Terminal.

It hasn't been possible to eliminate from the cockpit all of the information you personally do not need. No one pilot needs all the information. But everybody needs part of the total information available. It is hoped that we have given you a more practical product than you have been using. Meanwhile, back at the ranch . . . . ▲

A straight alphabetical listing is used in the new Aerodrome/Facility Directory.

. . . . DO YOU KNOW . . . .

The Flight Information Publication–Enroute–Low Altitude U.S. was developed by the Aeronautical Chart and Information Center with the approval of Headquarters USAF. It was designed to simplify pre-flight and in-flight reference to radio facility data. Specifically, it consists of 12 "accordion fold" charts, a separate chart containing blow-ups of congested areas, a booklet containing data to supplement the charts, and an Airways Planning chart. The "accordion fold" feature is intended to eliminate the necessity for "flip-a-page, where-do-we-go-from-here" book type Radio Facility chart.

The following illustrations are provided so that you may become familiar with the in-flight handling characteristics of these charts.

1

Only one hand need be used to hold chart. Notice Chart No. 1 in upper center of panel. If use of Chart No. 2 is desired, allow the front half to fall towards you, thus making Chart No. 2 available.

2

After selecting the proper chart, you will notice certain facility names above the chart number. These names indicate prominent or centrally located facilities within a two panel fold. For instance, on Chart No. 7 — above the chart number are four names. For information in the area of El Paso, open fold at tab marked accordingly.

3

After you have selected the fold desired, the chart may be "doubled over" for ease of handling while following path of flight.

4

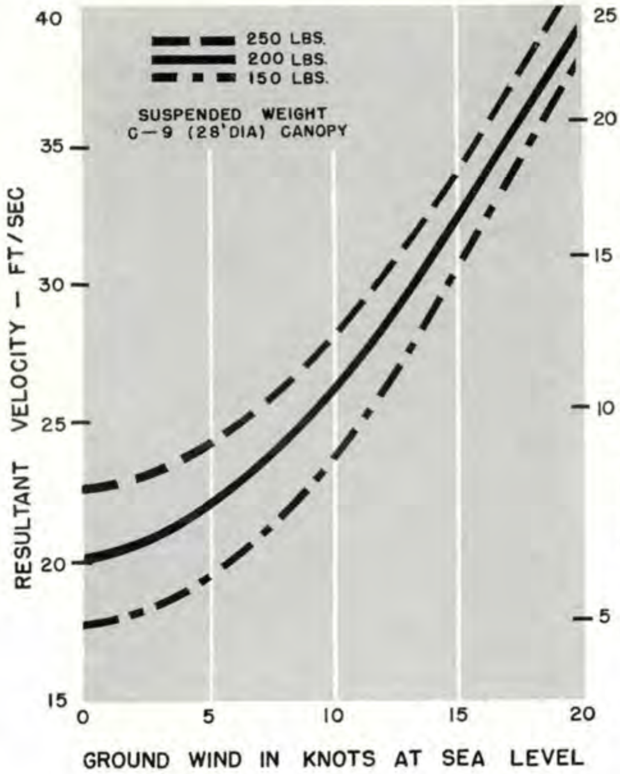
As you fly across the area covered by the chart, fly from fold to fold. If you are heading westward you use the next fold which is identified by the name Columbus. If heading eastward you flip over to Wink fold. You will find that these charts work best when used *ONE FOLD AT A TIME.*

The other day in the Ready Room a fellow said, "it's similar to jumping off a six foot fence." Then another troop said. "No, I was told that a parachute landing is more like leaping from a ten foot wall!"

The concern shown by these fellows was and is well justified, as a sizeable percentage of emergency escapes end up with the man sustaining injuries only because of poor parachute landing technique. By consulting the simplified landing impact graph you can get an idea of the magnitude of the shock to be anticipated by a man using a 28-foot parachute canopy. Of course the resultant-impact force could be markedly increased or decreased, depending on the oscillation at the moment of impact. The slight increase in rate of descent to be realized above sea level has been ignored also.

Most all flying personnel have at one time or the other been exposed to instruction and/or training in the use of the parachute. In some cases the instruction has consisted of less than a one hour briefing, while there are other individuals whose combined sessions of instruction and training probably rival that required prior to a parachutist's first jump.

Generally speaking, the gist of the instructions you have been given regarding in-flight emergency egress from airplanes has probably been straight forward and quite similar from all sources, whether it was in regards to use of an ejection seat, or a conventional bail-out. But then the confusion starts; that is, as to how best to come thru a parachute landing without incurring injuries.



How Hard?

Pete Barker, Pilot Safety Specialist, North American Aviation, Inc.

In reviewing parachute landing accidents, it appears that the relatively complicated instructions in the T.O.'s manuals, etc., are confusing and perhaps indirectly injurious. I would like to cite the following example as a typical case: A test pilot ejected from a disabled jet fighter recently. The ejection was uneventful and the parachute opened about 9,000 feet above the terrain. During the descent, it became evident that a considerable ground wind was blowing. This undoubtedly concerned the pilot, if for no other reason than it meant an increase in his resultant ground impact velocity. Eye witnesses stated that he appeared to stiffen his body just prior to impact, and that he also twisted his body violently in an attempt to absorb the impact on his side. The result was two fractured vertabrae, a very painful injury to say the least. The interesting thing about this particular parachute landing was that a flight surgeon witnessed it, and he stated that the pilot probably would not have sustained these injuries if he had stayed relaxed and had not resorted to the body twist at moment of impact.

It is only normal for you to want to see where you are going to impact at the end of your parachute descent. However, it is not necessary to "face obliquely downwind," etc., as is stressed in the formal texts. Merely follow these simplified instructions, and you will be in good shape afterwards.

- Stretch arms overhead and grasp risers.
- Place feet together, toes slightly down, bend knees slightly.
- Eyes looking at horizon.
- Relax.

The objective is to not ward off the fall with your hands and arms; hence hang onto the risers. Keep your feet together to take the initial shock with both feet and have your knees slightly bent as though jumping from an 18″ height. Rivet your eyes on the horizon, and you are not likely to know the exact moment of impact. Lastly, *stay relaxed*, and let your body fall as it may.

Not enough can be said about the importance of being completely familiar with the workings of your parachute before you need it. Your personal equipment people are always ready to answer any questions about the equipment. It is also advantageous to be wearing a pair of good (hiking) boots and *your helmet*. If you are equipped with a survival kit of the type that may be released and suspended on the end of a lanyard, well do so, if for no other reason than to reduce your landing weight and in turn landing impact. ▲

KEEP CURRENT

NEWS NOTES

Capsule type aircraft survival and flying clothing—Several types of future aircraft will be designed with encapsulated seats (that is, the crew-members will be encased in individual compartments) which, in emergency, will catapult from the aircraft with the crewman. An automatic opening parachute brings the capsule and the occupant to a safe landing, either on water or on land.

The Aero Medical Laboratory, Wright Air Development Center, has developed a clothing assembly for use in this type of aircraft. The assembly offers dual advantages. First, it is light weight and comfortable to wear in the capsule (even during prolonged periods of time). Secondly, as the crews must remain on alert duty for periods of 72 hours, the assembly provides the neat appearance of a uniform for wear to the mess hall, Base Exchange, etc.

A flight alert assembly is currently undergoing evaluation. It consists of a form-fitting, one-piece viscose-dacron coverall; an eight-inch high all leather, dress type black boot with a zipper front closure for speedy donning and doffing; and a light weight rigid shell helmet offering impact resistance and noise attenuation.

The vacuum packed down filled suit, and flight alert assembly are now undergoing evaluation.

Crewmembers for encapsulated aircraft are commonly called "shirt-sleeve" pilots because their environmental gear, including cold weather clothing, is contained in survival packages. Due to the limited space available, all items of survival clothing must be vacuum packed and stowed in the capsule. To satisfy this requirement, an assembly has been developed consisting of a universal size down-filled jacket, trousers, booties, and gloves which can be vacuum packed to 320 cubic inches.

The eight inch dress type zipper front boot.

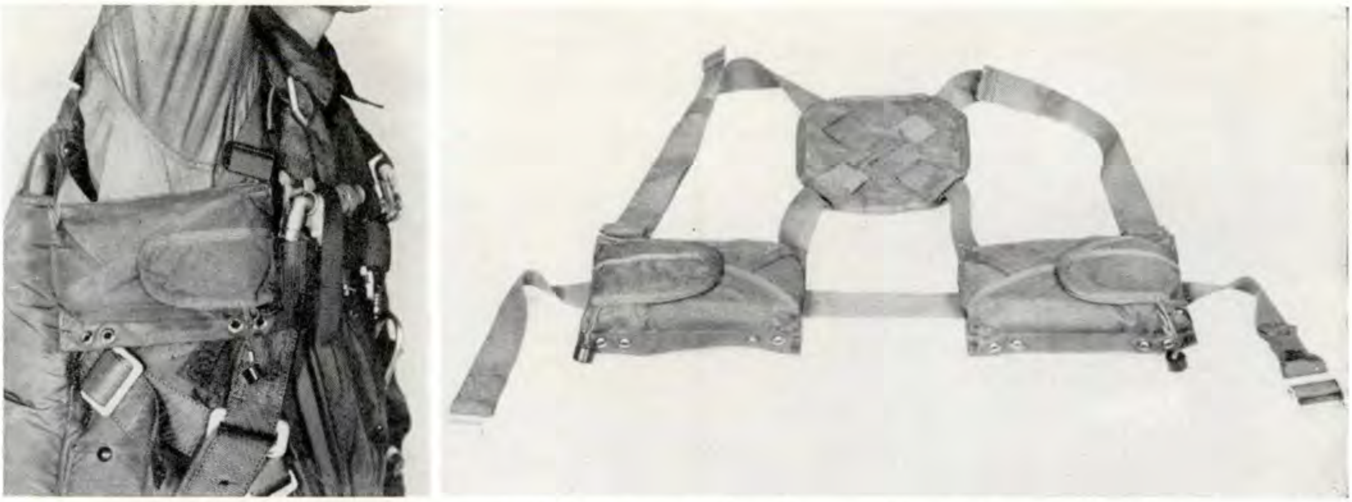
★ ★ ★

LPU-2/P Underarm Life Preserver—The type LPU-2/P underarm life preserver has been developed by the Wright Air Development Center's Aero Medical Laboratory to replace the MA-2 underarm life preserver. It is anticipated that this preserver will be available through supply channels in mid-1959.

The LPU-2/P preserver is approximately one inch thinner than a properly packaged MA-2 preserver, thus eliminating some of the bulkiness that existed when the MA-2 preserver was worn. The MA-2 preserver does not have a venting capability for high altitude and often expands as much as two inches at an altitude of 40,000 feet. The harness of the thin pack type preserver is made of a heavier webbing than that of the MA-2 and has a larger spacer for the shoulder straps to provide a harness which is less likely to entangle, knot or twist.

The new configuration eliminates most of the objectionable features of the MA-2.

The LPU-2/P preserver consists of



The new LPU-2/P preserver can be used with all existing types of parachute assemblies and all types of flight clothing.

two molten-orange colored flotation cells packages within sage-green colored containers which are attached to the adjustable harness. The cells have the following features—each cell has a mechanical inflation system and an oral inflation system; a device to permit venting of the cell; a baffle inside each cell to prevent cold cracking of the cell fabric when the cell is inflated by the mechanical inflation system; and a means for securing the cells in front of the wearer.

The LPU-2/P preserver was developed when in-service use of the MA-2 preserver was causing operating difficulties. In T-33 aircraft, as well as in other aircraft flown by large pilots, the bulk of the MA-2 preserver causes interference when pilots attempt to assume ejection position. It was also noted that the MA-2 was interfering with operation of the aircraft especially while attempting tight maneuvers.

It should be noted that the LPU-2/P preserver can be used with all existing types of parachute assemblies and all type of flight clothing. It is functionally suitable for Air Force use to provide a means of survival for aircrewmen in the event of ditching or bailout over water.

★ ★ ★

Protective flying helmets—The problem of head injury to Air Force personnel involved in aircraft accidents has long been recognized. Early attempts to solve this problem were largely confined to the installation of safety equipment, such as padding and restraining harnesses, in the aircraft cockpit. In recent years the development of high speed aircraft has magnified this problem to such an extent that a special protective helmet was designed for all aircrew personnel.

The type MB-3 light weight semi-rigid helmet

Two such helmets have been developed to prevent unconsciousness from head blows due to buffeting at high speeds and to prevent or reduce the severity of head injuries during emergency crash landings and escape from aircraft.

The type MB-3 helmet is a lightweight semi-rigid helmet intended for aircrewmen flying long hours and requiring a maximum of comfort. This helmet is currently undergoing service testing and is anticipated to be available to aircrews during 1959.

The type P-4B helmet is primarily intended for fighter pilots flying a two to three hour missions and consists of a rigid shell with attached visor to provide maximum protection. This helmet is a standard Air Force item (Federal Stock Numbers 8415-684-9166, small; -9165, large; and -9164, extra large).

★ ★ ★

The CSU-4/P high altitude coverall is a quick donning pressure suit designed to be worn over standard flight coveralls to provide adequate pressurization for emergencies of relatively short duration at high altitudes. Eight sizes of the garment are required for complete range because of comparatively loose fit. The suit, when standardized, will fulfill a requirement for short term emergency pressurization with minimal restriction from bulk in the uninflated status.

High on a mesa in southern Utah, men have built the "fastest track in the world." There, a likeable dummy is at work for your future. His routine is routine: just . . .

. . . Slam! BAM!

Colonel A. M. "Chic" Henderson, USAF (Ret.) and Josef Miller
Coleman Engineering Company, Incorporated

High on a hill, a mesa in southwestern Utah, lies a spot of vital interest to you, and to all the other men who fly the planes currently operational in our military inventory. This is storied country. This is a place of strong contrasts; the juxtaposition of the very old and the very new, the startling and the commonplace, the leisured and the swift. This is Hurricane Mesa. Immediately to its east rise the mysterious red-rock temples of Zion National Park. To the west stand the black lava crests of Pine Mountain from which, during the middle of the last century, came the long, straight logs that were hollowed to provide the great bass voice of the world-known Mormon Tabernacle organ, a function which they still fulfill today.

Looking across the broad table of the mesa, 1500 feet above the valley floor of the Virgin River below and protected by the sheer cliff surrounding the plateau, it is easy to visualize the time when this was a camping spot favored by agrarian Indians. They found on it a sanctuary from the warring nomadic tribes to their south. "Kitchen middens," the rubbish heaps left by these peaceful inhabitants are still plainly marked. After each rainfall potsherds penetrate the washed surface and any reasonably enterprising searcher can find not only arrowhead fragments but perfectly preserved specimens, including the microscopically delicate points known as "bird arrows." Overhead, fast commercial airliners and military jets share the air.

Yes, "intrinsically interesting," you may say; provocative but scarcely vital. And just why should you regard all this as being of importance to you? To find out let's take another look at this Hurricane Mesa.

Here, at the other end of the time scale, lies what has variously been dubbed the "Hurricane Short Line" and the "fastest track in the world," a 12,000 foot supersonic test track. Here, at Hurricane Supersonic Research Site, the problems of high-speed bail out—of getting *you* out of *your* plane alive—are daily being explored by Coleman Engineering Company of Torrance, California, who both designed and built facilities on Hurricane Mesa for the Air Force. This company, whose history in high-speed track work dates back to almost the inception of that art, is currently entering upon its fourth year in complete charge of all operations.

Originally designated as Project SMART, Supersonic Military Air Research Track, the facility was at its outset directed exclusively toward the study and evaluation of escape systems and the related physiological aspects of escape from high perform-

Thank You, Sam!

"Hurricane Sam" proudly displays his FM/FM telemetry packages.

ance aircraft. Currently, however, it is expanding its use for any type of testing in which either track-borne or controlled free-flight conditions—or a combination of both—may be advantageous.

It is to this end that the site was renamed, although it is still popularly known as SMART. Escape testing, however, the factor of immediate personal importance to you, continues unabated.

Ending abruptly at the southernmost escarpment of the mesa, the dual rails forming the track are continuously welded from end to end. Supported on a concrete girder foundation which rests directly upon bedrock throughout most of its entire length, they were anchored on a summer day at a time when their internal temperature had reached 115 degrees Fahrenheit. Thus assured of remaining in constant tension under all normal operational conditions, their exacting alignment arrived at by means of precise optical instrumentation, they display no deviation greater than ± .010 inch within any given 100 foot segment.

Rocket propelled sleds riding on

Left. The Hurricane Mesa supersonic track is shown in part, looking to the North. Above. A rear view of test vehicle used in tests of one upward ejection seat, F-102 configuration. Below, The Standard Hurricane Supersonic Research Site test sled and 5KS rocket propulsion vehicle.

slippers which grip the rails, capable of velocities up to Mach 2.0 and carrying completely instrumented anthropomorphic/anthropometric dummies, are customarily used in escape testing. These weirdly man-like figures whose foam rubber and composition flesh and steel joints exhibit about the same tensile strength and articulation as your own are stand-ins for you and me. Although their electronic instruments vary widely according to the requirements of test, they have assumed a universal personality and are indiscriminately known as "Hurricane Sam."

Nearing the end of the track— and while the test vehicle is sustained at peak velocity—this "Sam" is ejected from his cockpit precisely as you, in an emergency, may eject yourself from your own afflicted aircraft. Actuation of his lap-belt, separation from his seat, deployment of his parachute system are all automatic, even as you hope that yours will one day be. And, although not a talkative fellow, Sam is, paradoxically, rather articulate. Throughout the experiment he has, by means of accelerometers, strain gages, pressure probes and his FM/FM telemetric equipment, transmitted to a ground station in the firing control blockhouse a variety of intelligence concerning longitudinal, lateral and vertical accelerations, decelerations, angular accelerations, wind blast, pitch, roll and yaw, and the effects of flailing and tumbling. His seat and vehicle, too, have been carefully instrumented for such information as accelerations, airloads and space time. Data collected from all sources is stored on magnetic tape and recorded by oscillo-cameras for later playback and painstaking study.

From initiation through ejection to touch-down in the recovery area at the foot of the cliff, as many as 45 motion picture cameras with speeds of up to 3000 frames per second also observe his run and flight path, thus permitting an intimate and permanent study of the entire operational/escape cycle. All cameras are tied into a common binary coded time base. To give you some notion of the exactness of such information, position in real space may be determined within ± 2 feet; ejection and launch data locate the test object from the point of origin within ± 01 foot; test vehicle/test item clearance within + .01 second. Other factors may be read with comparable accuracy.

Meanwhile, the sled in which Sam has ridden, his "crippled aircraft", is most frequently retained on-track by means of a water brake and an hydraulic arrestor gear. For specific data purposes, however, upon occasion it may be expended over the cliff. Of some interest to you are the vehicles originally designed for escape testing, their appearance somewhat aerodynamically unorthodox to your eye, accustomed as it is to the fined down contours of your own craft. This design was deliberately arrived at in order to produce a down-load for stabilization of the vehicle. Admirably adapted to its initial purpose this same configuration is still utilized for testing in the high subsonic and transonic ranges, although later vehicles have closely simulated the exact characteristics of actual aircraft—among them is very probably your own—in order to produce, insofar as it is possible to do so, the true aerodynamic conditions affecting escape.

But to digress a bit:

The reason for all this testing arises, of course, from the fact that during the past few years the engineer and the scientist have made, and continue to make, tremendous advances in both the design and the performance characteristics of your aircraft. But as speeds have advanced, as the supersonic has become commonplace, nothing has changed in the design of man. You remain pretty much what you were when Icarus first lifted himself to fly; definitely subsonic. And while aircraft are now attaining fantastic performances (speeds in the neighborhood of 2000 miles per hour, altitudes of better than 70,000 feet) you, the poor human element, are barely able to withstand little, if any, more than 600 to 700 miles per hour when forced from your aircraft by an emergency.

Had your ancestors been gifted with greater foresight, perhaps things could have been worked out a little differently. Then you might have been conceived in an image more closely approximating Dr. Ira Mark Barish's description of the truly efficiently operational man:

"He would have a conical head so that he could eject through the canopy. He would have fins on his feet, so that he wouldn't rotate or spin during a free-fall. He would have a retractable head so the parachute lines wouldn't wind around his neck. He would have no circulatory system so he would be resistant to force. Given time to adapt, this man would be the ideal pilot for the supersonic age."

But while the geneticists are unable to do too much about your basic human design, the military services are doing their utmost to supplement and assist you by external means, by equipment such as automatic ejection seats, automatic capsules, parachutes and automatic lap-belts, anti-exposure suits, partial pressure suits and helmets as well as a wild variety of other paraphernalia. They are striving to keep you on a par with your airplane, to make you better able to cope with emergency and to survive the experience should you find it necessary to eject at high speed. Many items such as escape capsules are even now coming into the testing phase.

All of this equipment has been developed within the past few years. Much of it has—within the very recent past—been rigorously tested at Hurricane Supersonic Research Site atop Hurricane Mesa.

But prefatory to the successful testing of such measures was the immediate need for substantial extensions to the arts of track testing themselves. Performances never before achieved were called for.

The selection of Hurricane Mesa as a research site had by no means implied the automatic solution to all questions. Quite the contrary, this unique locale with its many advantages imposed its own set of problems. For example: in order to effect a successful ejection of the test mass and to assure its safe flight over the cliff's edge it is essential that the test vehicles be brought perilously close to the end of the track. To do this, of course, required the development of techniques for undamaged braking and on-track recovery of the sleds within an absolute minimum of space after they had reached their peak velocities.

To meet this challenge demanded the development of braking capabilities never before attempted with either horizontal or vertical return water scoops, the devices which, from a trough between the rails, pick up water and discharge it in a forward direction in order to derive the braking momentum which halts the vehicles. The first of these forms, although dependable, had never been made to produce braking loads such as were here required. The latter, although theoretically more potent, had previously been considered undesirable because of its inherent instability and flutter characteristics. Earlier attempts to stabilize such vertical return scoops had imposed severe penalties upon vehicle weight and performance. By the simple expedient of a third rail lying along the bottom of the trough formed within the concrete girder foundation, and by means of fixing to the lip of the water scoop intake a small shoe which bears upon this rail, it was found that down-loads induced when the scoop enters the water could be taken out and the scoop stabilized without penalizing the performance capabilities.

Success of this application may be measured by the subsequent development of a braking force of 632,000 pounds at a velocity of 1395 feet per second, during which the brake generated well over a million horsepower. This performance was accomplished within 873 feet of track. A maximum of 106 g's was developed, somewhat more than three times the capability of any other such brake presently known and roughly the equivalent of bringing your motor car from 100 miles per hour to a dead stop within less than 2 feet. Without, furthermore, so much as denting its chrome! Meanwhile, braking loads of 390,000 pounds have been readily achieved

Firing Control Console with mirror image of sled; the oscillo-camera and operator; data room with 7 channel tape recorder for storing information from sled and dummy during run and ejection.

Sam floats gently to Earth in impact recovery area, transmitting his "info" all the while.

with horizontal return water brakes. Performances such as these, while significant of themselves are, of course, merely means to an end. They demonstrate their true value only through direct contributions to actual testing. They have, for example, made it possible to consistently program tests for over 50 g's braking deceleration and to obtain the calculated results within 10%.

Significant, too, among other contributions to the state of the art are the established superiority of the welded rail technique; a record of well over 60% recovery and reusability of expensive instrumentation which has undergone high-speed ejection; the establishment of direct correlation between theoretical wind-tunnel pressures and those actually measured during on-track testing at speeds up to Mach 2.0; the development of a highly flexible re-usable liquid rocket propulsion system more powerful than any other known to be in use today. This last, in itself, constitutes a major contribution to track economics.

Up to the present moment, the fastest speed which has been recorded took place during qualification of the track. This velocity, 2730 feet per second or approximately 1860 miles per hour, was achieved with full-scale vehicles of 9725 pounds gross weight and which were capable of carrying fully instrumented anthropomorphic/anthropometric dummies.

While Hurricane Sam, either solo or in tandem, has been and will continue to be the "test pilot" most frequently employed in the preponderance of runs, the first successful supersonic ejection and recovery of a live subject was witnessed at Hurricane Supersonic Research Site. This took place at a velocity of 1165 feet per second for an equivalent Mach 1.025. His fast ride over, Gerry, a philosophical chimpanzee, was happily rewarded with a squeezed orange. Today he is again contentedly residing at the Aero-Medical Laboratory at Wright Air Development Center. Fastest ejection utilizing Sam's talents occurred at 1540 feet per second or approximately 1050 miles per hour; his only reward a return to barracks.

Of greatest importance to you, however, are those contributions to the business of escape, for, in the meantime, you and all your companions are flying and must continue to fly. It is already known that you are pretty durable characters, that you can withstand quite a beating and still remain functionable. But where is the thin line between the safe and the lethal? Just how dependable is your equipment? What assistance and protection does it afford?

To both psychologically and physically prepare you for battle with the alien elements, some of the answers are already in and others are coming.

Tests at Hurricane Supersonic Research Site have, for example, experimentally established the structural end points of ejection seats for the F-84 and F-86, while some separation problems were revealed with respect to the seat used in the F-94.

Earlier study of the F-84 and very recent testing of the B-52 have indicated some tail clearance problems. Adverse changes in seat trajectory from those initially calculated have been revealed by these programs, thus permitting the necessary remedial measures to be taken. Significant of this latter series are the successful dual ejections from both the pilot's and ECM operator's positions.

Such miscellaneous factors as problems of catapult rupture during high-speed ejection, drogue 'chute stabilization, difficulties with the F-1A automatic parachute timer, and potential lap belt problems with respect to its manual operation have all been revealed by testing at Hurricane Supersonic Research Site. During recently concluded tests of the F-105, impingement upon the vertical stabilizer occurred when the canopy was jettisoned during low-speed bail out. At approximately Mach 0.9, both seat and canopy functioned as calculated, assuring a safe escape. Attempted ejections at higher speeds, however, revealed potential test item impingement upon the tail group and evidence of seat structural failure.

Following its inaugural firing on 8 July 1955, some 183 runs have been accomplished at Hurricane Supersonic Research Site. Since that date evaluations of the F-84, F-86 and F-86F, the F-94C, the F-104, the F-105, and the Navy F-8U1 have been completed. Two programs with respect to the B-52 have also been completed as have evaluations of both the ICESC upward and downward Ejection Systems. For United States Navy use the high-speed low altitude qualification of the Martin-Baker seat, an English product, has been accomplished. And our northern neighbor, Canada, has also expressed a lively interest in the potential use of Hurricane Mesa. In each case where a deficiency has been revealed immediate steps toward its "fix" have been taken.

Painstaking effort has been required in order to progress from the relatively limited data of early runs to the complex and exhaustive returns from present testing. But just such information as this has enabled the men who design your craft and gear to narrow the gap between the inadequate and the optimum, to constantly improve your chances of survival. Such effort and such results do not, of course, absolve you of all responsibility in the safe practice of your profession. You have your part. Yours is the essential need to remain constantly and intimately familiar with your materiel and procedures—to know what you use and to use what you know.

Meanwhile, the testing at Hurricane Supersonic Research Site continues. Yes, some of the answers are in. More are yet to come. ▲

Helmet/Oxygen Mask Loss and Retention During Ejection

	Total	Lost No.	Lost %	Retained No.	Retained %
Chin Strap Fastened	192	54	28	138	72
Visor Down	93	18	19	75	81
Visor Up	99	36	36	63	64
Chin Strap Not Fastened	150	115	77	35	23
Visor Down	42	21	50	21	50
Visor Up	108	94	87	14	13
Total	342	169	49	173	51

VISORS DOWN!

The final moment does not leave much time for one to think of things he should have done. Automation will help.

In the romantic days of knighthood when, among gentlemen, duels of honor were fought at the drop of a gauntlet, titled champions went to battle resembling the armadillo. They were punctilious about their manners, their protocol, and their code of ethics. There is no record that they were addicted to bathing at frequent intervals, but they did insist on going by the book in matters involving doing battle.

Part of their armadillo-like suit was the helmet and visor. The visors were worn in the retracted position until the moment of truth and then lowered over the eyes and mouth when time came for the drawn sword or the poised lance. Any knight who forgot this item on his check list was not likely to be very popular at the game of post office later that evening in the castle ballroom. Knowing this the honored Sir probably had a short check list that went something like this: Steady the mount; lower the visor; brace the lance; charge on fair lady's signal of the dropped kerchief.

Today's flight helmet and visor is not unlike those worn in Sir Lancelot's day. The visor is there for a purpose and should be lowered when there is a possibility of getting a hole through the canopy or a fast lift in the ejection seat. Surprisingly enough, in most cases of ejection from aircraft in the Air Force, the visor is left up. And the chin strap which is designed to hold the helmet in place is not even fastened.

During a recent 18 month period there were 342 successful ejections using the hard hats. It takes no great amount of study of the table above to conclude that the smart pilot is the one who includes the strap and visor in his pre-bailout mental checklist. There were no face and head injuries reported as a result of having the chinstrap fastened during ejection, but several minor injuries were noted as a result of the helmet being forcibly torn off by wind blast when the strap was not fastened. Examination of helmets after bailouts clearly showed damage to the fiber brain buckets which, if not retained, might easily have disabled or killed the wearer. As usual, it makes sense to use the equipment at hand in the correct manner. Keep the old timers in mind the next time you mount your trusty steed. Get that visor down! ▲

While it is generally conceded that man is still the best servo yet invented, it is well to know the limits to which he can go. Here is the concluding discussion of . . . .

THE SLOW SPEED

Previous discussions have shown the importance of the physical and sensory limitations inherent in the human machine. There are other equally important limitations which must be considered. The limitations previously discussed, for example, are further aggravated by adverse physiological conditions. As a physiological being the human operates best at an optimal biochemical balance. Anything which disturbs this optimum level of functioning automatically results in a decrease in the individual's perception-analysis-response time as well as a deterioration in the quality of analyses made. This may result in faulty conclusions and the initiation of non-adaptive responses. One easily understood disturbance which can adversely affect the individual's physiological functioning is illness. This ordinarily is not of great importance in terms of the actual operation of the aircraft, because the pilot rarely flies when ill. There are, however, other disrupting factors which are common and which are of great importance in the actual operation of aircraft.

One such factor is fatigue. Fatigue is partly psychological in nature but basically it is a physiological condition which, due to the accumulation of metabolic wastes in the body, results in lowered efficiency. A number of Air Force accidents can be attributed directly to assignments which necessitated operation of aircraft for excessive periods of time. The acute fatigue which results from long continued flying is an obvious limitation. Another fatigue factor which is not so obvious is progressive chronic fatigue which is associated with excessive strain over long repeated periods of time.

One physiological limitation which is of particular importance to the pilot, is the inability to maintain efficiency without an adequate oxygen supply. The result of such an oxygen deficiency can be unconsciousness and ultimately death, but in the early stages the result is often a feeling of excessive well-being which renders the individual incapable of perceiving his own impaired abilities or the seriousness of unusual or emergency situations. It is particularly important that pilots learn to recognize the initial symptoms of oxygen deficiency and the methods of alleviating the deficiency. It is equally important that careful consideration be given to the design of oxygen equipment so that it is completely reliable as a system, easy to use, designed for maximum ease of maintenance and easily serviced. It is also important that a highly reliable warning system with maximum attention attracting characteristics be incorporated in the system.

Another factor closely associated with oxygen deficiency is poisoning as a result of noxious gases in the air which is breathed. One of the most dangerous of these is carbon monoxide. Carbon monoxide is a by-product of any incomplete organic combustion and consequently is associated with the operation of aircraft engines currently in operational use. A malfunction of the exhaust or pressurization systems may result in this gas being forced into the air which the pilot must breathe. Other noxious gases,

One physiological limitation of particular importance to the pilot is his inability to maintain efficiency without adequate oxygen.

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DEMON

Fatigue is a physiological condition which results in lowered efficiency — and accidents

smoke, fuel vapor, hydraulic fluid, etc., can also have an adverse effect on the individual because of their irritating as well as their toxic effects.

There are many other physiological limitations which could be considered, such as the individual's inability to withstand severe explosive decompression and his susceptibility to excessive acceleration forces, but those discussed are considered sufficient to demonstrate the importance of the limitation in this area.

The last major group of limitations to be considered are those associated with the individual's psychological characteristics. One of the areas in which these limitations are most apparent is in the ability to learn. Even for the most capable individual, learning is a time-consuming process. When the number of judgments, interpretations and procedures which the pilot must master are taken into consideration, it is not surprising that the time alloted for training must be of considerable length if the pilot is to become sufficiently adept in these procedures and to learn, in addition, to use his aircraft as a tactical weapon.

During the past several years the pattern of aircraft accidents in relation to rated experience shows that there has been a marked decrease in accidents experienced by pilots with limited experience. This reflects very favorably upon the attention which has been directed toward the Air Force training program. In spite of this very marked improvement, however, the highest accident potential still exists among pilots in the limited experience, younger age category. In addition to the high accident potential of these groups, the relative portion of the accidents attributable to human factors is markedly higher than in groups of older pilots with more experience.

As would be anticipated, pilots of high performance jet fighter aircraft consistently experience the highest accident rate. Because of the time compression which results from the high speed of the newer high performance aircraft, the pilot must accomplish the same number of tasks in a much shorter time. Hence, the need for assistance to the pilot is increased. This assistance can be rendered in many ways but some of the most practical are through the development of improved displays, simplified procedures and increased automation which will facilitate aircraft operation, particularly during the critical landing and takeoff phases. It must always be kept in mind that aircraft should not be designed for use by the most experienced pilot or even the pilot of average experience, but must be designed so that the newly trained, below average experience pilot can successfully operate them in fulfilling assigned missions.

Another important psychological factor associated with learning is habit interference. Although what learning is, is not clearly known, once an individual has learned some sequence of acts after a great many repetitions this pattern becomes a relatively permanent part of his response system. When in a different situation this person is required to make a different series of responses to the same stimulus, the human, being very adaptable, apparently learns to do this quite readily. In an emergency, however, when his attention is diverted to other aspects of the situation and it becomes necessary for him to perform the particular response in question, all too often he will revert to

Problem is all individuals do not age and deteriorate at same rate.

the former firmly ingrained habit which is now the wrong response and the result quite often is an accident. As an example, an individual who has learned to reach forward and push with his right hand to obtain a certain response and has practiced this act through thousands of hours of experience and then is placed in a different situation where it is necessary for him to reach up and pull with his left hand in order to obtain the same response will, when consciously thinking about it, perform the correct sequence with his left hand. In an emergency, however, he is quite likely to attempt to push with his right hand. This will either result in no effect or possibly a further complicating effect. This habit interference can not be considered forgetting. It is a built-in limitation which has often been demonstrated in the laboratory as well as in operational situations. Although the use of simulators, cockpit trainers, and other training aids can greatly minimize the effects of this limitation, the greatest gains can be made by standardizing equipment from one aircraft to another so that the factor of habit interference is reduced to a minimum. In some instances experimentation has shown the best location and other characteristics of an instrument or control, and in such cases this evidence should be used in design. If, however, no such evidence is available great assistance can be given to the pilot by standardizing the position, direction of movement, type presentation and so forth, associated with a cockpit component.

Another psychological-physiological factor which affects an individual's learning ability as well as his performance ability is that of aging. Aging is a particularly difficult problem because all individuals do not age at the same rate and within a single individual abilities do not deteriorate at the same rate. With age an individual's reaction time and ability to perform precise physical manipulation responses is decreased. However, his judgment and integrative ability increase. The problem as it applies to pilots is to determine the point at which the deteriorative effects of the aging process overbalance more mature judgments.

Because of the relatively restricted age range of Air Force pilots, critical evaluation of performance changes with age are relatively difficult to document. Evidence indicates, however, that there is an upsweep in the accident rate among pilots in the late 30's and in older age groups. Because the number of accidents experienced by these individuals is relatively small, this finding is of more theoretical than practical import as far as military operation is concerned. Age, nevertheless, is a potential limiting factor which must be considered and which could become of very great importance if the population being considered were shifted toward the older age groups.

A further limitation to the successful accomplishment of a task is the fact that an individual has emotions and feelings. Some of these are abnormal. Fortunately individuals who exhibit these are rare among Air Force pilots. Other emotions, although disruptive, are quite normal and universal. Examples are the emotions of fear and anxiety. In a new and frightening situation fear is a normal and natural response. With added experience

High performance aircraft have raised demands made on pilots.

and successful accomplishment, this fear ordinarily decreases. If, however, the individual consistently feels that the demands of the task are close to his upper limits of accomplishment, this fear, rather than decreasing, often increases and in even a minor emergency may result in a complete disruption of his normal responses. There is then a compounding of the normal difficulties of flying and often the result is a major accident.

To this point the various limiting factors have been considered separately. In an actual situation, they may often occur simultaneously and the result is a compounding decrease in efficiency to the point that the individual's total ability to respond is lessened so that in even a minor emergency the situation is beyond his capacity to make an adequate response.

As a great portion of the human error which results in aircraft accidents is charged to the pilot, the limitations discussed have been those which are most pertinent to an understanding of errors committed by persons in this group. It should be pointed out, however, that human limitations are by no means limited to pilots. They are universal. They apply to all individuals from designers to supervisory personnel and must be taken into account in all stages of aircraft development and utilization.

The accomplishment of any task may be looked upon as an integration of two variables: one of these is the level of the operator's ability; the other is the level of the demands of the situation. As long as there is a wide margin between these two, the probability of successful accomplishment is high. An increase in the demands of the situation or a decrease in the individual's ability will decrease this margin and often result in a situation with which the individual is not capable of coping. There are many indications that the high-speed, high-performance characteristics of modern aircraft have raised the demands made on the pilot to the point that the probability of successful

achievement is considerably lessened. This is demonstrated by the fact that while accomplishing one-third of the flying time, jet aircraft experience approximately two-thirds of the major USAF aircraft accidents.

The question which automatically arises as a result of an evaluation of human limitations is "what can be done." The picture is, however, not as black as this would indicate as there are a number of ways in which these limitations can be minimized and/or circumvented. By the careful selection and training of both operator and maintenance personnel the obviously unfit can be eliminated and those who are capable can be given the benefit of formal controlled training. The wise use of both operator and maintenance personnel in operational settings can also do much to minimize the effect of some of the human limitations discussed. The basic area in which most can be done, however, is in the area of design. No matter how well trained an individual and no matter how adequately the personnel and equipment are utilized, unless the equipment has been designed taking into account the human limitations, ineffective operation will result. In terms of design the primary requirements of any mechanism is that it operate efficiently and effectively. It is equally important, however, that the control of the mechanism be within the capability of the human operator. The instruments must be arranged in such a relative position that the maximum amount of information can be supplied with a minimum amount of effort on the part of the pilot. Controls must be effective and must be well within the capability of the average or below average operator. Visibility must be at a maximum and the entire cockpit must be designed with full consideration for the human operator.

Not only must design take into consideration the operator, it must also take into account the maintenance man who must keep the equipment in operation. The equipment must be designed so that any component part is readily accessible to even the most inexperienced. Parts must be designed in "package" form that require a limited amount of technical information for servicing, and equipment should be designed so that various component parts are not interchangeable and cannot be installed incorrectly. No matter how adequate a piece of equipment is from the standpoint of operating efficiency and no matter how carefully designed from the standpoint of the operator, unless this equipment can be serviced and maintained by personnel available for this function, its efficiency is lost.

Ideally, human limitations can best be compensated for at the drawing board stage. It is recognized that this is difficult, but it is at this initial stage that the greatest gains in accident prevention and operational efficiency can be made. Retrofit programs are costly and often impracticable as the correction of one deficiency often produces others. For example, the use of red cockpit lighting although conducive to the retention of dark adaptation creates a problem when it is necessary to read charts under this illumination which were prepared using red or brown ink. The filtering effect is such that the red portions of the chart can't be observed.

Optimum design of many components, taking into account both the human operator and the maintenance men can, however, be achieved now in many instances with knowledge now available. Where direct information is available this information should be utilized. In instances in which experimental evidence is lacking or, if available, indicates no clear cut favored position, size, shape and so forth, great gains can be made by standardization which minimizes the difference from one cockpit to another or from one component part to another. Such standardization must be on the basis of agreement. Any nonconforming design change should be very carefully weighed against the disastrous results which can occur from nonstandardization as a result of habit interference. On the other hand repetition of design deficiencies or reinitiation of design deficiencies in new type aircraft should be avoided and every effort made to improve the design of those components which have proven to be either mechanically unsound, operationally inadequate or unwieldy from the standpoint of maintenance.

The Air Force as well as the other services has a great investment in manpower, equipment, time and national defense potential. If this investment is to be protected to the maximum, it is essential that human limitations be given full consideration. ▲

Compounding the apparent complexity involved in flying airways may not seem to simplify the system, but in this case, it does. Just don't forget your destination forecast.

High Level Altimetry

It's one thing to know the rules, but it is always a different problem when it comes to following them. Everyone who flies nowadays has become fairly well accustomed to rules and regulations, and, by and large, most people follow them in flight. Problems arise when we try to "simplify" the procedure called for.

It is hardly conceivable that all the pilots who actually violate the rules daily really intend to do something wrong. Investigation of violations continues to show lack of knowledge and lack of understanding of many of the rules of flight. But perhaps most importantly and frequently, such reports indicate that a lack of appreciation for the importance of the rule, and the necessity for following it.

Too often, rules are merely announced. The explanation of why the rule was made is left to the individual to determine. Not so with the latest. That is, the "latest as we go to press."

By the time you read this, you should also have read a recent copy of Air Force Regulation 60-16, dated 17 December 1958, and a revision thereto, AF Reg. 60-16A. At last count there was also an AFR 60-16B in the mill. Watch for it, if it hasn't come through.

Effective 15 January 1959, a new rule went into effect concerning high altitude flight. Basically, this amendment to the air traffic rules provides for the use of one standard altimeter setting for aircraft operating at and above 24,000 feet MSL, in the Continental Control Area, and for use of current reported altimeter settings from the surface upward to 23,500 feet MSL. The selection of these altitudes followed considerable study and discussion with the principal users of the higher altitudes. It was decided that they were the best altitudes to initiate the change in the altimeter setting concept, considering the diverse interests involved. To insure common procedures in trans-border operations, coordination with the Canadian Government has assured compatible procedures.

Atmospheric Pressure In Inches of Mercury	Lowest Usable Flight Level
29.92	240
29.91 to 29.42	245
29.41 to 28.92	250
28.91 to 28.42	255
28.41 to 27.92	260

Figure 1. Showing flight levels appropriate to normally encountered atmospheric pressure.

The need for a standard altimeter setting at high altitude has become more urgent as more aircraft operate in this airspace. As altitude increases, the altimeter is required to measure progressively smaller units of atmospheric pressure and the accuracy of the instrument is thus reduced. The use of a standard setting will not wholly solve all the problems of altimetry, but it is a necessary adjunct to other expected improvements.

Knowledge of the exact meaning of certain terms is important to the understanding of the discussion that follows, particularly with respect to the term "Flight Level" which is not widely used in the United States. The following definitions have been added to AF Regulation 60-16A.

"Cruising altitude. A level determined by vertical measurement from mean sea level." (This is a revision of the definition previously listed.)

"Flight level. A level of constant atmospheric pressure related to a reference datum of 29.92"Hg. For example flight level 250 corresponds to an altimeter indication of 25,000 feet, and flight level 265 to 26,500 feet." (This term and its definition are brand new in the regulation.)

There have been over many years, studies and suggestions advocating that aircraft altimeters be set to standard atmospheric pressure because of the inherent advantages of this system in achieving vertical separation of aircraft. With this standard setting, every pilot knows that other pilots in his area are governing the altitude of their aircraft by reference to an altimeter set as his is set. Thus, he may be certain that no altitude conflicts will occur because respective altimeter settings are derived from different sources.

This system is excellent for separating aircraft by reference to the standard, but two difficulties become apparent. First, the pilot has no indication of actual altitude, and so terrain clearance and the avoidance of obstructions are not assured. Secondly, if this problem is solved by the use of corrected pressure settings at low altitudes, then separation of aircraft using the two systems becomes a problem.

Assuming that these problems are susceptible of solution, use of two systems, each in the area in which its advantages make it appropriate and its disadvantages are at a minimum, will result in improved safety of flight. Where measurement of altitude is of primary importance, as in landing, after take-off, and in cruising flight at low altitudes, the corrected pressure setting is most desirable. Although the altimeter must be reset as atmospheric pressure varies along the route of flight, these settings are generally available and the resulting cruising altitude of the aircraft is reasonably constant.

At high altitudes, a standard setting is much more desirable. Terrain clearance is no longer a factor and there are many reasons why the standard setting is preferable. The speed of aircraft operating in the upper airspace is such that they traverse pressure systems quickly. If separation depends on the accuracy of a setting received from the ground, frequent resettings are necessary. The chance of error inherent in resetting would be eliminated by standard setting. Where controlled flights are possible in the Continental Control Area without regard to airway systems, the possibility exists that no reporting station would be available in the immediate area in which a jet might be operating. Finally, standard setting is more adaptable to automatic flight control and improves the correlation between performance data and actual performance.

In previously devised proposals to enable the use of two settings, a sterile airspace was included in which cruising flight was to be prohibited. Since cruising altitudes are at a fixed altitude above MSL, and the altitude of flight levels varies as atmospheric pressure changes, it is apparent that conditions could exist in which a flight level would be coincident with a cruising altitude. As atmospheric pressure decreases, the altitude of a flight level decreases. The sterile area, or "buffer zone," was devised to provide airspace to accommodate this sinking effect of flight levels as atmospheric pressure decreases below standard. A disadvantage in this, however, is that a buffer zone entails permanent loss of altitudes available for cruising flight. This has been considered unacceptable because of the volume of air traffic in the United States which requires use of all available flight altitudes.

No permanent loss of cruising altitudes, or of flight levels, is necessary in the new rule published. Essentially, flights of aircraft within the Continental Control Area will be conducted by reference to an altimeter set to a standard setting and will utilize *flight levels*. Cruising flight in the airspace between the ground and 23,500 feet, which is below the Continental Control Area, will be conducted at *cruising altitudes* maintained by reference to an altimeter set to current, reported altimeter setting. Proper planning by pilots and air traffic controllers will eliminate the possibility of conflict between aircraft using the different systems of setting. Having no buffer zone, the workability of the new rule is predicated on maintaining at least the standard vertical separation, (1,000 feet), between aircraft, even though they may be controlled by altimeters set to different pressure references.

Air Force Regulation 60-16A describes the areas wherein each system will be employed. The dividing line is the lower limit of the Continental Control Area, which is defined as 24,000 feet above MSL. All cruising altitudes from the ground to 23,500 feet are available at all times, regardless of the atmospheric pressure. However, when pressure is below 29.92"Hg., the altitude of an aircraft using standard setting is below the altimeter indication. Since this altimeter indication defines the flight level, it follows that some flight levels will fall below 24,000 feet MSL. Obviously, this situation could result in conflict with aircraft conducting flight at a cruising altitude and, therefore, pilots must not choose, nor controllers assign, flight levels without ascertaining that the flight level is actually within the Continental Control Area.

Reference to Figure One will give, by example, the lowest usable flight level when the atmospheric pressure is below 29.92"Hg. During a large percentage of the time, atmospheric pressure is at or above 29.92"Hg; therefore no reference to the table will be necessary. Since all cruising altitudes are always available, it will be noted that only for flights in the lower levels of the Continental Control Area would the possibility exist that a flight level would not be usable. The table covers atmospheric pressures prevailing in most areas the greater portion of the time. Atmospheric pressures which are extraordinarily high may permit the use of additional flight levels which normally lie below 24,000 feet MSL. Abnormal lows also might force vacation of flight levels usually well above 24,000 feet.

To execute this rule, it will be necessary for each controller to know the atmospheric pressure and pressure tendency in his area of responsibility. Similarly, since the pilot has the primary responsibility for flight planning and execution, the atmospheric pressure and pressure tendency must be included in preflight planning. *(Weather Forecasters Note.)* This problem would still be present even though a buffer zone were provided. However large the buffer zone provided, the possibility of extremely low atmospheric pressures, such as those present in hurricanes, would necessitate the same planning on the part of pilots, and the same procedural planning for controllers.

The 24,000-foot altitude was chosen to begin the constant altimeter setting area because the altitude was already significant as the beginning of the Continental Control Area. This area is programmed for expansion by changing the lower limit to 15,000 feet MSL when the added burden of air traffic control can be accepted. At that time, the desirability of revising the regulation to continue the constant altimeter setting as a rule applicable in the Continental Control Area will be examined.

Because of these changes, Air Force Regulation 60-16 has been modified to read:

"58. Altimeter setting. The cruising altitude or fligh tlevel of aircraft shall be maintained by reference to an altimeter which shall be set:

"(a) At or below 23,500 feet MSL, to the current reported altimeter setting of a station along the route of flight within 100 nautical miles, or the current reported altimeter setting of an appropriate available station. In aircraft having no radio, the altimeter shall be set to the elevation of the air base of departure or appropriate altimeter setting available prior to departure.

"(b) At or above 24,000 feet MSL, to 29.92" Hg. The use of flight levels which are below this altitude is not permissible."

One exception has been made to the rule. This exception pertains to VFR flights operating in the local flying area. Such flights may be conducted with altimeters set to the current reported altimeter setting, regardless of altimeter changes during flight. This exception was announced in an "All Major Commands Message" which specifically pointed out that all point-to-point and all IFR flights will use flight levels as directed in the published regulation.

The implementation of the newly revised regulation should not prove to be a great source of confusion to anyone. If, for some reason, flight at altitudes near the dividing line is desired, more care will be needed in planning the flight. And regardless of the altitude you plan to fly, a careful check of altimeter settings along the route should be made a mandatory portion of your flight planning.

The regulation still places the burden on the pilot to know his altitude, and to abide by the rules set forth. ▲

A term which is much bandied about is pilot saturation. Although it appears completely self-explanatory, some consideration given to the components which go into such a condition should be of value in both understanding and in precluding the condition. The human is capable of mentally attending to only one thing at a time. Although in practice an individual may seem to be doing a number of things concurrently, in actual fact the attending to either the stimulus or the performing of the response is a sequential type of activity in which attention shifts very rapidly from one to the other so that the illusion of multiple activities at the same time is created. There are many things which change the rapidity with which an individual can alter his attention as well as the speed with which a given activity may be performed. Some of the more common of these are illness, fatigue, toxic contamination, emotional disturbances and aging.

Pilot Saturation

If you fly complicated airplanes on complicated missions, trying to remember all the complicated procedures, in an emergency, you are a potential victim.

Colonel H. G. Moseley, Chief, Aero Medical Safety Division, Directorate of Flight Safety Research

Even under optimum circumstances, however, there is a limit. When this limit is exceeded, the result is a general breakdown of the entire system. In flying aircraft the pilot must attend to many things, and during some periods of flight, and during practically all emergencies, these must be attended in a very short period of time. If at any time the number of things to be attended to and acted upon exceeds the limitations of the human machine, the breakdown which follows may well develop into an accident. Much of the responsibility for the overloading of the pilots must be laid at the feet of designers of equipment and in the hands of those who have defined the procedures which must be executed. from the standpoint of the individual pilot, however, it is small consolation to know that the predicament in which he finds himself may, to a great extent, not be of his own making. The clear fact remains that he is the individual involved, and if there is an accident, he is the one who experiences it, and should injury result, it is he who suffers. It becomes expedient, therefore, that each individual recognize the overloading potential and take actions which are within his ability to preclude its occurrence.

There are several methods by which a pilot may prevent becoming supersaturated with the requirements of flight, or in other words, overwhelmed. The first of these is learning the aircraft. This is nothing other than training, retraining and re-retraining until the handling of the aircraft becomes almost automatic. This is the overlearning process. It can be done by flying, by simulators or even by reading appropriate T.O.'s. The value of such training is that when emergencies happen, the pilot does not have to be simultaneously thinking about how to handle the emergency and how to handle the aircraft. The latter has become more or less automatic by diligent training.

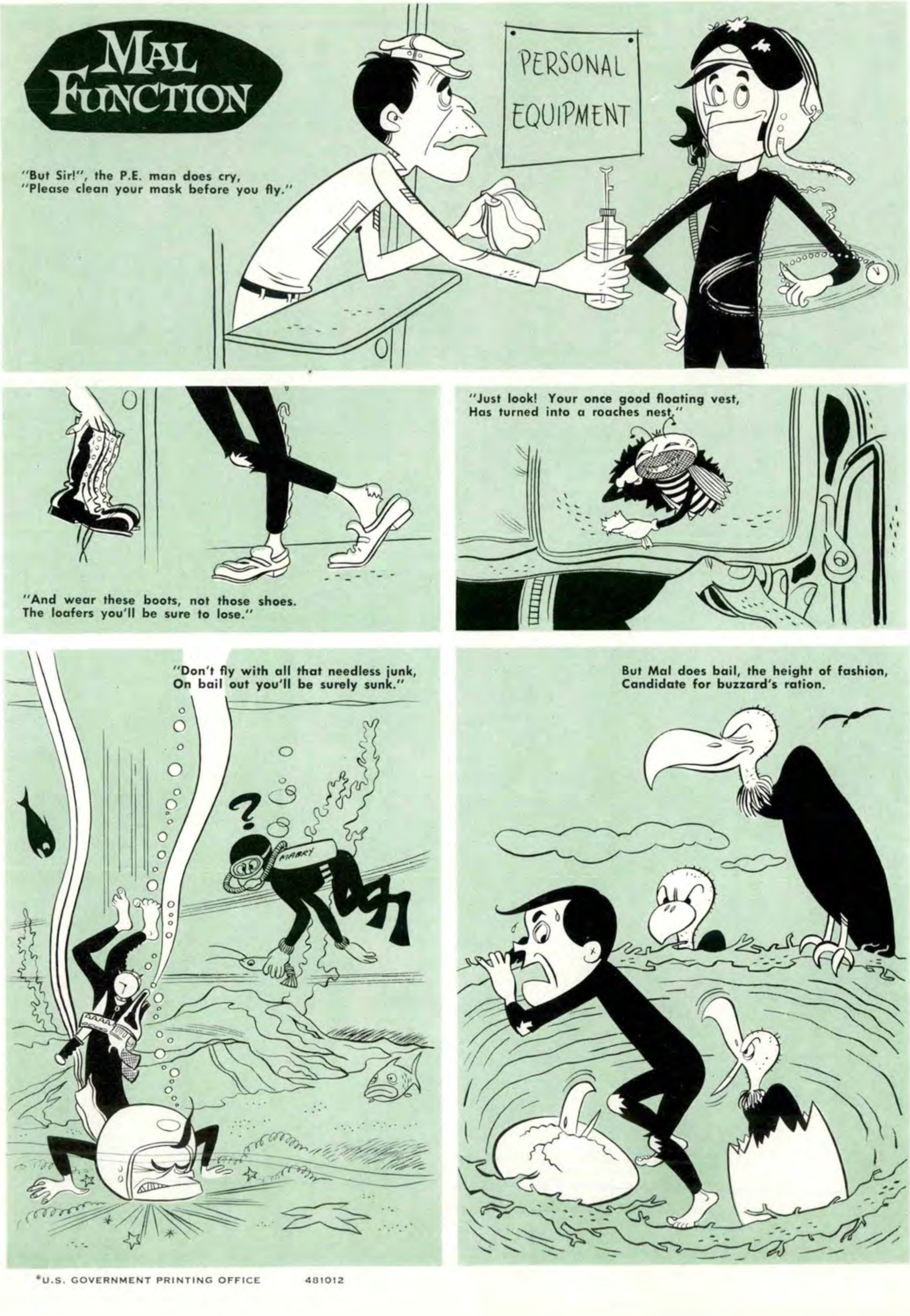
Another method of avoiding pilot saturation is knowing emergency procedures. This is also training, but specialized training. Because emergencies seldom occur, many people do not bother to know exactly what should be done in every type of emergency. Those who do not bother to learn are all too frequently killed because if an emergency occurs they either do not have time to analyze the situation and take corrective action before a crash occurs or they take the wrong type of corrective action and compound the emergency with the result that an accident becomes inevitable. On the other hand, those who know their emergency procedures well can instantly respond to the demands of the occasion and take the correct type of remedial action before an accident occurs.

There is a third method of avoiding pilot saturation and this also is in the form of training. This is instrument proficiency. There is no other type of flying which is as demanding of vigilance and technique as instrument flight, yet accidents continue to occur under instrument flight rules because the pilot loses control of the aircraft. These are usually the cases wherein instrument proficiency has been minimal, and when the chips are down the pilot suddenly finds himself supersaturated with the requirement of flight. He cannot attend all things which must be attended and suddenly he is in a spin or a stall and all effective control of the aircraft is lost. This can only be effectively prevented by instrument proficiency. Those who cannot become proficient should not fly. If they do, sooner or later they will turn up missing during an attempted cross-country on some dark or stormy night.

However, the best method of all for preventing pilot saturation is pre-planning. This is the simple expedient of determining what is to be done insofar as possible before the flight takes place. This not only applies to routes, weather and alternates and to the pre-flight inspection of the aircraft, it also applies to the thoughts given to potential emergencies, to survival equipment and to such things as a more logical choice of altitudes. There are many dead pilots who would be alive today if they had chosen a 13,000 foot flight altitude instead of 11,000 feet. They did not think that they were going to get off course and strike a 12,000 foot mountain, but a little pre-thought would have told them that they *might* get off course, and that there *were* 12,000 foot mountains, and the *smart* thing to do was to fly at 13,000 feet.

The moral of the story is that pilot saturation can be controlled. In this and succeeding months some of the human limitations which relate to pilot saturation as well as various factors associated with all phases of flight from the pre-flight planning to the post-flight writeups will be discussed with a view toward showing areas of greatest accident potential and hence the areas in which pilot oversaturation can be most profitably avoided. ▲

Granted! Finding a raft complete with a lovely lady like this would seem to make your survival gear superfluous. But who could be so lucky? Even the most naive crewmember could hardly expect the fates to deal him such a good hand. We suggest you continue to rely on appropriate survival gear when taking those over-water flights.


MAL FUNCTION
PERSONAL EQUIPMENT
"But Sir!", the P.E. man does cry,
"Please clean your mask before you fly."
"And wear these boots, not those shoes.
The loafers you'll be sure to lose."
"Just look! Your once good floating vest,
Has turned into a roaches nest."
"Don't fly with all that needless junk,
On bail out you'll be surely sunk."
MABRY
But Mal does bail, the height of fashion,
Candidate for buzzard's ration.