flying SAFETY

It's *NOT* Simulated Training

We Can All Learn From "Sims!"

Simulator Highlights

Now There's Simulator Sickness

JUNE 1991

SIMULATORS

THERE I WAS

■ There I was, C5202 (T-38 pre-solo), on a heavyweight single-engine delay. The winds were down the runway. It was very cold.

At the 9-mile point, I was cleared for the straight-in. The RSU controller/upgrader said later he followed that call with, "Negative straight-in, re-enter," but because of radio congestion, we did not hear him.

At 6 DME, the student slowed to configure. He dropped the gear and selected 60 percent flaps. I confirmed the flap lever position, and the flap gauge indicated 60 percent. The student performed the configuration check. I confirmed, "Gear down, three green, flaps at 60, two good pressures."

At 5 DME, the student called, "Gear down." I tacked on, "Single engine."

An aircraft at the perch rolled off toward us and called, "Gear down, no flap." My attention focused on him.

The controller asked the aircraft in the final turn if he had us in sight. He continued through the turn and rolled out abeam us, roughly co-airspeed. The controller directed him to go around and to clear to the west.

Our aircraft got a little rough. I checked the airspeed. We had a green donut and a red chevron, and the airspeed indicated 4 to 5 knots slow. I made another configuration check. The flaps were at full. Somewhere between 4 miles and our present position (approximately 1 mile final), the student repositioned the flaps to full.

I informed the student, "Hey, your flaps are full. They should be at 60 percent." I glanced inside again to see the flaps starting to track up from full. I didn't visually confirm the flap lever position. We were on speed and on a good glidepath approaching the overrun.

The aircraft began to sink toward the ground more than I was comfortable with. I took control, advanced both throttles to max AB, and tracked the nose up. We kept sinking towards the overrun. I continued to add backpressure, hoping to at least make it to the threshold. The plane was in a nose-high attitude with both afterburners lit when it impacted the overrun, about 500 feet shy of the threshold. We did not bounce.

When I saw how much overrun I had between myself and the runway threshold, I elected to abort. With both throttles at idle, I brought the stick full aft, but the nose refused to come up. As we passed the threshold, I glanced at the airspeed indicator — 140 KIAS.

Surprised the nose was not tracking at all, I checked the flaps. The gauge indicated 0 percent, and the flap lever indicated it was in the full up position.

The student had retracted the flaps to the full up position, rather than to 60 percent as required, placing us in a low-airspeed, no-flap, heavyweight situation. If the temperature had been a little warmer, we could have died

In hindsight, I would have been better off simply by taking the aircraft and executing a go-around, rather than allowing the student to try to reconfigure and continue the approach.

I also learned two other tidbits: The student is guaranteed to misinterpret your instructions, i.e., "watch your pull" or "pull a little more or harder" could result in an over-G, and, perhaps most importantly, you can't check your configuration too many times. What if the student had inadvertently retracted the *gear* rather than the flaps on short final?

Hopefully, this will never happen to you. Remember, always expect the unexpected, and be prepared to intervene through assertive positive control — "I have the aircraft!" ■

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page 2

page 6

page 20

SPECIAL FEATURES

REGULAR FEATURES

DEPARTMENT OF THE AIR FORCE • THE INSPECTOR GENERAL, OSAF

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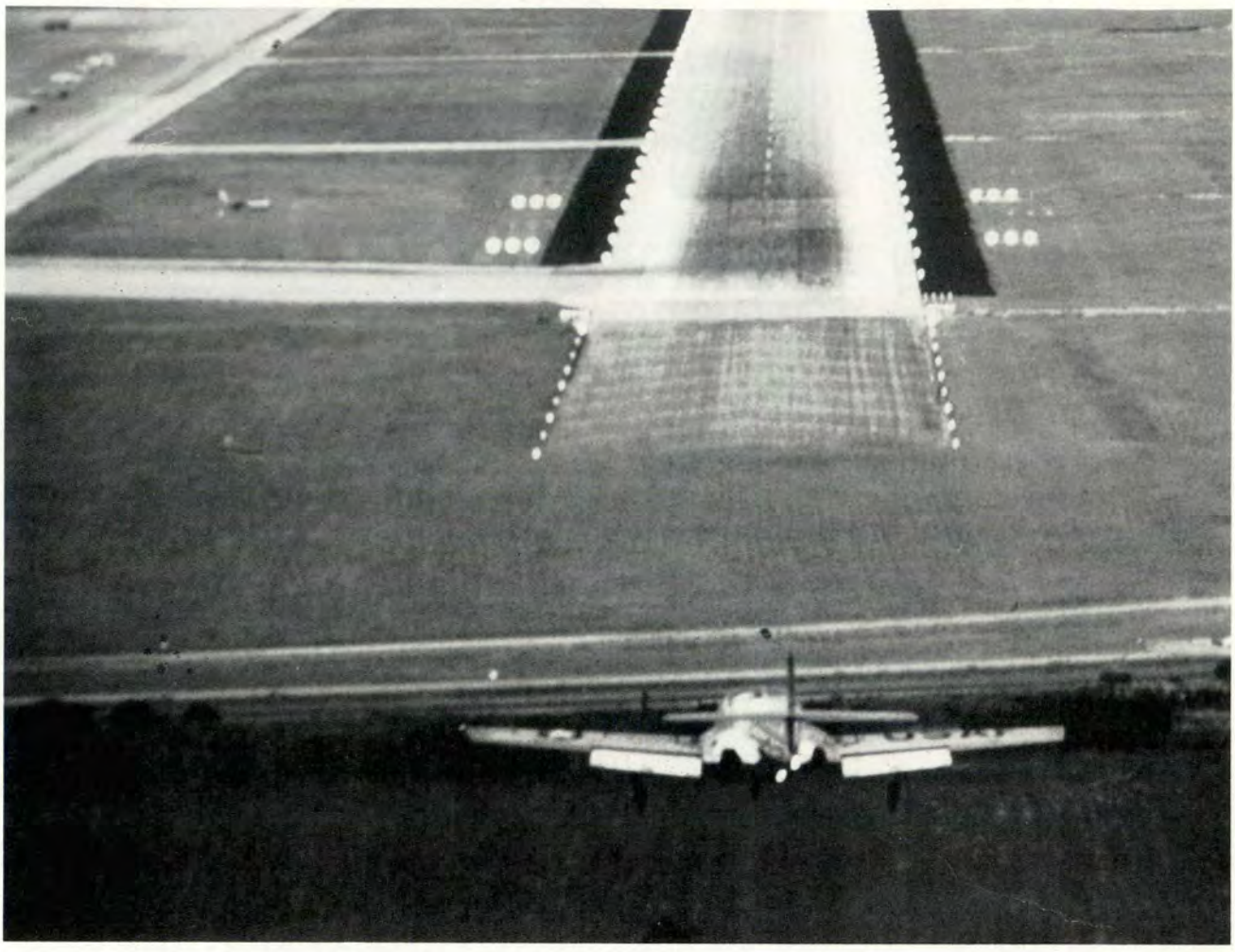


IT'S ***NOT*** SIMULATED TRAINING

The term simulator training has all but lost its meaning in recent years because of the sophisticated accuracy of today's simulators. The lessons that can now be learned are often better than reality.

MAJOR ROY A. POOLE
Editor

■ One hour of watching the T-37 student attempt to navigate through the Southwest had almost numbed the IP, but now, the Tweet was on radar vectors to March AFB.

"Ontario Approach, this is Sage three-nine with you, passing nine thousand for four thousand," announced the student confidently.

"Sage three-niner, radar contact. Turn right, heading two-niner-zero. Descend and maintain three thousand four hundred."

The world was still gray out the front windscreen, so the student kept both eyes glued to the instrument panel. The IP noted with some relief the student at least had the approach plate open to the correct procedure.

"Sage three-niner, you're cleared for the ILS runway three-two. Maintain three thousand four hundred. Contact March Tower, two five three point five at the final approach fix."

"March Tower, Sage three-nine is final approach fix, gear down."

"Sage three-niner, March Tower, you're cleared to land runway three-two. Use caution, landing heavy KC-Ten is just touching down."

"Sage three-nine is cleared to land," repeated the student.

With a mile to go, the IP began looking for the runway while the student riveted eyes on the localizer and glideslope indicators. Just before minimums, the Tweet broke out of the weather. The student looked up to see more than 13,000 feet of runway where it should be, and with an audible sigh of relief, pulled the throttles to idle to begin the landing flare.

At the same instant, the little jet began to drop off on one wing and

Early Link® trainers enabled students to practice only the fundamentals of instrument flight in a cramped cockpit.

nosedive to the overrun. Suddenly everything stopped.

A Critical Teaching Tool

"What happened?" began the IP, while the student continued staring at a frozen, slanted world.

What happened was another student learned a valuable lesson about adequate separation for wake turbulence caused by heavy aircraft. The lesson is one which will likely never be forgotten as the student continues a career as a pilot. The tool to teach this lesson may be called a "simulator" but the lesson is anything but simulated.

Air Training Command has been using simulators from the earliest days of Air Force pilot training, and they have done so with ever-improving skill.

A Look at Development

The earliest simulators were wood and fabric mockups of the real training aircraft. They were cramped, dark, and barely simulated anything except the fear of early instrument flying. For many years, the real purpose of simulators was to provide a procedures trainer.

Procedures trainers enabled students to practice the fundamentals of instrument flying and to go through the physical motions required of them during emergency procedures training. Most trainers had little or no motion capability; nor did they have any realistic view of the outside world. All training was accomplished in "zero-zero" conditions.

The modern simulators used by Air Training Command are quite different. They have a full motion capability which even does a fair job of duplicating the sensations felt by T-37 pilots in a spin. Sound effects have been added to match precisely the sound of engines as they respond to throttle movements.

The view outside the cockpit has come a long way from the days of gray-painted windscreens. Initially, Air Training Command simulators used a "terrain model board" to present a view to the pilot. Over the board, which was located in an adjacent room, a video camera with a special lens skimmed in response to various pilot inputs. The computer connected the moving camera with

continued

Modern simulators are fully instrumented. This T-38 simulator is almost an exact replica of the aircraft instrument panel.

IT'S ***NOT*** SIMULATED TRAINING

continued

Randolph AFB, Texas, Headquarters for Air Training Command, where simulators play an important role in the Air Force's flight training program.

the flight controls and presented it as a televised image in front of the pilot. The computer was able to add various cloud ceilings by blanking out the upper portion of the television screen at precisely the right moment.

As time passed, Air Training Command instructors realized there were limits to the terrain model board. First, in order to simulate landings, the expensive camera lens had to get *very* close to the miniature runway on the board. This runway, complete with tiny runway remaining markers, hangars, and waiting aircraft, proved a hazard to the lens. If the student lost control and the aircraft (really the camera lens) swerved off the runway, the expensive lens would be scratched. Additionally, weather simulations were pretty simple and the base of the clouds was always sharply defined. Of course, in the real world, the base of the clouds is often ragged and just when you think you're in the clear, the clouds close in again.

The solution came with improvements in computer technology and graphic imagery. Computer Generated Imagery, or CGI, has brought a sense of realism to Air Training Command simulators which is difficult for the average IP to find in the local flying area. Icy runways, ground fog, and high density takeoffs almost never occur at most of the southern locations used by Air Training Command. Although thunderstorms and lightning are common at these bases, safety oriented regulations keep the aircraft on the ground when hazardous weather is around. A growing thunderstorm over the end of the simulator's runway is as easy to create as a moonless night.

Responding to the growing concern for midair collision avoidance, the CGI computers are capable of adding airline jets or light airplanes to the student's view. If the student fails to take any avoidance actions, the results are ... predictable. In fact, the student can't rest until the aircraft comes to a stop since the possibility of simulated emergency vehicles pulling onto the runway is ever present.

An Effective Training Program

All of these simulator features, combined with a syllabus based upon training experience and the needs of the gaining commands, have added to safer and more effective flight training. A few years ago, Air Training Command might lose two T-37s and up to five T-38s. Today, mishap-free years have occurred and are a continuing, realistic goal.

When the rare mishap does occur, Air Training Command puts its simulators to use as part of the solution. First, they use the simulators to attempt to duplicate the maneuver which led up to the mishap, and to see how a typical cross section of pilots would respond. From these studies, they are able to more effectively address solutions to the mishap. Those solutions have frequently included additional training for all pilots in the simulator to increase their ability to handle similar emergency situations in the future.

A Future Role

Simulators will continue to play an important role in training the Air Force's future pilots. They are an integral part of the new T-1 Jayhawk package which will mark the beginning of specialized undergraduate pilot training. This combination of simulator and new aircraft training will continue to provide the Air Force with the best trained pilots in the world. ■

The T-38 simulator provides realistic motion and visual cues.

Once Again, Thanks For Your Support!

AND THE WINNER
FOR THE FEBRUARY 1991
DUMB CAPTION CONTEST IS . . .

MSgt Santos Lara
USAF-CAP/NHLO
Concord, New Hampshire

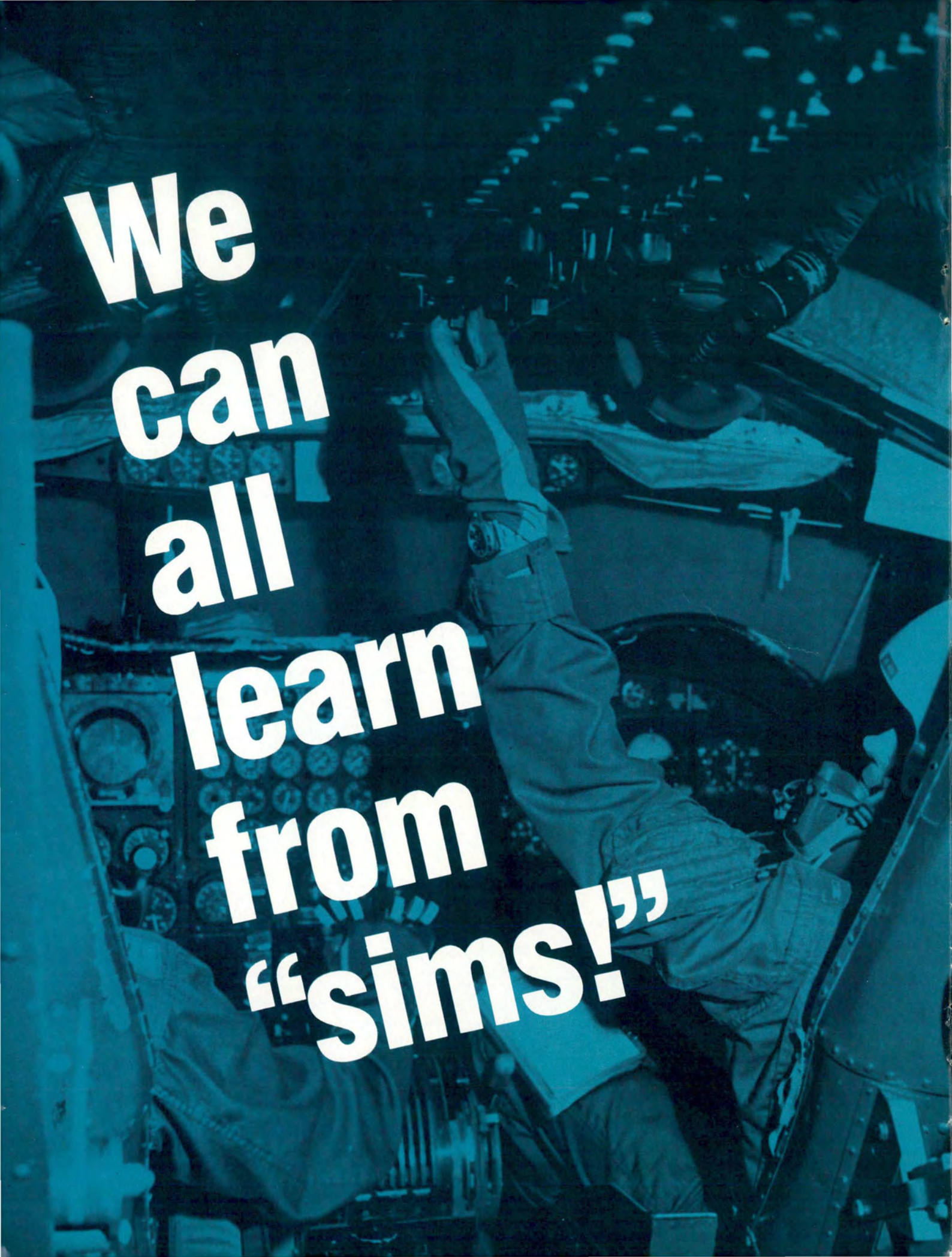
Judging from the flood of entries to this edition of the celebrated Dumb Caption Contest Thing, more than a few of our readers have sat in those chairs and stared at the arrow on the ground before them while waiting for transportation to the Middle East.

The unanimous decision of our judges goes to this month's winner, MSgt Santos Lara. However, the judges said it was one of the toughest contests ever, and if it hadn't been for the free tickets to *The Memphis Belle,* any one of the 10 honorable mention captions could easily have been this month's winner.

In an ongoing effort to save money, the judges even brought some popcorn back from the theater to pack our Cheap Little Prize in when we send it to MSgt Lara. (Psst! If I were you Santos, I wouldn't try to *eat* any of that popcorn — you never know where it's been.) For those of you who just missed winning this month's contest, check out our new contest on page 21.

Honorable Mentions

1. **(Thinking) . . . So then I had to say, "Whatcha gonna do about it? Shave my head and ship me overseas?" Dumb!!**
   Jim Burt, Academic Training, Bldg 1824, NAS Corpus Christi, Texas.
2. **When they told me I had a ticket to the theater, I thought they meant the movie theater! I don't see a screen!**
   SSgt Jeffrey D. Cumberland, 171 AREFW/SE (PaANG), Greater Pittsburgh IAP, Pittsburgh, Pennsylvania
3. **This is the last time I sign up for a free desert trip!**
   S. Burrier, SA-ALC/LAKD, Kelly AFB, Texas
4. **I hope my hair is in place.**
   MSgt Santos Lara, USAF-CAP/NHLO, 87 Airport Road, Blanchard Hangar Rm 101, Concord, New Hampshire
5. **New cammies, new boots, new haircut, new plane waiting at the end of the arrows, new war . . . it doesn't get any better than this!**
   Jim Burt, Academic Training, Bldg 1824, NAS Corpus Christi, Texas
6. **Who am I? Where am I? I can't remember anything!**
   Major Ralph C. Mayton, Jr., 12814 Brockwell Road, Prince George, Virginia
7. **So then I said to the commander, "Sure I like the sand and sun, why do you ask?" And the next thing I knew, here I am. This is a bit early for April Fool's jokes!**
   SSgt Jeffrey D. Cumberland, 171 AREFW/SE (PaANG), Greater Pittsburgh IAP, Pittsburgh, Pennsylvania
8. **When I said, "I'd walk a mile for a Camel!" I didn't think they would take me literally!**
   SSgt Jeffrey D. Cumberland, 171 AREFW/SE (PaANG), Greater Pittsburgh IAP, Pittsburgh, Pennsylvania
9. **OK men, there's a C-5 Galaxy Transport out there waiting to take us over. This is what we've been training for. Now remember, you follow the arrows out to the airplane. Once you're on the plane, use your map and compass to find your way to the troop seating area.**
   Jim Burt, Academic Training, Bldg 1824, Corpus Christi, Texas
10. **(Gentleman to far right standing) I have never seen a group study so hard for a urinalysis test.**
    TSgt Tom Lyons, Pennsylvania Air National Guard, 171st Air Refueling Wing, Greater Pittsburgh International Airport, Pittsburgh, Pennsylvania


We
can
all
learn
from
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Today's simulators are a far cry from the WW II Link® .

NOW EVERYTHING WORKS!

From our "There I Was" file

■ I was exhausted before the games even began. I was on alert in the B-52 and had spent the last three nights trying to change over an aircraft. When you have 12 cruise missiles and a bomb bay filled with assorted "crowd pleasers," a lot of wires and plugs must match perfectly. Ours didn't, and we had been up until at least 0300 Friday, Saturday, and Sunday.

By Monday afternoon, I didn't know what day it was, but I knew I had gotten my old bird off the pad and the new one cocked on alert. I was ready for the tour to be over. Since I didn't have anything major scheduled and would be going home Thursday morning, I considered the tour to be over. Was I wrong!

About 1830 Monday, I got a phone call from Lt James. "I have a trainer ride with you at 0900 tomorrow instead of your regular copilot. By the way, it's my annual check ride. I'm just calling to make sure scheduling or somebody had told you." Smart lad. No one had told me. Unfortunately, for both of us, it was one of the last smart things he did in the next 24 hours. I told him to be there a half-hour early the next morning and I staggered off to bed.

Today's B-52 trainer, the Weapon System Trainer (WST), is a far cry from the Link® of WW II. Mounted on large hydraulic jacks, it will roll, yaw, pitch, and get nasty. Every gauge in it is hooked up to a huge computer and to every other gauge and switch. When some indicator needle moves in one gauge, everything else everywhere else moves just as it would in flight. It "simulates" nothing.

The WST operator is not sitting 3 feet behind you in an armchair. He's in another room in the building, facing several video monitors and two keyboard consoles. You don't talk to him by turning over your shoulder and bellowing above the clickety-clack of analog-driven cogs and gears. You use the interphone and the radio.

Moreover, while he plays "Departure Control," "Denver Center," "your tanker," "the crew chief," and everybody else, he can hear you only when you talk on the right frequency. Thus, when passing 12,000 feet, and he says "Contact Denver Center on 322.5," you must physically reach up and turn the radio to 322.5. *Nothing* is simulated.

In the old trainer, many things were. Lots of gauges weren't even wired up to anything. The old autopilot was so bad the trainer was usually put on "problem freeze," and the pilot daydreamed while the copilot read aloud from the Dash-1 (Flight Manual, or "How to Fly the B-52").

Not now. *Everything* works. The copilot still looks up procedures in the flight manual and reads, but the pilot must fly continuously. No more "Stop the World, I Want to Get Off."

However, none of this had yet dawned on me. I didn't want Lt James there early to explain these differences to him or to see that he understood the new WST was a fearsome critter and could not be successfully approached with the old trainer mindset.

The reason I wanted to see him early was because Lt James was one of the worst copilots in the squadron. His systems knowledge was poor, and his "air sense" even poorer. Those couldn't be cured overnight, and they weren't even his biggest problem. The man was a "pinger." (Get 1,000 mousetraps and 1,001 Ping-Pong balls. Remove the rugs, furniture, and drapes from a small room. Load the mousetraps with one Ping-Pong ball to each mousetrap, step to the door, throw in the leftover ball, and listen.)

This guy's reflexes would shame a rattlesnake. "All mach and no heading." He could be detonated by the slightest jar, and then you had no idea which way he would go. So, I wanted a little time to explain a few things, like: "This is the B-52. It does nothing quickly. Take your time. Think about it. Ask me. Let's talk it over. We have eight engines, six hydraulic systems, and four generators. Nothing can break all that stuff at once except a mountain, so don't rush off wildly." Lt James nodded thoughtfully at my sage advice, the evaluator arrived, and the games began.

We didn't even get out of the chocks right. The "starting engines" checklist has some 25 items on it, but only 11 or so are printed in boldface type. For alert scramble starts, you do only the bold-faced items. Further, only the pilot reads that checklist, and the copilot does most of the actions. The evaluator had asked for a battery only, no external power, alert scramble, cartridge start. I'm reading the checklist, and, suddenly, the lights come on. Lt James, without being told to, and without either asking or telling me, has blithely reached down and hit the external power on switch. I knew it was going to be a long day.

We managed to taxi out to the runway and make our first takeoff attempt without messing up anything else. (Trainer evaluations have a pretty standard profile. You know your first takeoff attempt will end up in some kind of abort situation. The next will be a crash landing. You will probably be allowed to get airborne on your third try.)

Sure enough, we get a nice, routine, expected engine fire about 10 KIAS below decision speed. Lt James handles his abort duties very nicely, and I start to hope things will look up. The reset button gives an engine change in 2 seconds, and we make our second takeoff attempt.

This time the evaluator gets craft-

continued

We can all learn from "sims!"

continued

ier. All he does is fail the water thrust augmentation on two engines. You can continue the takeoff easily in this condition. It's a fairly common thing — nothing to get real excited about. However, Lt James, whose primary takeoff duty was monitoring the engine instruments, announces "We have lost *power* on two engines," instead of "lost *water*."

Both the evaluator and I thought he was trying to tell me that two engines have quit, which is something else again. As I'm pulling back all the throttles to abort, the EPR (thrust) gauges catch the corner of my eye. Those engines are still running! Well, *@#$%&!!* Airborne at last, and we are now climbing toward a 2,000-foot overcast.

We reach the 180 KIAS flap retract speed and start them up. It takes a full minute to retract B-52 flaps. With 20 seconds to go, the no. 5 engine quits. Lt James wants to do something now, right now. I tell him to forget it until the flaps are up. No fire light, no overheat, no vibration. It has just quit, and we can worry about why or perhaps restarting it later. Right now, the flaps are in transit, and we are about to go into the weather. We have bigger fish to fry.

The flaps are up, and we are in the soup. Climb speed is 280 KIAS. The flaps-up speed should be 230 KIAS. We are doing 220 KIAS. Lt James sets climb power, stows his control yoke, and opens the Dash-1 to "Engine Air Starting."

Something is funny. We are still at 220 KIAS. No, the engines, except the forlorn no. 5, are running. Yes, the gear is up. I already know the flaps are up. Check the airbrakes are off. I level off from my 5-degree climb. Still only 220 KIAS. Cram all the throttles up to the stops. Two hundred and twenty KIAS. Damn! His airspeed reads only 190 KIAS, and I finally realize we are in the weather with complete airspeed failure. Lt James, serenely buried in the "Engine Air Starting" pages — 5 pounds of Dash-1 in his lap — still hasn't noticed anything is wrong.

I tell him to forget the engine and to look instead at "Loss of Airspeed." He protests, "But we have an engine down!" So what? It's not on fire. We can fly on seven of them if we don't stall out. On the other hand, if you slow down into a stall, 77 engines won't help! The evaluator restores the airspeed indicators, and we press on.

For the first hour, I had done a pretty good job of aiming Lt James in the general vicinity of the problem. Then I guess fatigue just caught up with me. That, and a little ego, got me into a real mess.

The finale of the standard trainer profile is a flaps-up, "three or four engines out on one side" approach. I should have routinely done the usual checklists when the no. 8 low oil pressure light came on, then no. 7 had to be shut down for a generator overheat, and finally no. 6 caught fire.

Please be sure the evaluator had been real nice about it and had given us the oil, generator, and fire situations about 5 minutes apart so we had time to do each little shutdown procedure one at a time and get ready for the no-flap landing.

If I had the sense of a doorknob, I would have just gone along with the standard profile, since everybody knew the evaluator was building us a box with a no-flap landing as the most reasonable way out. However, I got greedy and wanted to show off. I had coped with Lt James so far and thought I could continue to do so.

Modern state-of-the-art simulators leave little to the flightcrew imagination.

The simulator technician can program just about any in-flight problem a pilot can be expected to encounter in the air.

Flying the B-52 Weapon System Trainer with Lt James was a real learning experience . . . for both of us.

With any six engines running, I could make a normal, full-flap landing. No. 8 only had low oil pressure. If I could keep it running, I would be in super shape, or so I thought. The Dash-1 says up to 30 minutes of engine operation is possible even with no oil. So, instead of shutting down no. 8 and accepting the easy, book, no-flap answer, I left it running at idle. I thought even Lt James could do six-engine landing data and review the approach in 30 minutes. Dumb, but not as dumb as things were going to get. Lt James did ask me why didn't we just do the no-flap, but I was so used to static from his seat that I dismissed his sound idea. However, just in case the evaluator froze no. 8, I told Lt James to also do five-engine, no-flap *and* six-engine, flaps-down data.

Dumb. Lt James quite understandably took a lot more than 30 minutes to do everything I tasked — really overtasked — him with. Well, the evaluator waited the full 30 minutes and then froze no. 8 with a low pressure light on, rpm at 0 and pressure gauge reading 0.

I belatedly closed the throttle so at least we wouldn't dump any more fuel into the mess I had created out on the wing. Lt James never did quite figure out that no. 8 had given up the ghost. He was doggedly trying to restart this engine when the light finally dawned on me that I had been locked in auto-fail for most of the second hour of the trainer period.

I salvaged something out of my day in the WST by telling Lt James to forget the air starts, the flaps, six-engine data, and to go with the five-engine, no-flap approach we should have begun 45 minutes earlier.

We were both lucky to get out of the experience with only a "more training needed" in the "crew coordination" block. The evaluator told me it would have been a definite "Unqualified," busted check ride if we had missed the airspeed failure or if Lt James had brought the throttle up to start no. 8 with all the gauges at 0 on that engine.

He wasn't supposed to, but he made some allowances for my previous schedule, for Lt James' known problems, and for my lack of preparation time.

The effect of this memorable WST ride on me? Immediately, I was deeply embarrassed. I had completely missed the magnitude of change the WST represented. I had made a lot of poor judgments on the ride. I had tried to get fancy on a check ride, a cardinal sin in aviationland. Worst of all, I had judged Lt James to be a fool so thoroughly that when he really could help me, as a copilot is supposed to do when things get terse, I overrode him without mulling over his idea. Thus, the one right idea he had all day got dismissed mainly because of my prejudice against him. This intellectual honesty will make you a better crew commander. I wish a lot of other people had a lot more of such honesty.

However, now that some time has passed, I feel a little differently about it. For one thing, that was one of the first WST check rides ever given at my base. Even the evaluator was surprised at the difference the complete simulation of the WST made to an otherwise routine check. He told both of us to get the word out to our fellow crewmembers. No one should underestimate the WST.

Secondly, I was really tired. While that doesn't excuse poor decisions, it does explain why I made them.

Finally, I *did* figure out, eventually, what I should be doing — better late than never. Fatigue slowed me down, but it did not completely blank out my thinking.

One final point. Are you wondering why the wing schedulers put me in the WST for Lt James' check ride instead of his regular pilot? Didn't they know I had been up at all hours changing over an alert bird? I went over there and asked them.

"Well, his regular pilot had to fly with another crew yesterday to fill an empty seat on their plane. When we looked over the five pilots available at the pad to put with Lt James, we figured you had the best shot at guiding, molding, and shaping him."

That made me feel a lot better. I just hoped it was true! You've convinced me — a B-52 simulator is *not* a stationary trainer! ■

Winding The Clock

LT COL JAMES P. BRONOWSKI
Chief, Safety Division
452 AREFW/SE
March AFB, California

■ What a wonderful sensation! To be flying, to be suspended above earthly troubles for a time with the wonder of flight still possessing me like the warmth of a first love. The feeling of contentment as man, machine, and the elements combine in harmony to fashion a so-far near-perfect flight is almost an overwhelming experience.

I glance over toward the right seat and see my copilot gazing sleepy-

PHOTO BY ROBERT KING

*. . . when it comes, as it surely will, what is the first thing you should do when **your** in-flight emergency occurs?*

eyed down into a very choppy Pacific ocean. Turning my head a little farther right, I can see the flight engineer eagerly devouring a frozen meal — the second since takeoff 2½ hours ago. I make a mental note to throw my lunch in the oven before his stomach starts growling again as my rough estimate of his rate of consumption gives us another hour of food on board before he begins eating the insulation and seats.

I look out ahead of us and concentrate on the line formed by the light blue of the sky and the dark blue of the ocean. This horizon is regularly interrupted with cumulus puffies which appear to be patiently standing in line. It reminds me of people waiting for an available teller in a bank. The thought of a "cloud bank" brings a smile to my lips. As I turn to share this humorous association with my cockpit mates, I have second thoughts and keep this minor levity to myself. It doesn't instill confidence in the crew when the aircraft commander is describing the things he sees in cloud shapes.

All the same, I had been drifting, and the old axiom came back to me: "Hours and hours of boredom interspersed with moments of stark terror." The old transport pilot saying was first relayed to me long ago when the Air Force still wore uniforms requiring starch — and lasting half a day, if you were lucky. In my many years of flying heavies, the "boredom" axiom has proved itself over and over. Even though the moments of terror get farther and farther apart as engines and aircraft improve, the critical skills required to command the emergency situation have not changed.

The flight engineer is hunched over his table to keep the distance from plate to mouth as short as possible, so I have an unobstructed view of the instruments on his panel. I can view the dials and flicking counters that register quantities, electrical energy, pressures, and temperatures. All the indicators are dancing merrily in their grass-green playgrounds of normalcy.

I put my hand on the throttles and my feet on the rudder pedals to feel for any vibration which would tell me of an engine ailment the instruments wouldn't recognize. I am rewarded with a gentle response of quiet strength and power, and I am happy and content in my world. Now I've satisfied myself as to the physical condition and good health of this beautiful aircraft, I set to the more mundane task of trying to get the rest of the cockpit staff to be more attentive to the situation at hand.

From behind I can hear the scraping of plastic on aluminum, with each scrape followed by a slurp indicating the end of the meal but not the appetite. I look at my associate in the right seat. The copilot seems to have transferred all but the physical being somewhere more exciting. From the widening smile, it's not too hard to figure out at least the general company being kept while drifting.

I again scan across the neatly arranged rows of instruments continually monitoring the heart, brain, and nervous system of this most sensuous mechanical creation. The call of this siren has caused me to sail the seas for well over 20 years, and has changed from the deep-throated roar of pistons and props to the shrill shriek of turbine blades and expanding gases. No matter what sound these modern sirens make, the lure is just as compelling and attractive as it was to the sailors of mythology. It is also strewn with peril and hidden dangers to the unwary and unprepared.

I look over at the young officer in the right seat who is well-trained, efficient, eager, a good pilot, and a good friend. A fly on the side window, whose panicky escape attempt traces diagonal patterns across the glass, goes completely unheeded by my fellow aviator, who now appears to be reaching a comatose state. With mouth agape, the pilot knowingly offers sanctuary to the disoriented stowaway whose longevity is limited to how long it can stay out of my reach.

I wonder: Will the pilot sitting next to me ever have to face bailout, ditching, or crash landing like I have? Probably not. But what if there was no choice? Is this pilot ready to handle an extreme crisis situation? Could this pilot effectively fly the aircraft, direct the crew, and accomplish the necessary

continued

Winding The Clock

continued

PHOTO BY ROBERT KING

Taking the time to analyze the situation is the first step in handling most in-flight emergencies.

emergency procedures under life-threatening conditions?

As an instructor, these are the questions I have to ask, for it is the emergency situation and the competent flying of a sick aircraft that determines the true skill of a pilot. Many a pilot and many an aircraft have been lost because of the improper handling of an emergency situation. In too many cases, minor emergencies have resulted in tragedy because of pilot panic, fixation, or confusion.

About a hundred years ago while I was struggling through pilot training, I got superb advice from a grizzly, old instructor pilot on how to handle an emergency situation. "The first step in taking care of 98 percent of emergencies," he said through a thick, blue cloud of cigar smoke he had just exhaled, "is to wind the clock."

Over the years, I never forgot his advice or the smell of his cigar. And he was absolutely right. Taking the time to stop, think, and collect your wits is, without a doubt, the best first action in most emergencies. Of course, emergencies requiring an immediate flight control input or an abort sequence are exempt from this principle. But overall, taking the time to carefully and deliberately accomplish each action of an emergency procedure (bold print and checklist) will prevent an error which could compound the original emergency.

To demonstrate the validity of this concept, a few months ago I took my presently somnolent sidekick into the simulator and directed the accomplishment of the bold print items as fast as possible once receiving the emergency cue. My pilot was amazed and a bit frustrated at the number of mistakes. Then we did the same set of emergencies, and I said, "Take a deep breath and wind the clock before accomplishing the bold print procedures." (This isn't as easy as it sounds because the KC-10 has an electric clock, but we made do.) This time, each procedure was completed without error. I have tried to pass on this lesson for years, and I almost wish I had a big, smelly cigar to reinforce my teaching.

The warning devices we have in aircraft (lights, buzzers, and voice tapes) seem to be designed to scare us into immediate action rather than direct us towards a calm, positive reaction. Probably the ideal warning system would be a voice tape with a very sophisticated British accent saying something like: "Pardon me, old sport, but there seems to be a bit of a problem with your number two engine. Quite a nasty blaze in the accessory section. Do look into it when you get a chance. Jolly nice day, though."

We pilots have been taught and conditioned since the open cockpit days to react immediately in a specific sequence to critical situations. This conditioning is ingrained into us, simulator after simulator, flight after flight. This automatic response to visual or oral stimuli may be premature or even incorrect. An improper evaluation of the situation can lead to disaster.

I can hear movement behind me. I turn to see the flight engineer, a

half-eaten candy bar protruding from his mouth, cleaning a Class B food spill off his log. The rightseater, oblivious to the fly now setting up a holding pattern over the head, is most likely already on the beach in Hawaii. The HF radio is providing a background of annoying static with intermittent transmissions from airborne voyagers, like ourselves, who regularly report the well-being of their craft when it reaches a solid triangle on the airway chart. These position triangles all have names specifically designed to be misunderstood and mispronounced in any known modern-day language.

After the momentary diversion and a quick glance at fuel, position, and flight plan, my train of thought goes back to my last simulator evaluation. I was critiqued by the evaluator because I was slow to accomplish the bold print items on one particular emergency procedure.

"You got all the items," the evaluator said. "But it took you so long, I wasn't sure you remembered them."

As the critique was minor, and my normal practice is not to argue in a checkride debrief, I didn't debate the point. But I should have. There is no time limit specified to complete the "critical actions." The time required is the time necessary to maintain aircraft control and prevent the emergency situation from seriously damaging or destroying the aircraft. The bold print or "critical action" items listed in the emergency procedures section of all flight manuals are required to be memorized by the applicable crewmember so they can be accomplished without reference to a checklist.

The initial bold print listed in the KC-135 Dash -1 is only two steps, yet it applies to any aircraft in any emergency:

- FLY THE AIRPLANE
- STOP — THINK — COLLECT YOUR WITS

Another statement out of the KC-135 emergency procedure section which remained with me, long after I left that pretty airplane for another, has a universal application: "A thorough evaluation of each emergency should be made prior to initiating corrective action." I have always felt this statement should be written across the glare shield of every aircraft and simulator in our business.

A glance down at the inertial navigation system readout shows me it is almost time for a position report. I know my cohort needs the experience and frustration of shouting into the distorted void of high frequency communications and interpreting the garbled and wavering response. A good shot of adrenaline should fix my pilot up and allow reentry into the land of the living.

I reach over, put my hand on a shoulder, and prompt in a firm voice: "What would you do if you just got the indications of a fire on number one engine?"

Eyes come open with a look of shock as the brain makes an immediate analysis of the situation. Quickly looking at me and, without hesitation, turning back to the front, this pilot focuses on the instrument panel, leans forward, and very deliberately synchronizes his watch with the electric clock on the instrument panel. ■

Take a deep breath and wind your watch before deciding on a course of action. Hasty decisions can be fatal.

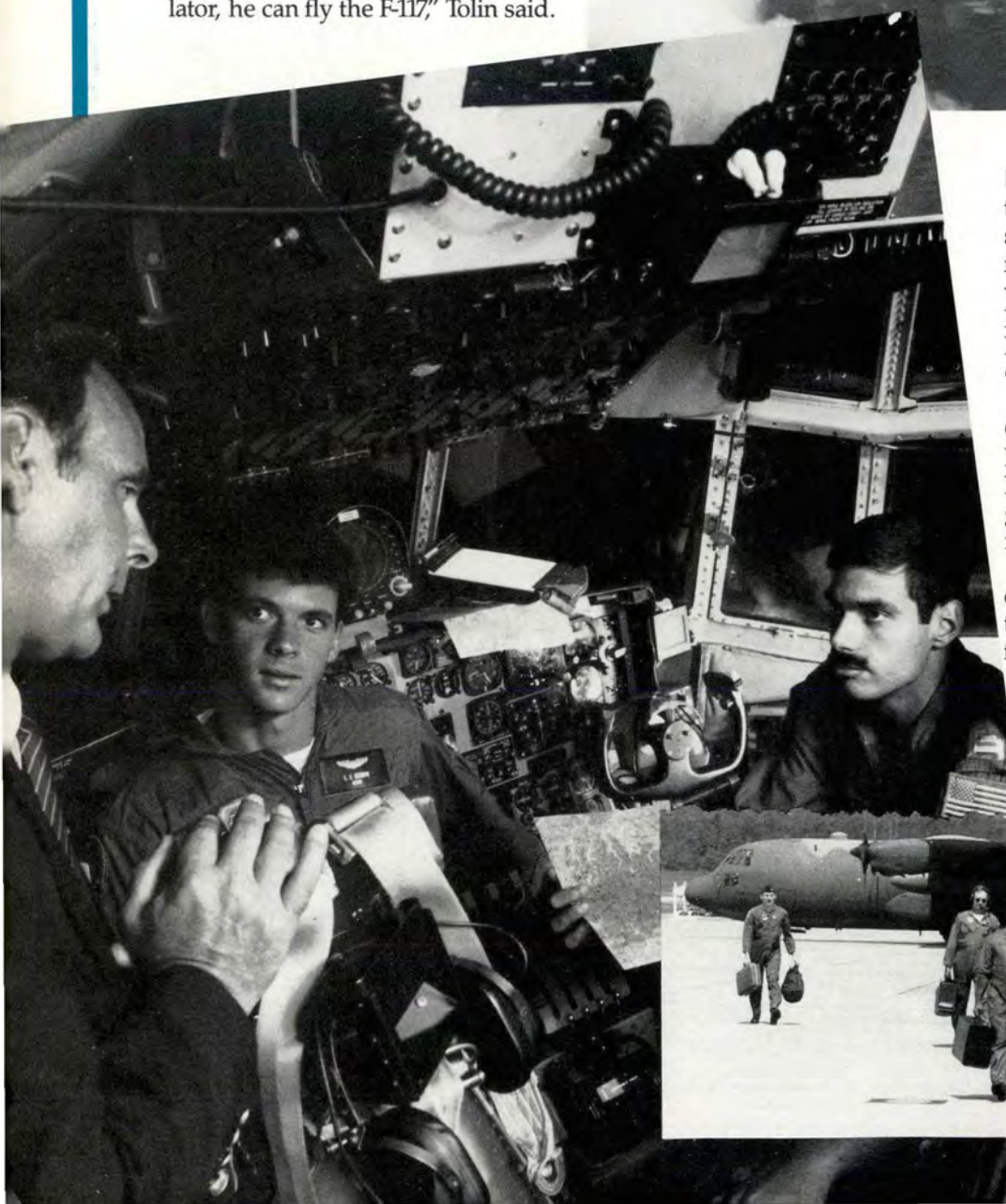
PHOTO BY ROBERT KING

SIMULATOR

■ The F-117A stealth fighter is flown by the 37th Tactical Fighter Wing of the USAF Tactical Air Command. The 37th is currently based at Tonopah Test Range, Nellis AFB, Nevada. The wing includes the 415th Tactical Fighter Squadron (Nightstalkers), the 416 TFS (Ghost Riders), and the 417 Tactical Fighter Training Squadron (Bandits).

As there are no two-seat trainer aircraft for the single-pilot aircraft, the flight simulator is the heart of the training curriculum.

Colonel Anthony J. Tolin, former 37 TFW Wing Commander, has flown the simulators of eight different aircraft and, according to *Air Force Times*, 7 May 1990, "the F-117's simulator is the best he has ever operated. If a pilot can fly the simulator, he can fly the F-117," Tolin said.



■ The C-130 Aircrew Training System (ATS) is truly international in scope. It encompasses students from 25 different countries and provides training for the USAF, Navy, Marine Corps, Coast Guard, Air Force Reserve, and Air National Guard.

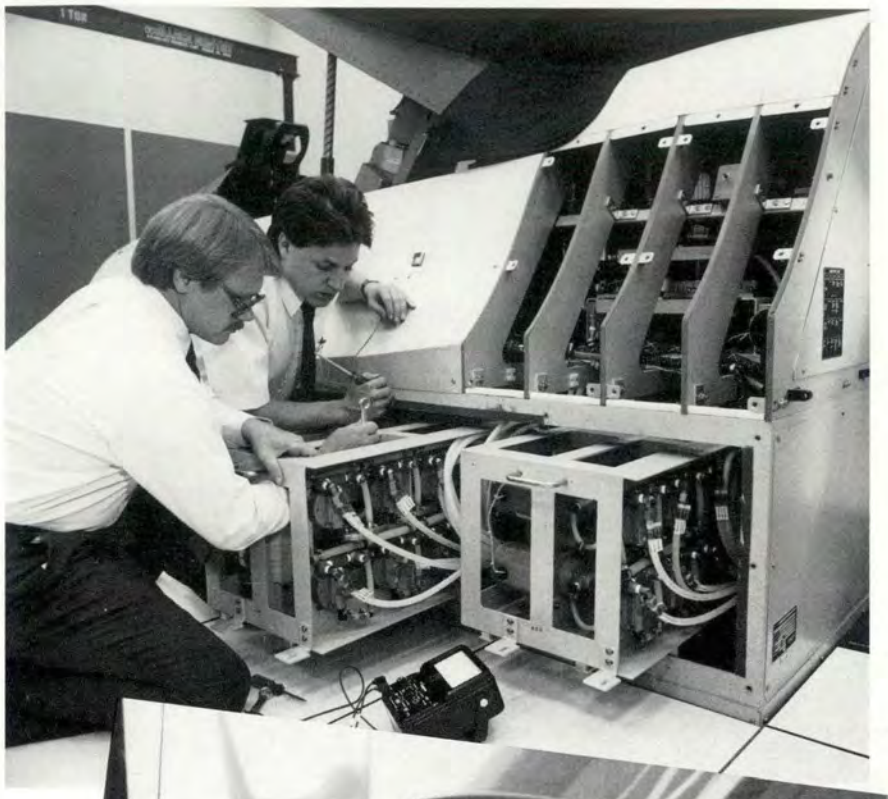
The ATS encompasses all facets of C-130 tactical airlift training for pilots, navigators, flight engineers, loadmasters, and maintenance engine-run technicians from entry into initial qualification.

MAC C-130 instructors and flight evaluators conduct all in-flight training and administer aircrew flight evaluations.

HIGHLIGHTS

■ The total F-16 training program includes tactical flight simulators and simulation of specialized sensor systems such as Low Altitude Navigation and Targeting Infrared Night (LANTIRN). It also includes part-task devices for air intercept and air-to-ground training, simulator maintenance and logistic support, academic courseware, plus a mixture of classroom and simulator instruction.

The first F-16 LANTIRN simulator was developed to support the critically important training required to safely accomplish the LANTIRN attack mission.



The LANTIRN system enables F-16 pilots to fly low-level, high-speed attack missions day or night and beneath adverse weather, thereby extending the capability of the F-16 around the clock and into all weather conditions, denying an enemy the sanctuary of darkness or bad weather for force movements or resupply.

The LANTIRN simulator provides TAC pilots complete simulation of the LANTIRN system, including navigation pod forward-looking infrared (FLIR), targeting pod narrow- and wide-field-of-view FLIR, AGM-65D Maverick missile IR, laser ranging and designation, terrain-following radar, and radar altimeter. ■

WRITE A DUMB CAPTION CONTEST THING

In response to our recent description of the judging procedures for the internationally recognized Dumb Caption Contest Thing, we have, once again, had to endure the whines of Byron Q. Lackluster, President and Voice Coach of the United Organization of Dumb Caption Writers of America (UODCWA).

Chief among Byron's list of complaints is our failure to recognize the three basic guidelines of the UODCWA. First, identify the oldest person in the picture and make fun of him. Second, find the second lieutenant in the picture and make fun of him (extra points given if the lieutenant is also the oldest person in the picture). And third, make fun of only one person in each picture.

We showed this list to our judges and they had one thing to say, "Byron, that's the funniest stuff you've ever written!" Obviously, they are used to judging the talented submissions of our readers and gagging over every caption from the UODCWA.

So, for the continued good health and high spirits of our judges, start sending in your caption to this month's contest right away.

Carefully trace this page with crayon and write your caption where ours is shown. Or, you could photocopy the page and tape a slip of paper to it with your captions. Or, you could cut out a "Post-It"® note to perfectly match the caption "balloon," put it on a photocopy of this page, and write your caption on the note. BUT DON'T SEND US THE PAGE. Entries will be humorously judged by an expert panel in September 1991. Chocolate-chip cookies have been added to our list of acceptable bribes as an added convenience to our readers.

Send your entries to **"Dumb Caption Contest Thing"** • *Flying Safety* magazine • HQ AFSA/SEDP • Norton AFB, CA 92409-7001

READER POLL

Flying Safety is published for aircrews, maintenance people, their commanders and supervisors, and support people in such fields as operations, air traffic control, and life support.

If you are assigned in one of these career fields, *Flying Safety* is for you. We would like you to tell us how we are doing so we can publish a magazine that best meets your needs. Please take a few minutes to complete the attached pre-addressed survey.

We also welcome letters and articles for publication. Please write to:

EDITOR, *Flying Safety* Magazine
AFSA/SEDP
Norton AFB, CA 92409-7001

The following information about this poll is provided in accordance with paragraph 10, AFR 12-35, Air Force Privacy Act Program: **Authority:** 10 USC 8012, Secretary of the Air Force; Powers and duties; delegation by; **Principal Use:** To collect a sampling of opinions on *Flying Safety* magazine. **Routine Use:** To present resulting grouped data for decision makers to evaluate the effectiveness of the magazine. Your participation is voluntary, but we need and will appreciate your honest responses.

Thank you for participating in this poll.

QUESTIONS

1. How often do you see the monthly *Flying Safety* magazine?
   - ☐ A. Every issue
   - ☐ B. Most issues
   - ☐ C. Some issues
   - ☐ D. This is the first issue I've seen

2. When you see *Flying Safety* magazine, how much of it do you read?
   - ☐ A. All of it
   - ☐ B. Most of it
   - ☐ C. Some of it
   - ☐ D. Never read it

3. Are the articles interesting to you?
   - ☐ A. Always
   - ☐ B. Often
   - ☐ C. Sometimes
   - ☐ D. Seldom
   - ☐ E. Never

4. Are the articles of value to you?
   - ☐ A. Always
   - ☐ B. Often
   - ☐ C. Sometimes
   - ☐ D. Seldom
   - ☐ E. Never

5. Are you currently an aircrew member? Yes ☐ No ☐
   If yes, what position? _____
   If no, what is your job? _____

6. What is your rank? _____

7. What is your AFSC? _____

8. What is your MAJCOM? _____

9. What type of subject matter do you prefer to see in this magazine? _____

10. What are your favorite regular features? _____

11. What would you like to see as a regular feature? _____

12. Please tell us how you would improve *Flying Safety*.

FOLD FOLD

AFSA/SEDP
Norton AFB CA 92409-7001

Editor
***Flying Safety* Magazine**
AFSA/SEDP
Norton AFB, CA 92409-7001

NOTE:
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FOLD FOLD

Water on the windscreen

In heavy rain, even if visibility appears fairly good to the pilot, terrain contours or lights may seem lower than their actual elevation relative to the airplane.

DOROTHY SCHUL
Editorial Assistant

PHOTO BY ROBERT KING

Heavy rain can affect perceptions of distance from approach or runway lights by diffusing the glow and causing them to appear less intense and the pilot to suppose they are farther away than they are.

■ Remember when you were a kid and you put a stick in the water? Do you recall how it appeared to "bend"? Remember, too, how objects at the bottom of a pool looked like they were in shallower depth than they really were?

Those are two examples of refraction — the changing of direction of light beams as they pass from one type of medium to another — air to water. Water slows down the passage of light, and objects appear to be distorted.

Water doesn't present much of a problem for a fish, which sees better in it than out of it. Pilots, on the other hand, are bothered when trying to fly through it. Water on the windscreen can bring about a refraction error.

Approach lights may appear to bloom and double their size. The illusion is the airplane seems to be closer to the runway than in actuality, possibly leading to a premature descent.

Let's consider a second problem. Pilots flying in heavy rain, even where visibility seems to be fairly good, may perceive contours of the terrain, or landing lights, to be lower than they really are. This is caused by diffusion ("halo-ing"), referring to the tendency of lights seen through moisture to spread apart and look less intense — therefore, farther away than the actual distance.

Rain on the windscreen can cause other illusions as a result of light ray refraction. For instance, even though an aircraft is correctly aligned on the approach path, it can appear to the pilot to be above or below the correct glide slope as well as to the left or right of the runway centerline, depending upon the slope of the windscreen and other circumstances. The apparent error might be as much as 200 feet at a distance of 1 mile from the runway threshold.

Another little known weather-related approach hazard involves an isolated rain shower ahead of the aircraft. As the aircraft approaches the cloudburst, the pilot's visual segment (the distance along the surface visible to the pilot over the nose of the aircraft) shortens. This can produce the illusion the horizon is moving lower and, as a result, is often misinterpreted as an aircraft pitch change in the nose-up direction. A natural response by a pilot would be to lower the nose or to decrease, not increase, power.

A pilot in command made the mistake of concluding he was higher than normal and allowed a too-rapid descent to take place. He was transitioning from instruments to visual reference during rainfall. The National Transportation Safety Board cited visual distortions as contributing to this 707 crash in Samoa. Ninety-seven people lost their lives.

There is no rule of thumb to apply to compensate for rain distortion because it will vary in accordance with weather and terrain conditions. However, awareness of this phenomenon should help the alert pilot or aircrew to avoid mishandling the approach. ■

Dozing off can place you in line for ribbing at best, or if it is chronic, in risk of a reprimand or even physical danger. Chronic dozing, however, can be caused by a medical condition that needs to be understood.

DEREK S. LIPMAN, MD

■ More than 50 million Americans snore. For many, it is a constant nightly disturbance which disrupts their partner's sleep and strains relationships. In addition, snoring is frequently the cardinal sign of a condition called "obstructive sleep apnea," in which the snorer periodically stops breathing during the night.

Apnea, which means "for want of breath," affects several million people in the United States. Almost always associated with heavy snoring, obstructive sleep apnea causes the sleeper to stop breathing many times during the night, triggering a chain reaction which results in oxygen deprivation to tissues and organs.

Because of these frequent breathing interruptions, people with obstructive sleep apnea lose the hours of deep sleep crucial for good rest resulting in tiredness during the day. This sleepiness may be mild, often encouraging minor catnaps after lunch, but in its more severe forms, it can cause debilitating fatigue which, as a flightcrew member, can affect the safe operation of an aircraft.

Sufferers from established sleep apnea will frequently fall asleep during meetings or while driving their cars. In addition to extreme daytime sleepiness, sleep apnea may be responsible for headaches, high blood pressure, heart attacks, depression, impotence, and even sudden death. Snoring is the result of vibrations in the tissues and muscles of the throat. In cases of apnea, the throat tissues vibrate and collapse to the point of completely blocking the upper airway.

Flight crewmembers can do something about this common sleep disorder affecting flight performance.

When To Suspect Sleep Apnea

- Extremely loud snoring throughout the night in all body positions.
- Interrupted breathing between snores.
- Restless leg and body movements during sleep.
- Uncontrollable sleepiness during waking hours.
- Early morning headache, weight gain, and general fatigue, coupled with severe snoring.

Self-Help for Snorers

- Follow a supervised weight loss and exercise program which can improve muscle tone and enhance healthy sleep.
- Cut down or stop smoking.
- Do away with alcohol before bed.
- Avoid sedatives, antihistamines, and sleeping tablets where possible.
- Sleep on a firm mattress with a single pillow in a cool, well-ventilated room.

Sleep apnea sufferers are often unaware of their problem, and specialized sleep laboratory studies may be the only method by which their condition can be diagnosed. A physician can then recommend one or several remedies from a wide selection of treatments now available to the snorer, especially one who has been diagnosed with sleep apnea.

Snoring is no longer regarded as merely a conjugal nuisance, but rather a medical condition, both treatable and curable. Flightcrew members who nod in the cockpit and drivers who doze behind the wheel, a source of potential danger to themselves and others, can now have their snoring and associated apnea accurately diagnosed and treated. ■

About the Author

Derek S. Lipman, MD, is an ear, nose, and throat specialist practicing in Portland, Oregon, where he serves on the staff of several major hospitals. He has studied at leading sleep disorders clinics in the United States and Europe.

Reprinted from the Flight Safety Foundation's *Human Factors & Aviation Medicine.*

Treatment for Severe Snoring and Sleep Apnea

There are now more than 2,000 sleep disorder centers throughout the United States and Canada providing diagnostic and treatment facilities. Researchers at these centers are developing a wide range of help for victims of sleep disorders.

- Medications currently being prescribed include drugs which clear the nasal air passages, stimulate respiration, or promote wakefulness.
- Mouth devices are available which pull the tongue forward and widen the upper airway.
- A device can be obtained that pumps air into the nose during sleep, overcoming the tendency of the tissues to collapse. Known as "continuous positive airway pressure," this method is gaining increasing acceptance in helping people with apnea to get a good night's sleep.
- A number of surgical therapies have been perfected for snoring and apnea, ranging from procedures to improve nasal airflow to surgeries which remove excess tissue in the back of the throat.

This information, including a directory of sleep disorder centers in the US and Canada, is contained in "Stop Your Husband from Snoring," by Derek S. Lipman, MD. (Rodale Press, 1990)

For millions of people, snoring is an annoying affliction which disrupts sleep and can seriously affect task performance.

PHOTO BY ROBERT KING

In case you didn't have enough to worry about, now there's...

LT COLONEL FREDERICK V. MALMSTROM USAFR
USAF-Civil Air Patrol
Great Lakes Liaison Region
Wright-Patterson AFB, Ohio

SIMULATOR SIC

■ Do aircrews react the same in simulators as they do in flight? Unfortunately, as much as we'd like to believe it, the answer is a definite NO. For one thing (go back to your own experiences), think of how many times you've "crashed" your simulator versus a real aircraft. It's not at all uncommon for a fighter pilot to crash his simulator (unintentionally) at least once every ride. It's obvious we all take risks in the simulator we just wouldn't take in the air.

Second, for the past 10 years, it's been a gradual puzzlement for researchers to recognize the motion sickness aircrews develop in the air isn't the identical motion sickness they develop in the simulator. Hence, simulators and aircraft simply *can't* be equivalent if they don't generate the identical physiological reactions. And this lack of equivalency is what this article is all about.

Flight Simulators Are Here to Stay

Don't get us wrong. Whatever their shortcomings, simulators are a fact of life. Today, the armed forces can buy a pretty good cockpit procedures trainer for kilobucks that only 10 years ago would have passed for a powerful megabucks flight simulator. And these simulators are a great deal safer and a much, much less costly alternative to the real airplane. Simulators are so much trusted, for many years now the FAA has permitted all B-737 pilots to do their entire transition training and qualification in the

PHOTO BY ROBERT KING

simulator. It's possible your first flight as a passenger in the 737 may be the first flight for your copilot, too.

All Fliers Have Their Limits

There are only two kinds of pilots — those who have experienced motion sickness and those who are going to experience it. Motion sickness comes in many deceptive forms. Too much motion (or even the perception of motion) will eventually get to everyone. Unfortunately, motion sickness doesn't occur only in the air. Some very experienced fliers get motion sickness in widescreen movies, on carnival rides, roller skates, space shuttles, elevators, and most recently, in-flight simulators.

Motion sickness isn't just vomiting — it's a whole range of connected symptoms from a vague discomfort to those completely disabling flu-like symptoms astronauts and their doctors have elegantly dubbed Space Adaptation Syndrome. Motion sickness often, though not invariably, goes through a progression of symptoms starting from some vaguely mild ones and escalating to some very specific, unpleasant ones.

A New and Different Kind of Motion Sickness?

To complicate this matter further, the progression of symptoms varies from aircraft to simulator. No two simulators yield the same checklist of symptoms, either. Figure 1 shows a "typical" (perhaps oversimplified) progression of the common types of sickness you might experience in the aircraft versus the simulator.

The two lists in figure 1 are just averages — you wouldn't necessarily experience every symptom in order or even all of them. But even these averages tell us there are some important differences and similarities between the two kinds of motion sicknesses.

Simulator sickness symptoms typically contain two important complaints not ordinarily found in aircraft-based motion sickness — namely, the vision and the so-called postural disturbances. Let's go over some of them.

Eyestrain, including focusing difficulties and visual fatigue, is a rather common complaint in the simulator but rarely ever reported as a part of actual aircraft motion sickness. Ataxia, defined as "an inability to control voluntarily muscular coordination," includes some unsettling aftereffects such as the "leans" and the "staggers." It's when the sidewalk keeps pitching and rolling long after you get off the ship. In their own words, some Army and Navy pilots have described their simulator sickness experiences as:

- "Dizziness, vertigo, and slight nausea — I fell down the stairs."
- "Problems walking straight after 4 to 6 hours in a simulator."
- "Felt slow moving — two times I waited 1 to 2 hours before driving home."
- "General malaise and biliousness . . . lasted 3 to 4 hours — I did not want to fly during that time."

There are two potentially nasty features about simulator sickness you may not be prepared for. For up

continued

KNESS

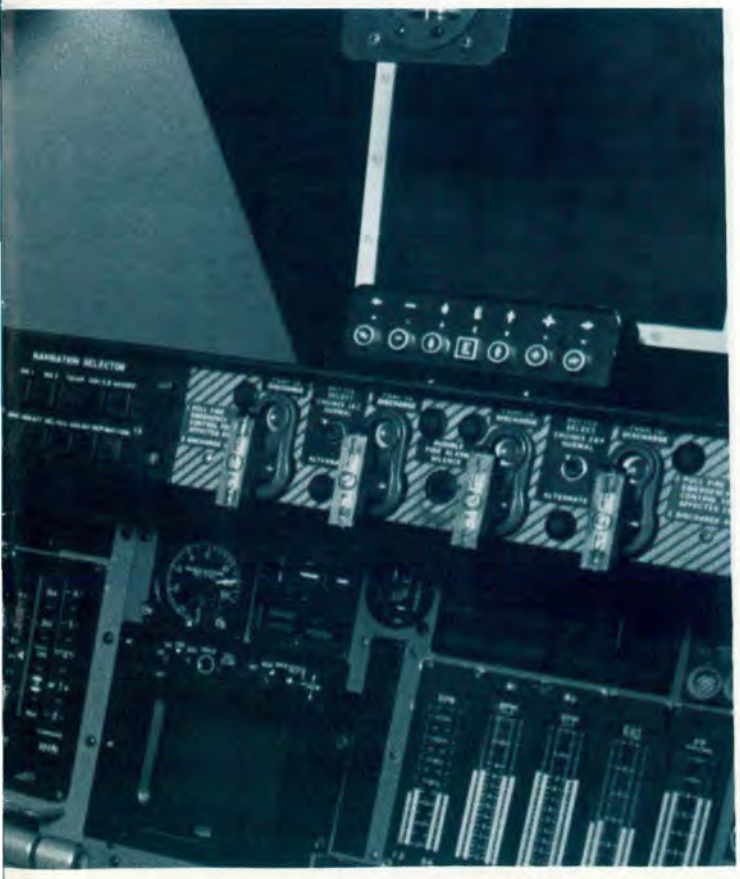

Figure 1

A typical progression of vision and motion sickness symptoms beginning with the most common (and mildest) to the least common (and most severe).

AIRCRAFT* SYMPTOMS	SIMULATOR** SYMPTOMS
Yawning	Eyestrain and headache
Drowsiness	Nausea
Pallor (paleness)	Ataxia ("leans" and "staggers")
"Cold" sweats	Sweating
Headache	Disorientation and confusion
Nausea	Dizziness
Vomiting	Vomiting

* Adapted from J.T. Reason and J.J. Brand (1976).
** Adapted from R.S. Kennedy (1989) and G.O. Allgood (1989).

SIMULATOR SICKNESS

continued

to 24 hours *after* the ride, (a) the symptoms may linger and (b) they may recur spontaneously; that is, they may (in about 1 percent of the cases) reappear as a minor visual "flashback." As a safeguard against these unwelcome residuals, the Army, Navy, and Marine Corps now routinely ground pilots for 6 to 24 hours after simulator rides. Postmission simulator sickness is very common. Figure 2 shows the percentages of hundreds of military pilots who have reported it.

High-Time Pilots Are At Risk

Who is at risk? Contrary to what you might think, studies show it's the high-time (1,500+ hours) pilots who are more susceptible to simulator sickness, especially if they are new to the simulator. There are several possible theories which explain this paradox. The most logical theory says experienced pilots know the aircraft more intimately and are, therefore, quick to pick up, unconsciously, on the little differences between the simulator and the aircraft. Even tiny, millisecond differences in lag and control times between aircraft and simulator can apparently make a difference. It's this conflict between what the simulator *does* and what it *ought* to do that causes the experienced pilot most of that disorientation.

Figure 3 indicates both Navy helicopter and patrol/transport pilots experience higher incidences of simulator sickness than fighter pilots. Before you fighter pilots go off congratulating yourselves on your high tolerance to pain, let me quickly add there is probably another good reason for this difference. Most of the helicopter and patrol/transport simulators studied in figure 3 were also motion-based as well as visual. The fighter simulators were not motion-based. A visual simulator alone will induce simulator sickness. Adding motion to the simulator only complicates the problem.

So Much for Simulator "Realism"

There is a continuing and rational belief that flight simulators ought to be "realistic." That is, the more "realistic" high-fidelity visual displays, complex motions, bells, whistles, and gongs you place on the simulator, the better it will train aircrews. Historical evidence says this isn't necessarily so; low-fidelity simulators most often do the job quite adequately. Nevertheless, as the more elegant, high-fidelity simulators become less expensive, it is a fact they are here to stay. These simulators have their advantages, but they show their undesirable side effects when they don't perform exactly equivalent to the aircraft.

Some Guidelines for Simulator Sickness

I don't want to leave you with the feeling that problems of simulator sickness don't have a solution. The US Navy has adopted some guidelines for dealing with simulator sickness. I'll list and condense some of the more important ones here:

- Be aware simulator sickness lingers after the ride. If it does occur, report it immediately to your flight surgeon.
- Limit simulator flights to 2 hours. If possible, take breaks and reorient yourself.
- Good health and physical fitness, combined with familiarity in the simulator, reduce your susceptibility to simulator sickness.
- Be especially careful when driving home after a rigorous simulator ride. (This is the author's recommendation!) ■

FOOTNOTES

Thanks to Dr Robert S. Kennedy, The Essex Corporation, 1040 Woodcock Road, Orlando, Florida, and Mr Glenn O. Allgood, Oak Ridge National Laboratory, PO Box 2008, Oak Ridge, Tennessee, for most of the research contained in this article.

Much of the research herein was sponsored by the US Department of Energy and performed under contract by Martin Marietta Energy Systems, Inc.

Dr Frederick Malmstrom is Visiting Assistant Professor of Psychology at the University of Dayton.

Figure 2

Percentage of pilots reporting postmission simulator sickness* (source is 742 Army and Navy pilots):

Immediately after — 45 percent
After 1 hour — 25 percent
After 6 hours — 8 percent

* Up to 1 percent may also experience minor visual flashbacks.

Figure 3

Types of US Navy simulators which have reported simulator sickness (Source: 1,186 Navy simulator missions).

SIMULATOR TYPE	REPORTED SICKNESS
Helicopter	26-40 percent
Patrol/Transport	39-47 percent
Fighter	10-31 percent

OPS TOPICS

Kick The Tires Light The Fires

■ Somewhere in ancient Air Force history is the fictional account of pilots briefing a flight with "Kick the tires, light the fires, brief on Guard, first one on the runway is lead." If the story ever was true, it's gone the way of brown shoes. The reason pilots brief so thoroughly today was driven home in a recent hard landing.

The pilot was upgrading to a newer version of the same aircraft. The upgrading pilot's instructions were simply to show up at the aircraft the next day, and the crew would brief while waiting for departure clearance. So much for preflight briefings, especially for the planned, maximum effort landing.

By the book, thrust reversers are not used until *after* the nosewheel is lowered to the runway and the speed brakes are raised. But this particular instructor, like many other pilots in the squadron, had a different technique. Namely, put the throttles in the reverse thrust position in the flare, so when the reversers engaged, the wheels would just be touching down.

The instructor briefed this technique to the upgrading pilot on downwind, in the midst of all the other checks. When over the overrun, the instructor pulled the throttles to idle, and then to the reverse thrust position before touchdown.

Everyone on board felt the sudden deceleration just before the hard landing. The aircraft "arrived" with twice as much sink rate as desired. This sink rate helped the no. 4 engine pod scrape along the runway until the crew got everything straightened out. The maintenance folks straightened out the engine, with the help of more than $138,000.

Would a better preflight briefing have changed anything? If done properly, yes. The Dash-1 is clear in prohibiting the use of thrust reversers while in flight. It is equally clear there never has been a correct procedure for short field/maximum effort landings — it is an unauthorized maneuver.

Who Am I . . . Really?

I know who I am, but does everyone else know who I am? The flight briefing gave us "Falcon 51" for a callsign, and it worked pretty well for the first half of the flight.

But when it came time to recover from the restricted area, Center had other ideas. They insisted there was no flightplan on file for Falcon 51, but there was one for Falcon 31. If we wanted to come home, we'd have to use the Falcon 31 callsign.

Who was I to argue? Home is where the JP-4 is, and we were running low, waiting for a clearance. As we entered the approach control airspace, my good idea turned out to be bad judgment. While we were proceeding inbound, the *real* Falcon 31 flight was departing from the base. After a few minutes of confusion, we landed, and the other Falcon 31 was able to continue answering the radio as they had planned.

Sure, the system had dropped our flightplan and put in two plans for Falcon 31, but that's no excuse for my error. We had never changed callsigns before, and I would have done better to have insisted on a plan with my original callsign.

OPS TOPICS

A-10 "Passenger"

There are two types of people who fly on airplanes — passengers and crew. This arrangement works out well when there are comfortable seats and in-flight movies for the passengers to enjoy. It does not work so well, however, when there is only one seat for the pilot, but a passenger is occupying it.

Recently, an A-10A departed in formation for some practice work on the range. The pilot on board had every intention of remaining the pilot for the duration of the flight.

Passing 10,000 feet, the pilot performed an oxygen system check, noticed the cabin altimeter was on schedule for pressurization, and dropped the oxygen mask to wipe away perspiration. Flight lead continued the climb to 26,000 feet while giving the wingman channel changes for the radio.

The pilot of the no. 2 aircraft *tried* to comply with lead's requests, but the hot and cold flashes were making things very confusing for him. Things were so confusing the pilot failed to notice the cabin had not pressurized. About this time, the pilot left and a "passenger" sat down at the controls of the Warthog.

The aircraft began a slow turn away from lead. Lead was unable to raise the pilot on the radios (lead did not yet realize a passenger was flying the aircraft). Lead finally caught up with the errant wingman, and after many unsuccessful attempts, was able to have the passenger reduce the throttles to 80 percent and lower the nose in a shallow descent. When the passenger finally reconnected the oxygen mask and gang-loaded the regulator, the pilot returned to the controls and made an uneventful GCA monitored approach and landing.

As anyone who's ever endured the flight from San Antonio through DFW and on to Denver, will tell you, being a passenger is a numbing experience. If you aren't going to be part of the crew, you might as well take a bus.

Ten Percent Don't Get the Word

Why is it there's always somebody who doesn't seem to get the word? Recently, an enlisted aircrew member with a mild cold decided to — "self-medicate."

Three days prior to a scheduled flight, the crewmember admitted the cold was real. But darn! The clinic is closed. Time to try an over-the-counter brand of an antihistamine. The next day, the crewmember joined a deadhead crew to reach the staging base. During the descent, the crewmember got behind clearing the ears and finally resorted to a nasal spray to help. An hour after landing, the ears finally cleared. No sense in seeing a flight surgeon now.

Not until very sharp pain returned to the ears did the crewmember finally seek a flight surgeon. The flight doc prescribed the obvious — DNIF for 10 days. And for the 10 percent who still haven't got the word, *"Don't* self-medicate. Period." ■

MAINTENANCE MATTERS

From the FAA: Just Scratching the Surface

■ The FAA has issued an Airworthiness Alert reminding aircraft maintenance folks improper marking of the aluminum skin of a pressurized aircraft can lead to stress cracks and eventual failure. The alert was generated as a result of the National Transportation Safety Board's conclusion two rapid decompressions, which occurred on civilian airliners, were the result of cracks generated by personnel marking aircraft skin with a scribe during structural repair.

Scratches, scrapes, scribe marks, and other apparent minor damage modify the load path through the structure, creating undesirable stress concentrations which can, in time, cause catastrophic failure of the airframe skin.

While Air Force structural repair specialists are aware of the potential hazard of using a scribe to mark the skin of pressurized aircraft, many other specialists who may have the need to mark an area of aircraft skin may not be aware of this potential hazard.

Defective KC-135 Wheel Bearings

A KC-135 unit recently discovered a number of tanker main wheel bearings received from the supply system were defective. The defects consisted of pitted surfaces, nicks on rollers, and dents on the surface of the bearing.

These bearings are issued from supply coated with a protective shipping grease, therefore, the defects are not apparent until the grease is removed before being packed IAW T.O. 44B-1-3. The unit identified defective bearings under the following stock numbers:

3110-00-100-3593
3110-00-725-0566
3110-00-198-2280

Units using these stock numbers should ensure a thorough inspection of these bearings prior to use.

More Phantom Fire Lights

About 40 minutes into the mission, the F-4 pilot noticed the left fire light illuminate just as he was completing a high-angle-of-attack maneuver. After recovering, the pilot retarded the left engine throttle, and the fire light faded out. During the press to test, the fire warning system checked good. A visual check from another F-4 revealed no sign of fire or damage, but the pilot declared an emergency and landed uneventfully with the no. 1 engine at idle.

In another incident, an F-4 pilot noticed the left fire warning light illuminate as he was making a 3-G turn to the left at 20,000 feet. The fire warning system checked good, so the pilot shut down the left engine and made an uneventful single landing.

In the past few years, the F-4 fire warning system has become notorious for giving false engine fire and overheat indications, and the design folks are working hard to solve the problem. However, these two incidents could have been avoided. It seems, in both cases, maintenance found the cause of the problem was moisture in the fire warning harness inside the left AUX air door well.

The source of the moisture in both mishaps was believed to be from a recent aircraft wash. It's a good idea to take precautions to protect the fire warning circuits (and all connectors) from moisture during aircraft wash. The areas of the aircraft which are vulnerable to moisture intrusion should be briefed to all personnel involved in aircraft washing operations. ■

MAIL CALL

Send your thoughts and comments to:
Editor • *Flying Safety* • AFSA/SEDP
Norton AFB CA 92409-7001

DESERT SHIELD'S FIRST CLASS A

Editor:

■ In reference to the article "FSO's Corner: Desert Shield's First Class A" in the February 1991 edition of *Flying Safety* magazine.

Captain Scales is wrong in thinking that the F-16 crash he investigated in the Southwest Asia theater of operations was the first Class A mishap of Desert Shield. It may have been the first one occurring on the Saudi Arabian peninsula, but the C-5A crash at Ramstein AB, Germany on 29 August 1990 should more properly be labeled the first Desert Shield Class A mishap.

The mishap aircraft (a C-5A) was scheduled for a Desert Shield mission from Ramstein AB to Saudi Arabia. It sure sounds like a Desert Shield mission to me, and I should know, because I was one of the four survivors and I was heading to Operation Desert Shield at the time!

Sincerely

Frederick K. Arzt, Jr., Lt Col, USAF
Commander, 62 Services Squadron (MAC)
McChord AFB WA 98438

Thanks for reminding us of the many sacrifices made in support of Operations Desert Shield and Desert Storm by the warriors of the Military Airlift Command. Many heavy lifters spent less than 3 hours on the ground in the desert theater, but the months they spent in the air justify their part as Desert Shield and Storm heroes.

Our story title was intended to attract the readers to the unique circumstances of a remote, desert aircraft mishap investigation. By learning from the difficulties of today, FSOs will be better prepared for unusual situations in the future.

The distinction of being the first Class A is not nearly so important as the fact it was MAC's only Class A mishap. They obviously knew how to make their safety programs work to their advantage. Flying Safety *salutes MAC's safety efforts during the desert operations and the current Provide Comfort operations. — Ed.* ■

CROSS-COUNTRY NOTES

Rex Riley, the unannounced monitor of Air Force Transient Services throughout the world, can visit your base at any time, day or night. His anonymous inspections of your facilities and the helpfulness and concern of your personnel will never be known until well after their ratings are tallied. The bases who are honored by being on his list are there only because they consistently maintain their levels of excellence.

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New Addition

■ **McGuire AFB NJ** Rex had a chance to RON at McGuire on a recent mission. The services he received were very good. Unfortunately, it was 95 °F (25° above normal), and the air-conditioning in billeting had not been turned on for the summer. After identifying the problem and trying to solve it, contract quarters off base were graciously offered. The same helpful attitude was apparent in other areas as well. Dinners at the NCO Club are highly recommended.

Incirlik AB, Turkey Incirlik received instant fame when it became necessary to provide massive relief to the Kurds in Northern Iraq during Operation Provide Comfort. Rex had a chance to see first hand how transient crew services were affected by this large influx of aircrews and planes. Everyone there did a super job. They had a great attitude, kept their sense of humor, and provided great service. While you are there, pick up a bag or two of pistachios, but eat at the pax terminal snackbar only as a last resort.

Retained Award

Mildenhall AB UK Mildenhall provided its customary super service once again. This time Rex gave outstanding ratings to the base operation dispatch section, crew transport, and billeting functions. He found individuals in each of these areas who did much more than was required to make sure some specific needs he had were dealt with.

Dover AFB DE This was just a quick stop for fuel and a bite to eat. Rex found Dover has an excellent facility staffed by friendly, courteous people. They did their best to make his stopover as pleasant as possible.

Aviano AB, Italy A little off the beaten track for most folks, but if you get in there, you will find they have placed a lot of emphasis on providing quality service for transient aircrews. Again, Rex found a friendly, helpful attitude among all the people he came in contact with. An early morning arrival into this base snuggled up against the base of the mountains is a beautiful sight you won't soon forget.

Removed

It takes a dedicated team effort by many different agencies on a base to receive the Rex Riley Transient Services Award. This base was removed from the list because one member of the team made a serious mistake.

The transient maintenance personnel discovered and repaired a serious engine hydraulic leak. That was good. However, they failed to document both the leak and the fix in the aircraft forms. That was bad. When Rex showed up to fly the aircraft, hydraulic fluid was found on the engine. Maintenance personnel tried to convince him it was residual fluid from the previous problem.

The resulting confusion and misinformation was compounded by the lack of documentation. The fluid turned out to be a second unrelated hydraulic leak which could have had serious in-flight implications. While all the other agencies on base provided excellent service, this lapse in discipline caused this base to be removed from the list. ■

Loring AFB	ME	RAF Mildenhall	UK	RAF Upper Heyford	UK	Kunsan AB	KOR
McClellan AFB	CA	Wright-Patterson AFB	OH	Andersen AB	GU	Ramstein AB	GE
Maxwell AFB	AL	Pope AFB	NC	Holloman AFB	NM	Johnston Atoll	JQ
Scott AFB	IL	Dover AFB	DE	Dyess AFB	TX	Wake Island	WQ
McChord AFB	WA	Griffiss AFB	NY	Aviano AB	IT	Sembach AB	GE
Myrtle Beach AFB	SC	KI Sawyer AFB	MI	Bitburg AB	GE	RAF Alconbury	UK
Mather AFB	CA	Reese AFB	TX	Keesler AFB	MS	Hurlburt Field	FL
Lajes Field	PO	Vance AFB	OK	Howard AFB	PM	Carswell AFB	TX
Sheppard AFB	TX	Laughlin AFB	TX	George AFB	CA	Altus AFB	OK
March AFB	CA	Minot AFB	ND	Peterson AFB	CO	Grand Forks AFB	ND
Grissom AFB	IN	Vandenberg AFB	CA	Clark AB	RP	Fairchild AFB	WA
Cannon AFB	NM	Andrews AFB	MD	Moody AFB	GA	Mountain Home AFB	ID
Randolph AFB	TX	Plattsburgh AFB	NY	RAF Lakenheath	UK	Barksdale AFB	LA
Robins AFB	GA	MacDill AFB	FL	Zaragoza AB	SP	Hickam AFB	HI
Seymour Johnson AFB	NC	Columbus AFB	MS	Torrejon AB	SP	Kelly AFB	TX
Elmendorf AFB	AK	Patrick AFB	FL	Luke AFB	AZ	Travis AFB	CA
Shaw AFB	SC	Wurtsmith AFB	MI	Eaker AFB	AR	Norton AFB	CA
Little Rock AFB	AR	Williams AFB	AZ	Bergstrom AFB	TX	Tinker AFB	OK
Offutt AFB	NE	Westover AFB	MA	Davis-Monthan AFB	AZ	Charleston AFB	SC
Kirtland AFB	NM	Eglin AFB	FL	Zweibrucken AB	GE	McGuire AFB	NJ
Buckley ANGB	CO	RAF Bentwaters	UK	Hahn AB	GE	Incirlik AB	TK

FLIER'S INDEX OF THERMAL STRESS (FITS) °F FOR LIGHTWEIGHT FLIGHT SUIT

Instructions: Enter chart with local air temperature (°F) and relative humidity (%). At intersection, read FITS value and determine Zone.

Air Temp (°F)	Zone	Relative Humidity (%) 10	20	30	40	50	60	70	80
70		67	70	72	74	76	78	81	83
75		71	74	77	79	82	84	86	88
80		75	79	81	84	87	89	92	94
85	Normal	79	83	86	89	92	95	97	99
90		83	87	91	94	97	100	103	105
95		87	92	96	99	102	105	108	111
100		91	96	100	104	108	111	114	117*
105	Caution[2]	95	100	105	109	113	116*	120*	122*
110		99	105	110	114	118*	122*	125*	128*
115	Danger[3]	103	109	115	119*	124*	127*	130*	134*
120		107	114	119*	124*	129*	133*	136*	140*

Comments:

1. Chart is valid for clear sky to light overcast (shadows visible).

2. **Caution Zone:**
   a. Be aware of heat stress.
   b. Limit ground time (preflight, cockpit standby) to 90 minutes.
   c. Recovery time minimum 2 hours between flights.

3. **Danger Zone:**
   a. Limit ground time to 45 minutes or less if possible.
   b. Avoid more than one flight a day if possible.
   c. Low-level mission with temperatures in this zone are not advised.
   d. Recovery time as shown.

4. *When index is greater than 115, consider canceling all nonessential flights.

NOTE: FITS was designed to provide supervisors a guide to predict when fighter type cockpit environmental conditions during low level missions may jeopardize aircrew performance.

FITS developed at USAFSAM by Stribley and Nunnely, 1978.