

One day, a crew chief friend of mine was changing the LOX bottle when hydraulic power was inadvertently applied to the aircraft. The oxygen bay door jerked upwards, the corner of which caught the man on the right side of his head. He awoke a couple of minutes later with a lump the size of a golf ball and one heck of a headache.



Another accident occurred when a hydraulic troop was working on the leading edge flaps of an F-4. His right hand was behind the flap; the flap having been previously lowered. Hydraulic power was accidentally applied, the flaps rose restraining him by the hand. Result--one crushed right hand with numerous broken bones.



There was also an Egress troop working in the back seat of yet another F-4. The bucket was removed; he was working on the rails. As he was jockeying components around, the canopy initiator activated, filling the canopy area with smoke. No physical injuries, but the troop had to change his shorts.



The list of personal observations I've made could go on and on. I decided to limit my lesson to just these examples and elaborate on them. I stressed the fact that accidents will happen for as long as aircraft maintenance has to be done; in fact, for as long as man feels the need to invent and twiddle with machines. I also stressed that accidents that do occur do not have to occur as frequently nor with severe injuries, if every available precaution is taken. If an accident does occur in spite of proper precautions, then it is probably fate.

I gave the presentation as planned, with great emphasis and much heart-felt concern. At the end of the presentation, a troop declared that he'd rather not work around aircraft if it was that dangerous. It was hard to tell if I had made an impact or not. Those of you who work in the shops and on the line, help the new troops out. Show them the right way to do it. You could save them a finger, a hand, or... ➤



INERTIAL COUPLING

OR

How I Learned to Maneuver an Aircraft at Negative G and Love It

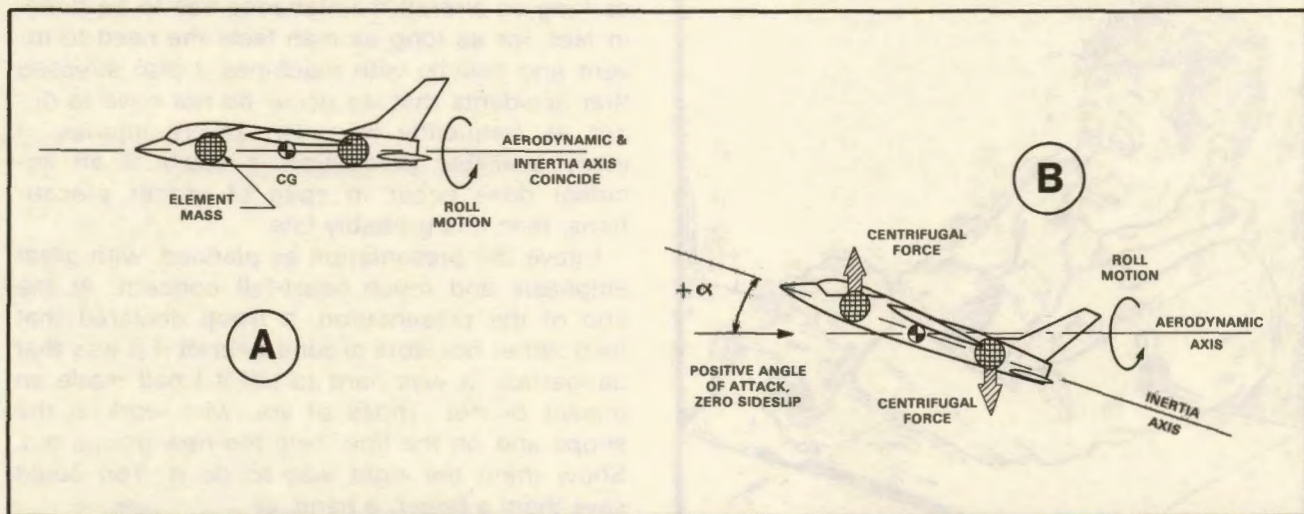
I'm certain you all know what inertial coupling is, right? Oh, you don't? Actually, I wasn't too sure that you did. I'm also sure that you're not too keen on finding out what it is to begin with. After all, who wants to read another boring article on aerodynamics? I sure wouldn't. So in that vein, I'll try to keep this from getting too heavy. But watch out, I'm not making any guarantees.

First of all, we're going to have to understand what "coupling" actually is. "Coupling" results when some disturbance about one airplane axis causes a disturbance in another axis. An example of uncoupled motion occurs when the elevator position is changed. The aircraft's pitch increases or decreases, but nothing else happens. On the other hand, if you take a swept-wing aircraft and push on the rudder, you get a yaw and also a roll movement. This is what is

known as "coupling." This sort of interaction results from aerodynamic characteristics and is termed "aerodynamic coupling."

The importance of this phenomenon has long been recognized in the description of adverse yaw and the potentially dangerous roll in the direction opposite that of intended flight. Proverse yaw is less understood and may result in departures from controlled flight in the direction of intended roll. Proverse yaw occurs when a deflection of the ailerons results in a yaw in the direction of aircraft roll. The potential for this problem is present in all high performance, swept-wing aircraft. It is very evident in the F-105. All you other fighter drivers, don't stop reading! We lost an F-4 because of this characteristic not too long ago.

Control inputs which will negate the effects of adverse yaw have been taught to every pilot.



COUPLING



By Maj Dave Wherley
FSO/NGB

Some aircraft require an extensive amount of rudder to coordinate rolls at high angles of attack, while others roll exclusively with rudder. These very control inputs can get you into a great deal of trouble if applied at low and negative angles of attack. But let's leave adverse and proverse yaw for a moment and talk about something else--inertial coupling.

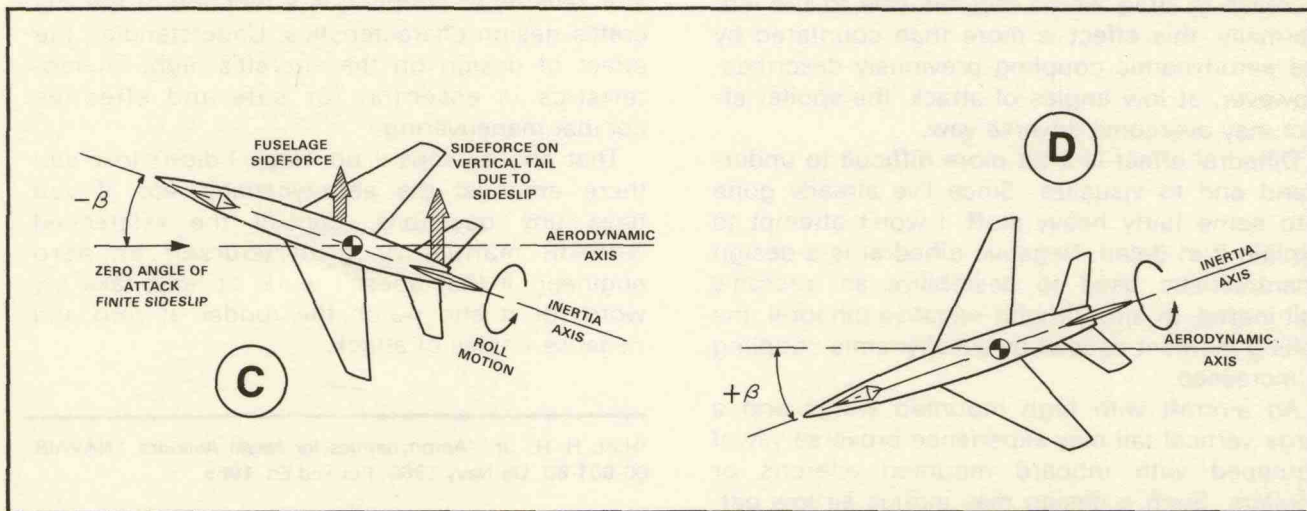
You know what inertia is--that's the tendency of a particular body to resist movement in any particular plane, or the tendency to continue a movement once started. For example, an aircraft with a long fuselage and short, thin wings has a higher level of inertia in the pitch and yaw axes and lower inertia in the roll axis.

Inertial coupling can be illustrated by considering the mass of an airplane to be concentrated in two elements, one representing the mass ahead of the c.g. and one representing

the mass behind the c.g. There are two principal axis systems to consider: (1) the aerodynamic or wind axis is through the c.g. in the relative wind direction, and (2) the inertia axis is through the c.g. in the direction of the two element masses. This concept is explored in figures A, B, and C below. Heads up now, I'm starting to get a little heavy...

Aircraft A is shown at zero angle of attack. The aerodynamic and inertia axes coincide with the mass distribution of the fuselage which is divided fore and aft around the center of gravity. Aircraft B demonstrates the inertia forces created at a high angle of attack. Roll about the aerodynamic axis results in a centrifugal force (of the two element masses) and leads to a pitching tendency. As the aircraft passes 90° of left bank as in C, the initial angle of attack, α , becomes sideslip angle $-\beta$. The effect of relative wind is identical to the aerodynamic effect previously described and increases the tendency to roll back to the right. If that tendency is too great (the initial α was large or because of wing design), a classic departure in the direction opposite the intended roll may occur.

At negative angles of attack, the effect of inertia coupling is opposite that described in the preceding discussion and will increase the roll rate. The aircraft at D started with a negative α and has rolled 90° to the left. The sideslip now causes the aircraft to roll further left--creating more centrifugal force, more sideslip, more roll, and...voila...a coupling that will water your eyes.



Inertial Coupling

An aircraft with a long slender fuselage may exhibit inertia characteristics that override the aerodynamic effects at negative angles of attack. The application of rudder in the direction of roll under these circumstances will increase the proverse yaw and could result in a snap roll. At a zero angle of attack, yaw due to inertia coupling will not occur; however, other design characteristics can cause proverse yaw.

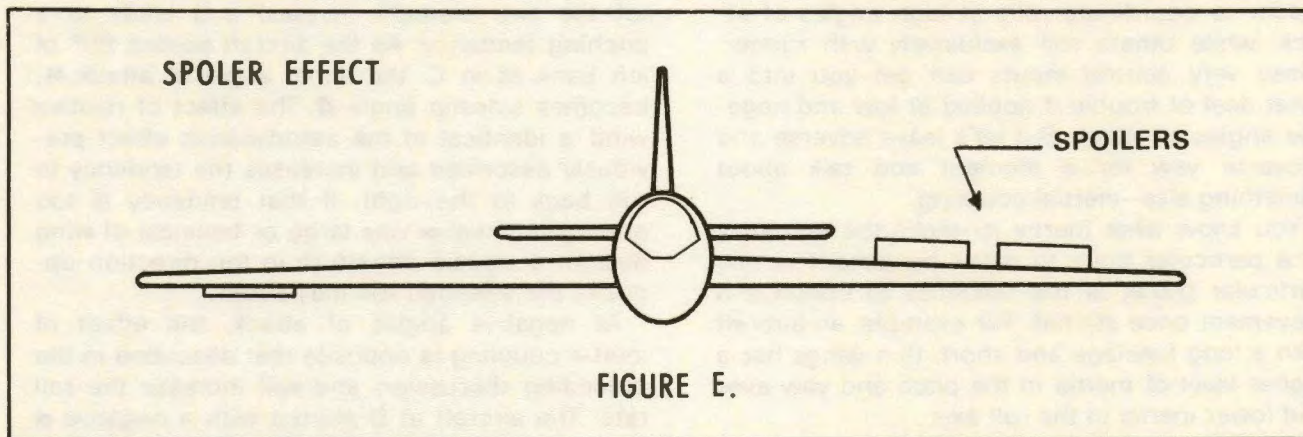
The design characteristics that can generate proverse yaw at zero or small positive angles of attack include high mounted wings with negative dihedral, large vertical tail, and spoilers. A long slender fuselage will increase the effect of proverse yaw due to inertia coupling. The F-105 has all these characteristics (so does the B-52).

The influence of spoilers on producing proverse yaw is easy to understand. Figure E

terns at the vertical tail conducive to proverse yaw. (1:291)

Because of the proverse yaw characteristics of the F-105 and other fighter aircraft at small angles of attack, misuse of the rudder is particularly dangerous. Use of pro rudder under these circumstances could result in an out-of-control situation. Aircrews must avoid the tendency to use rudder to increase roll rates. Its purpose is to coordinate the roll. During a rapid turn reversal at zero or negative angles of attack, opposite rudder will be required to coordinate the roll. Keeping the rudder neutralized should be sufficient to prevent a snap roll as long as excessive aileron deflection is not used.

Because of roll coupling, continuous aileron rolls and maximum deflection aileron rolls are prohibited in most aircraft. Misuse of the rudder



shows the form drag introduced when attempting a left hand roll.

The spoilers on the left wing cause an increase in drag which induces yaw to the left. Normally, this effect is more than countered by the aerodynamic coupling previously described. However, at low angles of attack, the spoiler effect may overcome adverse yaw.

Dihedral effect is a lot more difficult to understand and to visualize. Since I've already gone into some fairly heavy stuff, I won't attempt to explain it in detail. Negative dihedral is a design characteristic used to destabilize an aircraft's roll inertia. In aircraft with negative dihedral, the rolling moment caused by aerodynamic coupling is increased.

An aircraft with high mounted wings and a large vertical tail may experience proverse yaw if equipped with inboard mounted ailerons or spoilers. Such a design may induce airflow pat-

terns at the vertical tail conducive to proverse yaw. All swept-wing aircraft are subject to roll coupling. The degree and severity of coupling is a function of the aircraft's design characteristics. Understanding the effect of design on the aircraft's flight characteristics is essential for safe and effective combat maneuvering.

That about wraps it up. Hope I didn't lose you there amongst the aerodynamics, etc. If you have any questions, consult the referenced NAVAIR manual or grab yourself an aero engineer. If that doesn't work, at least take my word for it and watch the rudder at zero and negative angles of attack.

¹Hurt, H. H., Jr. "Aerodynamics for Naval Aviators," NAVAIR 00-80T-80. US Navy 1960, Revised Ed. 1965.

Reader Response Form

HOW WOULD YOU RATE THE FOLLOWING **TAC ATTACK** MATERIAL?

TYPE OF ARTICLE/FEATURE		YUCK	50-50	GOOD	SUPER
REG FEATURES	ANGLE OF ATTACK				
	CHOCK TALK				
	TAC TIPS				
	WEAPONS WORDS				
	SPO CORNER				
	AWARDS				
	LETTERS				
	FLEAGLE				
TYPE ARTICLE	EMERGENCY SITUATION TNG				
	LIFE SCIENCES/SURVIVAL				
	AIRCRAFT OPERATIONS				
	WEATHER				
	MAINTENANCE				
	GROUND SAFETY				
	HISTORICAL				
	FUNNY PHOTOS				
	CURRENT DEVELOPMENTS (AIRCRAFT)				
	WAR STORIES				
	CENTER SPREAD ARTWORK				

CAN BE IMPROVED 50-50 GOOD

MAGAZINE LAYOUT

ARTWORK, PHOTOS, ETC

HOW MANY ISSUES OF **TAC ATTACK** HAVE YOU SEEN IN THE PAST YEAR? _____

HOW SOON AFTER THE FIRST OF EACH MONTH DO YOU SEE A COPY?

- A. THE SAME MONTH? C. TWO MONTHS LATER?
- B. ONE MONTH LATER? D. OVER TWO MONTHS?

HOW WOULD YOU COMPARE **TAC ATTACK** TO THESE SAFETY MAGAZINES?

	BETTER	WORSE	ABOUT THE SAME	DON'T KNOW
AEROSPACE SAFETY				
MAC FLYER				
USAFE AIRSCOOP				
APPROACH				

HAS **TAC ATTACK** HELPED YOU IN YOUR PRESENT DUTIES? NO YES

HOW? _____

IF YOU COULD CHANGE **TAC ATTACK** IN ANY WAY, WHAT CHANGES WOULD YOU MAKE? _____

WHAT TYPE ARTICLES WOULD YOU LIKE TO SEE MORE OF/LESS OF? _____

JOB AND RANK: _____

CUT ALONG SOLID LINE

Reader Response Form

HOW WOULD YOU RATE THE FOLLOWING **TAC ATTACK** MATERIAL?

TYPE OF ARTICLE/FEATURE		YUCK	50-50	GOOD	SUPER
REG FEATURES	ANGLE OF ATTACK				
	CHOCK TALK				
	TAC TIPS				
	WEAPONS WORDS				
	SPO CORNER				
	AWARDS				
	LETTERS				
	FLEAGLE				
TYPE ARTICLE	EMERGENCY SITUATION TNG				
	LIFE SCIENCES/SURVIVAL				
	AIRCRAFT OPERATIONS				
	WEATHER				
	MAINTENANCE				
	GROUND SAFETY				
	HISTORICAL				
	FUNNY PHOTOS				
	CURRENT DEVELOPMENTS (AIRCRAFT)				
	WAR STORIES				
	CENTER SPREAD ARTWORK				

CAN BE IMPROVED 50-50 GOOD

MAGAZINE LAYOUT

ARTWORK, PHOTOS, ETC

HOW MANY ISSUES OF **TAC ATTACK** HAVE YOU SEEN IN THE PAST YEAR? _____

HOW SOON AFTER THE FIRST OF EACH MONTH DO YOU SEE A COPY?

- A. THE SAME MONTH? C. TWO MONTHS LATER?
- B. ONE MONTH LATER? D. OVER TWO MONTHS?

HOW WOULD YOU COMPARE **TAC ATTACK** TO THESE SAFETY MAGAZINES?

	BETTER	WORSE	ABOUT THE SAME	DON'T KNOW
AEROSPACE SAFETY				
MAC FLYER				
USAFE AIRSCOOP				
APPROACH				

HAS **TAC ATTACK** HELPED YOU IN YOUR PRESENT DUTIES? NO YES

HOW? _____

IF YOU COULD CHANGE **TAC ATTACK** IN ANY WAY, WHAT CHANGES WOULD YOU MAKE? _____

WHAT TYPE ARTICLES WOULD YOU LIKE TO SEE MORE OF/LESS OF? _____

JOB AND RANK: _____

Reader Response Form

NAME OF ATTORNEY	OFFICE	ADDRESS	PHONE	TELETYPE	TELEFAX

FOLD ALONG DOTTED LINE
TAPE AND DROP IN MAILBOX

HQ TAC/SEPP
LANGLEY AFB VA 23665



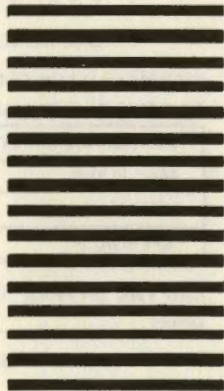
OFFICIAL BUSINESS
Penalty for Private Use, \$300

NO POSTAGE
NECESSARY
IF MAILED
IN THE
UNITED STATES

BUSINESS REPLY MAIL
FIRST CLASS PERMIT NO 4006 HAMPTON VA 23669

POSTAGE Will be Paid by

DEPARTMENT OF THE AIR FORCE
1st Combat Support Group/DAA
Langley AFB, Virginia 23665



Reader Response Form

NAME OF ATTORNEY	OFFICE	ADDRESS	PHONE	TELETYPE	TELEFAX

FOLD ALONG DOTTED LINE
TAPE AND DROP IN MAILBOX

HQ TAC/SEPP
LANGLEY AFB VA 23665



OFFICIAL BUSINESS
Penalty for Private Use, \$300

NO POSTAGE
NECESSARY
IF MAILED
IN THE
UNITED STATES

BUSINESS REPLY MAIL
FIRST CLASS PERMIT NO 4006 HAMPTON VA 23669

POSTAGE Will be Paid by

DEPARTMENT OF THE AIR FORCE
1st Combat Support Group/DAA
Langley AFB, Virginia 23665



DOWN TO EARTH

FOOD FOR THOUGHT

Growing use of electronic pocket calculators has brought a message of caution from the JOURNAL OF ENVIRONMENTAL HEALTH. It warns that an improperly shielded calculator can explode.

As a case in point, the JOURNAL reported that one man carrying a calculator in his shirt pocket was knocked down by such an explosion. The cause was a metal object in the man's pocket touching the calculator's unprotected battery charge contacts, creating a thermal runaway, shorting out the nickel-cadmium batteries and causing the explosion.

The JOURNAL went on to say that even a pencil's lead can cause such a thermal runaway. The best preventive measure, the article concluded, is to always carry it in its case.

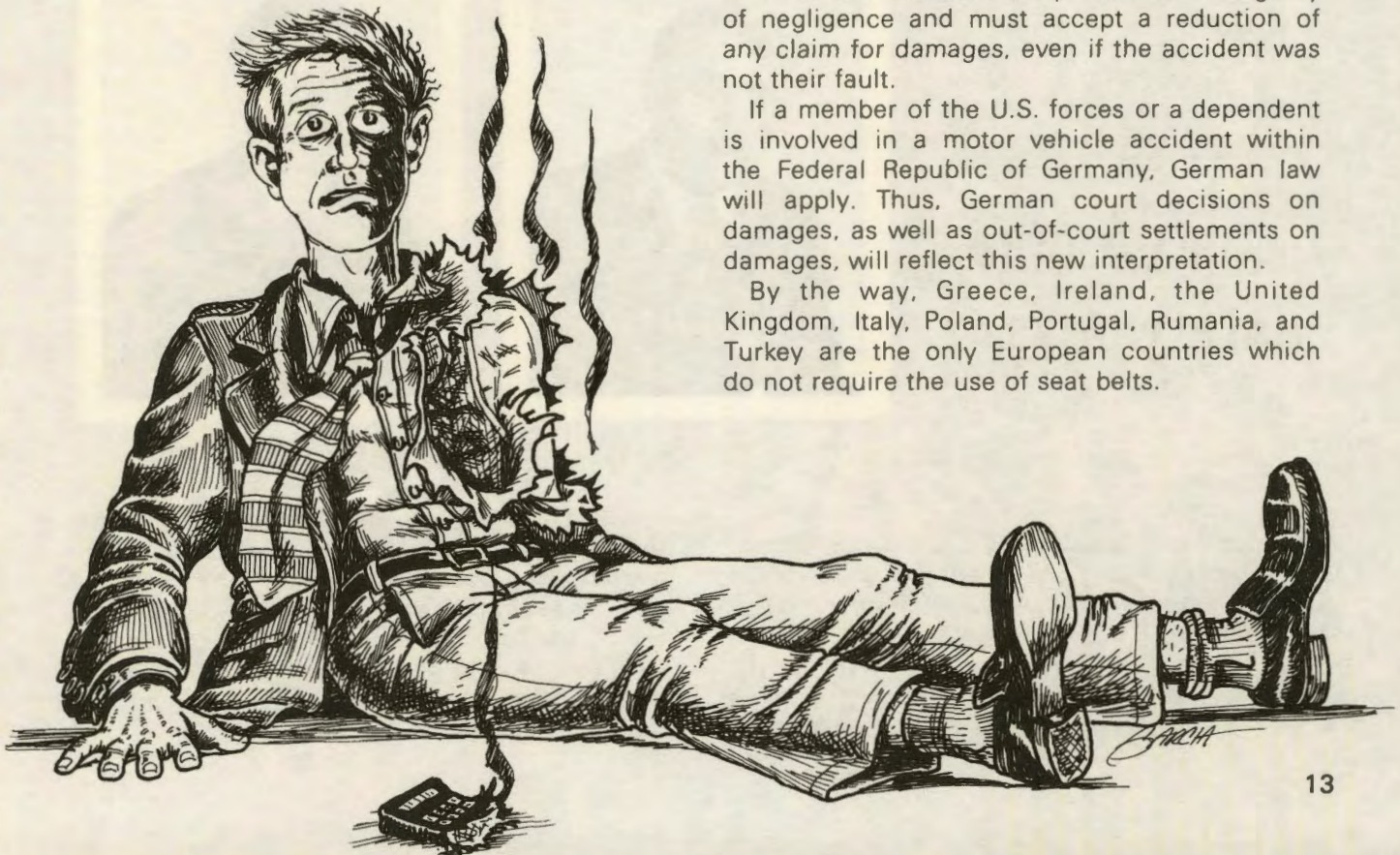
A special word of caution from the JOURNAL was a reminder that many youngsters are now carrying these calculators and should be alerted to this danger.

GOING TO GERMANY?

Better fasten your seat belt. Why? The German Federal Supreme Court has ruled that, from a medical and technical point of view, motor vehicle occupants who use seat belts have a considerably reduced risk of injury. Therefore, motorists injured in a vehicle accident who failed to use seat belts are presumed to be guilty of negligence and must accept a reduction of any claim for damages, even if the accident was not their fault.

If a member of the U.S. forces or a dependent is involved in a motor vehicle accident within the Federal Republic of Germany, German law will apply. Thus, German court decisions on damages, as well as out-of-court settlements on damages, will reflect this new interpretation.

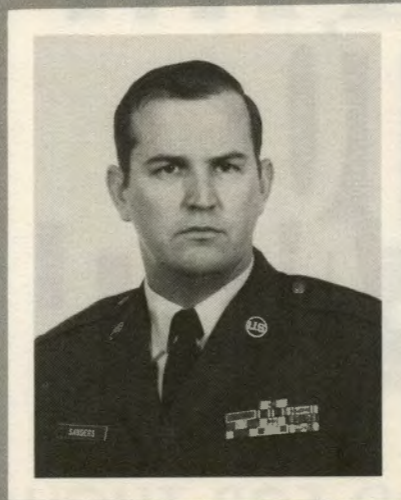
By the way, Greece, Ireland, the United Kingdom, Italy, Poland, Portugal, Rumania, and Turkey are the only European countries which do not require the use of seat belts.



TAC SAFETY AWARDS

Individual Safety Award

Staff Sergeant Ben A. Sanders, 552d Aircraft Generation Squadron, 552d Airborne Warning and Control Wing, Tinker Air Force Base, Oklahoma, is the recipient of the Tactical Air Command Individual Safety Award for July 1979. Sergeant Sanders' safety consciousness was demonstrated by his detection of a safety hazard involving the E-3A aircraft. During an engine intake inspection he discovered a defective retainer nut and took the initiative to personally inspect the entire aircraft fleet. He discovered that 13 other engines had the same defect. Sergeant Sanders' awareness and knowledgeable action prevented an incident which could have had serious consequences.

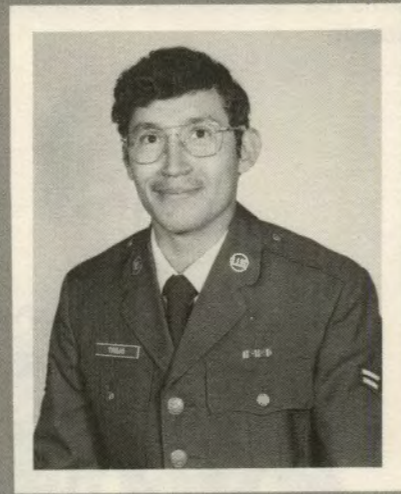


SSgt Ben A. Sanders

Crew Chief Safety Award



A1C Donald L. Lytle



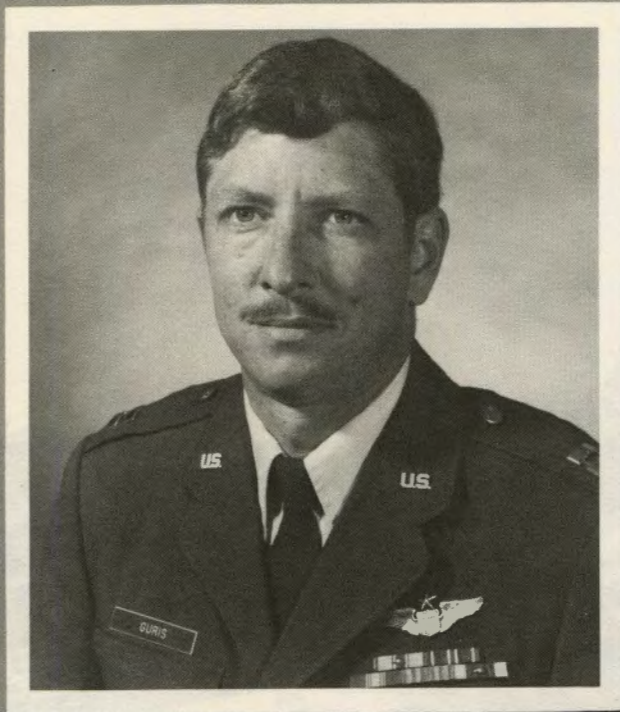
A1C Jack D. Trejo

Airman First Class Donald L. Lytle and Airman First Class Jack D. Trejo, 474th Aircraft Generation Squadron, 474th Tactical Fighter Wing, Nellis Air Force Base, Nevada, are the recipients of the Tactical Air Command Crew Chief Safety Award for July 1979. Reacting immediately to an engine explosion, they assisted the aircrew to

egress the aircraft and fought the fire with disregard to their own personal safety. The stricken aircraft was located in an area surrounded by rows of other aircraft in various stages of readiness, all fully loaded with fuel--some with weapons. Numerous personnel were also in the vicinity. Their heroic actions prevented a potential calamitous situation.



AIRCREW OF DISTINCTION



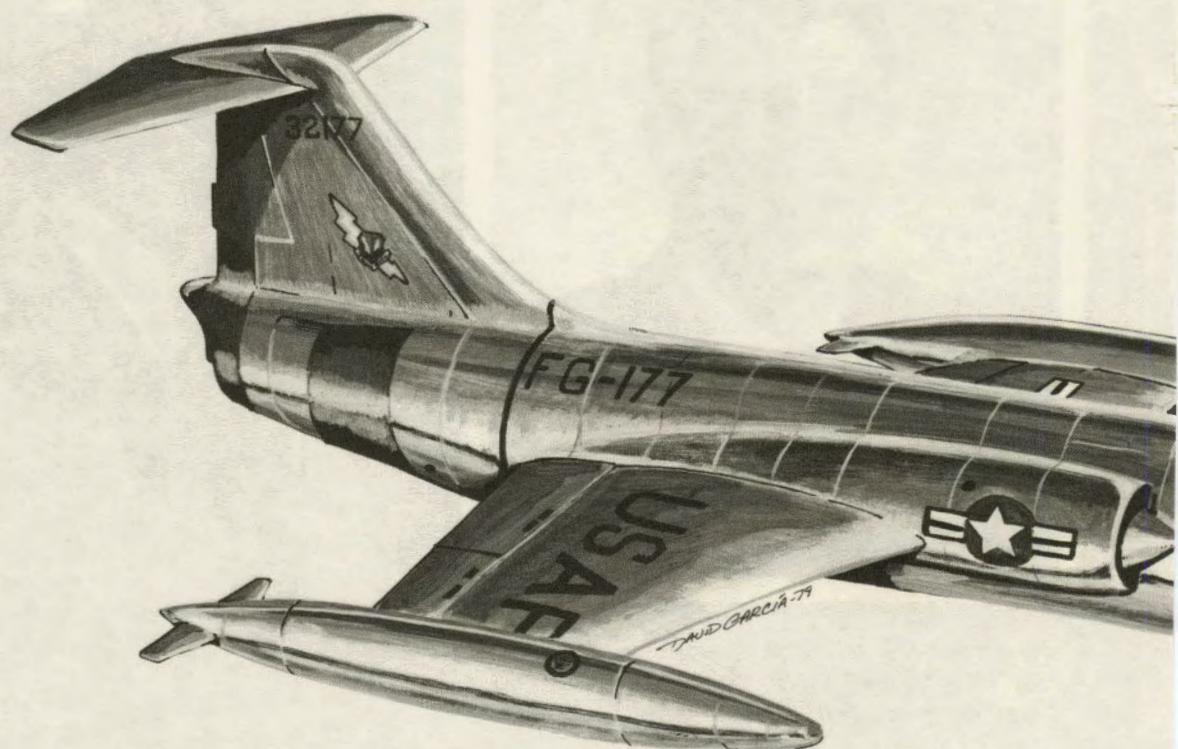
Capt John J. Guris
357 TFTS/355 TFW
Davis-Monthan AFB, AZ

On 15 February 1979, Captain Guris was number three in a four-ship ground attack mission on Luke AFB Gunnery Range Four. The mission was normal through two bombing events (four passes). When on normal climbing turn to crosswind leg, after the first low angle strafe pass, the canopy plexiglass imploded. Captain Guris was struck in the facial area by pieces of plexiglass. He sustained a fractured helmet visor shell, a fractured tinted visor (lowered in place), a fractured clear visor (retracted), a dented oxygen mask shell, and minor facial injuries.

Disoriented by the implosion, high noise level, and injuries, Captain Guris rolled wings level and climbed. He slowed the aircraft to below 250 knots and performed a controllability check. With the aircraft under control, Captain Guris proceeded to Gila Bend Auxiliary Air Field (20 NM northeast of Range 4) and recovered without further incident.

The skill exhibited by Captain Guris, as well as his timely and decisive actions, prevented possible loss of life and the recovery of a valuable aircraft. This achievement qualifies him as the TAC Aircrew of Distinction.

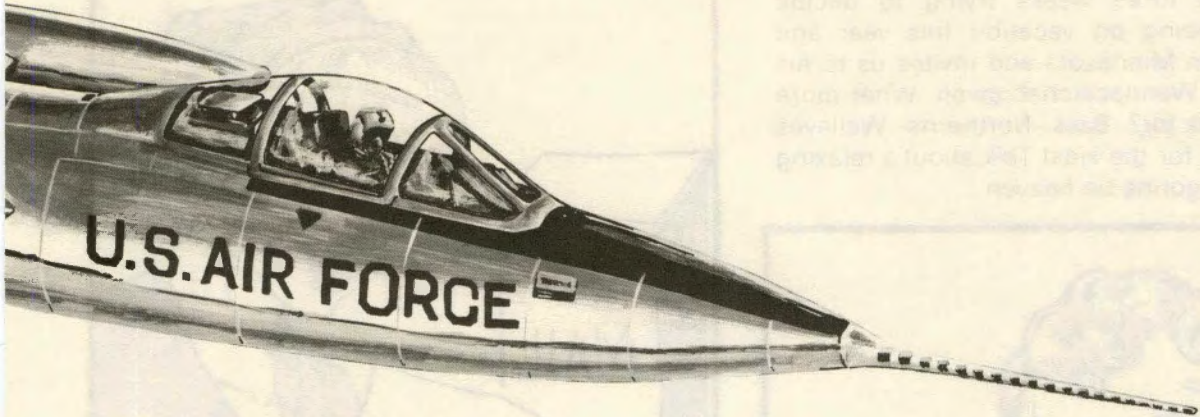
F-104 Starfighter



THE TRAVELERS OF ED AND MAGGIE

By *Gregg DeGuire*
Crew

Maggie is a...
...the...
...the...
...the...
...the...
...the...



I don't believe in Ed and I have been...
...the...
...the...
...the...
...the...
...the...
...the...
...the...
...the...
...the...



THE TRAVELS OF ED AND MAGGIE

By Capt Pete Abler
Editor

Boy, won't Maggie be surprised! Here we've spent the last three weeks trying to decide where we're going on vacation this year and Frank calls from Minnesota and invites us to his cabin on Lake Wannacatchabigwan. What more could a man ask for? Bass--Northerns--Walleyes --even Sunfish for the kids! Talk about a relaxing two weeks. It's gonna be heaven...



I don't believe it! Ed and I have been racking our brains trying to find a place to go for our two weeks' summer vacation this year. We've been saving since last summer so we could afford a nice trip, but where to go? And today in the mail, a letter from Sue inviting us to Dallas. Just think of all the places to shop and to see. Ed can even take the kids to Six Flags and a few Ranger games. Best of all, I'll get to see Sue. We haven't seen her since the family reunion three years ago. Talk about the answer to our prayers...

The scene which followed later that evening made the siege of Bastogne look about as exciting as a world class chess match. As each side advanced, retreated, or attempted to flank the other, a perfect countermove prevented either from gaining the advantage. The battle carried on into the morning hours and each side went to sleep exhausted.

The battle continued at breakfast where Ed munched his burnt toast, washing it down with day-old coffee. He managed a few retorts from behind the battlements of the morning paper. The stalemate continued. As the day wore on, it became obvious to Ed and Maggie that there was only one solution--to compromise. You know what a compromise is? That's where both sides end up with something neither one wanted. But that's another story...

After dinner that evening, they discussed how they were going to fit trips to Minnesota and Texas into a two-week vacation. Trying to travel 3,600 miles and still have time to visit all their friends, relatives, etc. in that short period would be tough--but not impossible.

It was agreed that Ed could get off from the plant early on Friday and come home, pack the car, and take a nap while Maggie got the kids from school, fed them dinner and took care of the last few details. If they left about midnite, they ought to get 8-900 miles done before stopping Saturday afternoon. That would leave about 400 miles to go on Sunday.

"Yea," said Ed, "we'll get there early Sunday afternoon and have until the next Friday before we have to head for Texas. I can get in four and a half good days of fishing. Then we can leave for Dallas about midnite on Friday and be in Dallas early Sunday the 22nd. The only thing that really bothers me is that 1,400-mile trip from Dallas back here. You know, we both have to be back to work on Monday the 30th, so we absolutely have to be back home on the 29th. Guess we'll leave Dallas about noon on the 27th and get 400 miles out of the way and then plan the rest of the trip for Saturday and Sunday. Yea, we ought to be able to make it with a little bit of luck. Sure am looking forward to seeing Frank and getting out there to catch those lunkers..."

Friday the 13th of July...

Ed managed to get off at noon. He really had to work hard to get far enough ahead to get off early. Talk about being tired. As the next scene

opens, we find Ed getting home to pack the car.

"Maggie, I'm home. Got the car inspected this morning, oil changed, and lubed. We're ready to go. Where's the stuff you wanted packed? I want to get that done and get some rest. Boy, am I tired."

"It's all right here in the living room Ed. There are just a few more things I haven't gotten down here yet, but they'll fit into the corners. If you want any help carrying it out to the car, just give me a holler. I'll be in the laundry room."



"Maggie!!!! Where am I supposed to put all this stuff? We're only going to be gone for two weeks. You must have half of the clothes we own packed here. If I have to put all this stuff in the car, there won't be room for you and the kids. Whadya think we drive anyway, a moving van?"

"Now Ed, don't get upset. You never know when you're going to need some of this stuff. I've packed so that whatever we need, we'll have it. I know that you can make this fit. You've managed to make it fit somewhere almost every year. Here, I'll help you carry it out to the car."

As Ed was putting the finishing touches on this three-dimensional jigsaw puzzle, he silently mused to himself that there wasn't a judge and

The travels of Ed & Maggie

jury in the world who would call it anything but justifiable homic..... His train of thought was interrupted by Jerry and Jean arriving home from school. They seemed to enjoy the extra classes they were taking this summer, but were really looking forward to the vacation too. Oh well, time to have one more beer and get some shuteye. I feel like I could sleep a week at least. "Maggie, I'm going to bed. I'll be setting the alarm for 11. Make sure you get the car gassed up when you go out for dinner."

11 PM, Friday the 13th...

The alarm goes off awakening Ed. "Those beers sure made me sleep," he thought to himself. "Guess I'm still a little tired, but Maggie should be able to help with the driving if I get too sleepy. Sure wish that Jerry had his license; then he could do his share of the driving too." As he came into the living room, the evening news was just wrapping up. "Time to go everyone. Let's hit the road and do some traveling!"

"Maggie, where in tarnation did all this stuff come from? I thought I packed it all before I went to bed."

"There were just a few extra things we needed--you know, some food to munch on while we're driving, something to drink, sweaters, pillows, etc. I realize that we're cramped, but it will all work out after we've been driving a while."

After crushing a package of crackers and his sunglasses, Ed finally got settled into the seat and pressed on. By the time he had gotten onto the freeway, everybody was asleep, except for Ed. "A good time to travel," he thought to himself. "Nobody on the road but me and some truckers. The weather's good, it's nice and cool. Should be able to make a lot of miles tonight." After turning the dial on the radio station to get some good tunes, Ed settled back and engaged the cruise control. "Greatest invention since the toaster. Sure saves the cramp I used to get in my right leg."

As the gas tank was approaching the ¼ mark, Ed decided he'd better look for a gas station. There didn't seem to be too many open this time of night. "Blasted gasoline shortage! I don't

know who's responsible, but they sure end up sticking it to ole John Q. Public! Hope I can find one open." Ed decided to pull off into the next town to search for a station. To his relief, there was an open station on the exit where he gassed up and pressed on once more. Didn't even wake anyone up during the gas stop. Soon, Ed began to wish someone was awake so he could talk to them. "Really getting tired now. Let's roll down the window, breathe some of that fresh air. That will help for a while. Stretch a little. Find a new station on the radio. I'll just go a few more miles and then I'll wake Mag...."

When Ed woke up, he noticed that the ride seemed awfully bumpy. "OHMIGOSH, I'm on the median--at 60 MPH!!! Just got it back on the freeway in time. That stand of trees would sure have been the end of us all. Guess I'd better let Maggie drive. Maggie...Maggie...Wake up. I need you to drive."



"OK! OK! Just let me wake up. What time is it anyway? We just left home a few minutes ago. It's almost five? Guess I didn't realize how long we've been on the road. Pull over at the next exit, and I'll take over."

Maggie took over at the wheel and continued driving. She and Ed swapped off during the day.

They managed to make their 900 miles, but by then they could barely keep their eyes open. They were too pooped to even take a dip in the motel pool with the kids. After a quick dinner, all they could do was to collapse into bed--exhausted.

Sunday the 15th of July...

"Well, we're almost there. Can't wait to see Frank and his family. When we were smaller, we used to spend entire summers together. Sure had a lot of fun then. Don't know how we're going to make the rest of this trip. I'm a lot more tired than I thought I would be. I'm sure I'll recover by tomorrow. Can't wait until I get out there fishing."

Frank really had a nice cabin set up. Just the right size for the four of them. Even though they were tired from the trip, they stayed up until the wee hours of the morning catching up on old times and making plans for the rest of the week. Ed was going to fish a lot while Maggie and the kids were going to explore the nearby woods, swim, water ski, and just relax. It was going to be a fantastic week...

Monday the 16th of July...

At the crack of dawn, Ed was up and rarin' to go. Maggie and the kids wanted nothing to do with the whole operation. They decided to catch up on some well-deserved rest; but not Ed.

"What a beautiful day, dum dum de dum. Those fish won't have a chance. I'll make myself a few sandwiches, take a thermos of coffee and a couple of beers and get my limit by noon." As he headed out in the boat Ed thought to himself, "I could do this for the rest of my life." After finding a good spot, Ed proceeded to try his luck in a style that even Izaak Walton would have envied. By 11 in the morning, he had finished his sandwiches and coffee and decided to have a cool beer. It was getting hotter too, so he took his shirt and pants off. "I'll just sit here in my swimming trunks and the breeze will keep me cool. One more beer won't hurt--the fish must be hiding for a while."

When he woke up at two o'clock, Ed decided it was time to head back in. He noticed as he started that his shoulders seemed a little tight--burned a little too. "No sweat," he thought. "Just a little sunburned." As Maggie applied the lotion that evening she told him, "Ed, I don't see how you can go out in the sun for the next three or four days. You look like a lobster." So much for

the fantastic week of fishing...

Friday the 20th of July...

"Maggie, I don't see why you had to buy all those souvenirs. You knew that we didn't have an inch to spare in the car to begin with. This packing is getting a little ridiculous." Ed winced as he tried to maneuver the suitcase into the trunk. That sunburn he had gotten on Monday was still hurting. This was the first time he had ever blistered that badly. Frank was concerned and wanted him to see a doctor about it, but Ed wouldn't think of it. Who would have thought that the sun would be that bright. He'd only spent six hours on the lake and it seemed so nice without a shirt and all...

Anyway, it didn't hurt as much as Maggie's poison ivy. She was really looking bad. All those



patches on her arms and the constant scratching day and night was getting to him. The calamine lotion sure didn't seem to help much

Travels of Ed & Maggie

either. "Well, it's time to get everyone in the car. Sure don't intend to drive very far before we stop tonight. Don't want to end up driving down the middle of the freeway again!"

As Jerry came hobbling up to the car Ed thought to himself, "I told that kid not to hot dog it on those water skis. But would he listen to his old man??? Noooo. There was that cute girl from the third cabin down and he was going to impress her with his slalom. Guess he sure did. It's a good thing he had that ski belt on, probably wouldn't have stayed afloat without it--as much as that sprained ankle hurt.... I wonder why nothing happened to Jean? She seemed to do everything we did. Just lucky I guess..."

Saturday the 21st of July...

"Boy, we sure didn't get very far last nite. Barely made 200 miles before we had to stop. We're going to have to make up some time today." Ed pressed on, keeping the speedometer on 65 and one eye out for the Highway Patrol. Maggie kept telling him to slow down, but he wouldn't listen. "We've got a lot of lost time to make up. We don't want to end up driving all day Sunday and get to Dallas after dark."

The words were barely out of his mouth when he noticed the red light in his rearview mirror. "Blast" he thought to himself. "Can't afford a big ticket. Hope I can talk my way out of this one..."

The patrolman had seen it all before. For some reason he felt sorry for Ed and let him off with a warning citation--on the stipulation that Ed stop at the next town and take a rest there. Ed didn't have much choice since the patrolman followed him all the way to the motel...

Sunday the 22nd of July...

"Boy, it sure is hot here in Oklahoma! Too bad the car doesn't have air conditioning. But we don't need it back home anyway. I'm not sure how much more of this I can take. Seems like we've been driving all weekend and Dallas is still four hours away. Here I am, the only one awake again and... BANG! "What's that? Blew a tire! Well, I'll pull over to the side of the freeway and change it."

"Not much of a shoulder here, and those cars sure seem like they're going faster than 55 when they whiz by. Look at all this stuff I have to unpack just to get to the spare tire. Maggie, some day I'm going to wring your neck! Jerry, you'll have to get over here and help me."

"Am I glad that's over. Those cars were sure coming close. It would have been all over if one had hit us! On top of that, we wasted another hour unpacking the trunk, changing the tire and repacking. Hope we don't have another flat before I can get to Dallas. I'll need another tire for sure."

It was almost midnite when they arrived in Dallas. Ed was almost over the sunburn--no danger of falling asleep at the wheel with all that burning and itching. Maggie still had problems with that poison ivy. If anything, it looked worse. Jerry was still hobbling.

"He'll probably slow us down all week too," thought Ed. "It sure was good to see Sue and her family. The best part of our arrival was getting to bed. That drive seemed a lot longer than



the one to Minnesota, and it was 300 miles shorter!"

Tuesday the 24th of July...

"Yesterday was one of total relaxation. Just spent our time talking with Sue and her husband Dick and making plans for the rest of the week. Today, Maggie went off to buy out downtown Dallas and Dick, myself, and the kids are heading out to the amusement park."

"Man, this sure is some setup. Look at all the rides. Dick, let's let Jerry and Jean go on some rides while you and I just walk around and see the sights. Kids, we'll meet you back here at noon."

Dick and Ed walked through the shops and sideshows. Most of them were pretty nice--had a lot of interesting stuff. Sure were a lot of good looking girls out on that hot summer day. Ed happened to be admiring one particularly striking gal when he walked into the side of the fun house. [WHAM!] "Thaaat hurt! Guess I should have looked where I was going." All Dick could do was just stand there and snicker.

After they met the kids, Jerry and Jean dared them to take a ride on the "Wreck of the Ole '97" reputed to be the world's toughest roller coaster. Ed and Dick weren't too sure, but didn't see how they could back out. The climb up to the top of the tracks wasn't too bad--as long as you didn't look down. After they came out of the long dive and into the turn, Ed thought that it would be no sweat from here on. Just to show the kids that this whole operation was a piece of cake, he turned around to stick his tongue out at them. At that instant, the train entered its triple loop/double underhanded roll which snapped Ed's head four different ways at once. On the ride home, Ed could barely move his head from anything but straight forward. "Another week shot to _____," he thought to himself.

Friday the 27th of July...

You aren't even going to believe the amount of stuff that Maggie bought on her shopping trips in Dallas. Seemed like she bought the whole state's output for that week and packed it into the car. Compared to the previous week, this one was fairly relaxing except for the wrenched neck Ed got on the roller coaster and the finger he broke trying to catch a line drive foul ball at the game Wednesday.

Ed and Maggie said their goodbyes to Sue and family and once more started driving the

1,400 miles back home. As they drove along, they mused over the ventures and misadventures of their vacation. Although they had some good times, they both agreed that they had packed too much into too little time. The only thing which sustained them on the trip home was simply the thought of being home. Even the thought of returning to work made them both happy. Somehow, they made the drive home uneventfully with Ed still wondering how Jean had escaped unscathed...

Sunday the 29th of July...

"Only a few more miles and we'll be home. When we get there, let's hurry and unpack the car. We'll just leave everything in the living room and take care of it later in the week."

It was during the mad rush to get everything unpacked that Jerry accidentally dropped the picnic cooler on Jean's foot. From the way she acted, it was broken for sure.

Ed got home from the hospital emergency room with Jean at two in the morning. It was only a minor break, but would require a cast for three weeks or so. "Talk about a vacation," Ed thought. "You can be sure that we'll never go on another one like this. I'd shoot myself first."

Ed slowly woke up and rubbed the sleep out of his eyes. Maggie was gently shaking him. "Ed, Ed, you asked me to wake you. It's time to pack the car. You wanted to be on the road by midnight. Ed? Ed? Why are you crying?" ➤



TIPS

tac tips

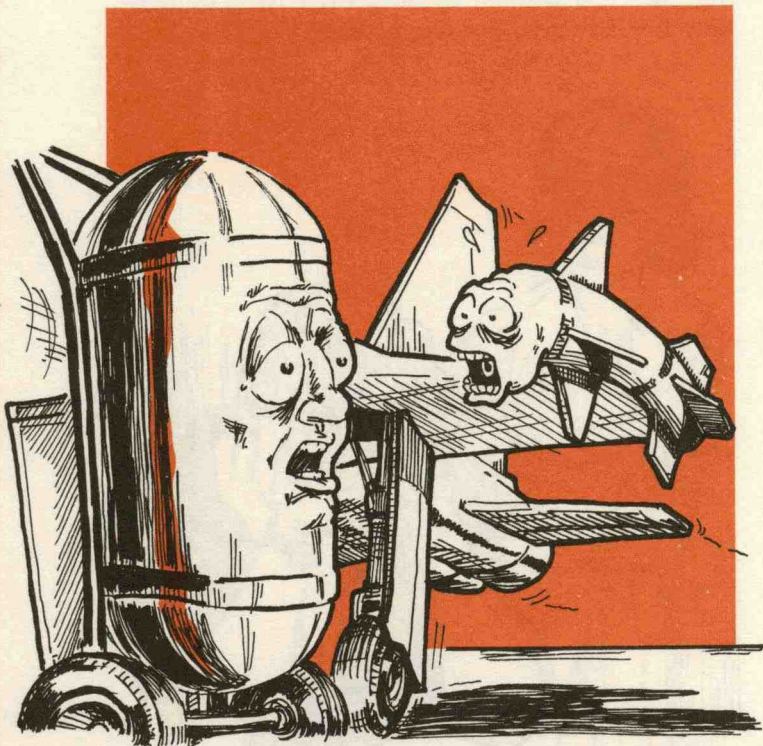
If principle is good for anything,
it is worth living up to.

FRANKLIN

AIM-9 Attacks Fire Bottle...And Loses

The F-5 was taxiing back to the parking ramp from a training sortie when the pilot observed a fire extinguisher located near the taxi line. He stopped, surveyed the situation, and decided that he had enough room to taxi around the extinguisher.

He deviated to the left of the yellow line and almost made it. The AIM-9 missile on the right wingtip struck the extinguisher. The missile head received extensive damage.



...interest items, mishaps with morals, for the TAC aircrewman

But you've never heard of AFR 60-11. That's the reg that deals with obstruction clearance and so on. It's also the reg that says that aircraft will not be taxied within 25 feet of an obstruction without a wing walker. You might want to read it. You might be surprised at some of the other restrictions which could affect your daily operations....

Non-Bold Face Items Are Important Too

The F-4 was starting the engines using starter cartridges. The start appeared to be normal; but as the RPM began to rise rapidly, an explosion occurred. The explosion was so intense that parts flew off the aircraft. The crew chief signalled the crew to shut down the aircraft and evacuate. While the crew was evacuating, the crew chief got a fire bottle and began to fight the fire with the help of other personnel. As the fire bottles began to run out, the fire trucks arrived to finish the job.

Investigation revealed that the force of the explosion caused the starter body to travel upward into the engine low pressure fuel filter, shattering the filter mount. This allowed JP-4 fuel to drain from the internal fuselage tanks through the shattered filter mount. The escaping fuel drained through a hole in the fuselage and burned on the ground. If the fire had been more intense, or the personnel had not reacted quite as quickly with the extinguishers, the incident could have been much worse.

The fuel would not have been allowed to drain and feed the fire if the engine master switches had been turned off---a non-bold face item. Remember, the throttles control the fuel at the engine while the master switches control the fuel shut-off valves.

At times, non-bold face items can be just as critical as the bold face procedures. Don't ignore them unless time is absolutely critical.

How High Is Up?

The Phantom was climbing out on a radar trail departure. Everything was going fine until the aircraft passed 8,500 feet. At this point, the Master Caution light, Altitude Encoder light, and Static Correction Off light came on. The indicated airspeed dropped to zero, true airspeed dropped to 150, and the altimeters stabilized at about 8,500 feet.

Join-up was accomplished, fuel burned down, and the incident aircraft was led back to the field by another flight member. Passing 8,500 feet in the descent, the altimeters and airspeed seemed to recover except for a 500-foot difference between cockpits and the SPC would not reset.

What caused the whole thing? A knob from the rear cockpit altimeter! The AAU-19 altimeter is a sealed unit. For some reason, the standby/reset knob had come loose from the altimeter, so the WSO put it in his pocket. This caused a leak in the pitot-static system and when the aircraft pressurized (at about 8,000 feet like it should), the problems developed.

Weird fact number 2,763 for your on-board computer....

North By Northwest

A real Hitchcock thriller for those fans of his movies. Also, a not-so-thrilling title for a couple of TAC aircrew members.

The aircraft was being readied for its second flight of the day. Engine start, taxi, and quick check were normal. During engine runup, the pilot felt the right engine "chug" slightly passing 85% RPM; and then the engine flamed out. Needless to say, the pilot aborted the mission.

Once back in the chocks, the maintenance folks had a look at the aircraft and discovered portions of the Northwest High Altitude Letdown book in the right engine and parts of the Northeast book in the left engine. The Southwest book was still in the aircraft. A Southeast book had been found on a taxiway by the Base Ops folks several hours earlier.

On the previous flight, all four letdown books were in the map case on preflight. During that flight, the pilot laid on 1.5 negative Gs but did not notice anything loose in the cockpit. During recovery, his wingman noticed some type of foreign object up around the top of the seat, but moved to the other wing and entered some clouds shortly thereafter and never said anything about it. After landing, the wingman turned off the runway early and was not in position to notice any foreign objects when the leader opened his canopy. The flight leader did not notice anything out of the ordinary either.

After this flight, a thru-flight inspection was conducted with no discrepancies noted; but the crew chief did not use a flashlight to inspect the intakes as required. The books were not noticed on the preflight by the pilot flying the next sortie.

The first pilot should have checked the cockpit before opening the canopy after landing; but the wingman who saw something on top of the seat and didn't mention it, didn't earn anything either. Individual and flight integrity demand professionalism throughout every aspect of flight operations. Some of that was missing here.



SUPERBOOM

By Thomas M. Weeks, Ph.D.
Air Force Flight Dynamics Laboratory
External Aerodynamics Division

Back in the late 1950s and early '60s the American public was introduced to sonic booms when the B-58 Hustler began making supersonic runs on many major cities. At first the booms were a novelty, and everyone wondered how a plate glass window could flex so much without breaking. Soon, however, people came to be annoyed by the characteristic "Baa-BOOM"; and reports of damage, awakened babies, etc., became more frequent.

As the speed capabilities of aircraft continued to increase, it became necessary to isolate areas of supersonic operations over the water or in sparsely populated areas. Still, annoyance and damage happens occasionally. Why? Aircraft can "slip" into the supersonic range accidentally because the crew isn't watching what they are

doing or, perhaps, the crew knows full well what they are doing; they just happen to do it in the wrong place.

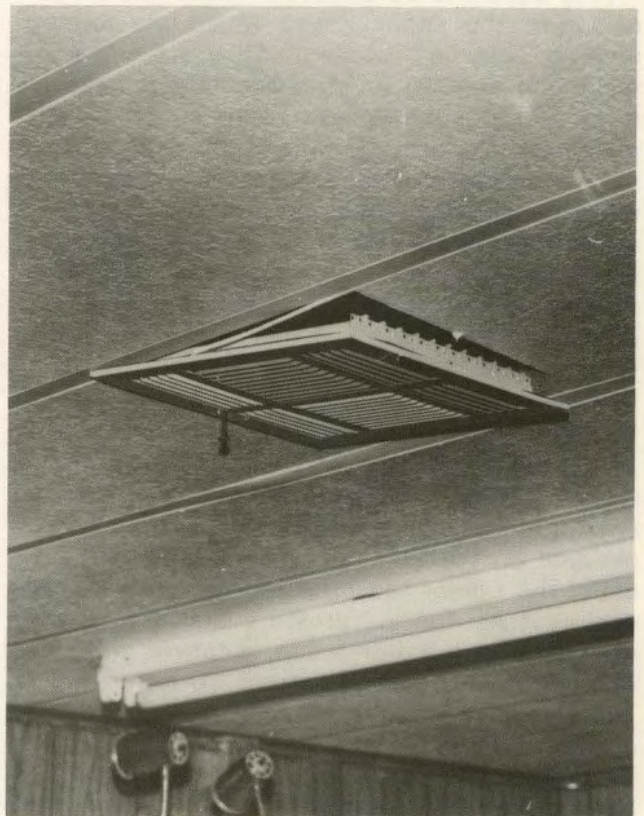
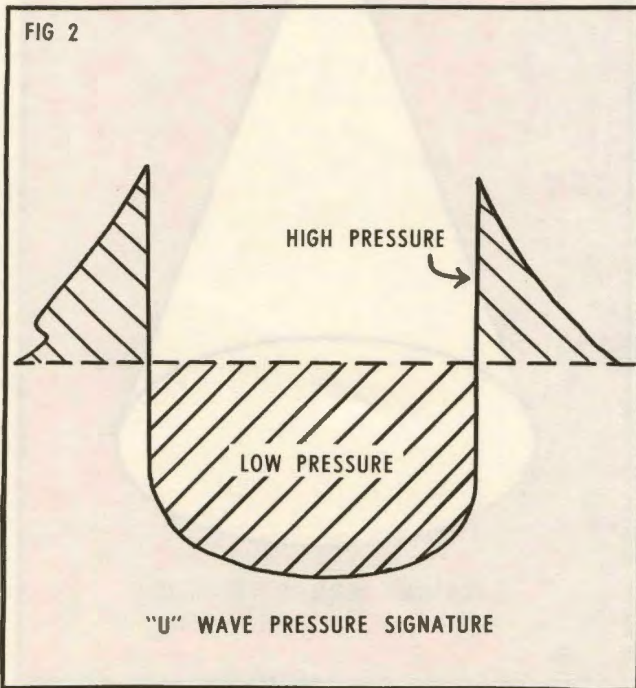
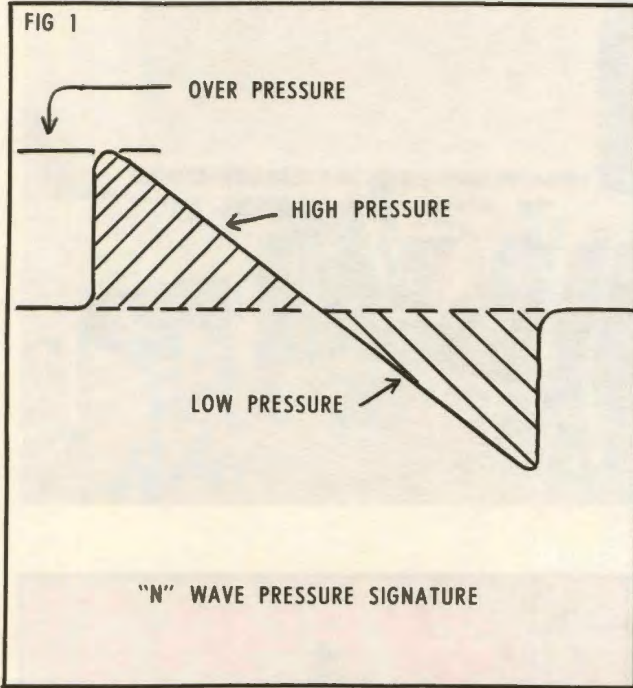
Lately, there have been several incidents where facilities located on tactical ranges have been damaged. Broken windows, doors, and damaged equipment have resulted. Luckily, the ground personnel have escaped injury. Next time we might not be so lucky. Let's talk about a few things concerning sonic booms and supersonic flight. I think you'll be enlightened when we get through with this article.

First, let's just talk about an aircraft in steady, level supersonic flight. The aircraft in this regime produces two compression fronts (actually weak shock waves)--one from the nose of the aircraft and one from the tail with a low-pressure area in between. The shock waves from an aircraft may or may not reach the ground for various reasons: obviously, the sonic boom from a T-38 is much smaller than one from the Concorde. Secondly, an aircraft at low altitude will produce a much more intense boom than one at high altitude. From extremely high altitudes, the shock wave can dissipate long before it strikes the ground. Atmospheric conditions can also result in the lessening of sonic boom intensity.

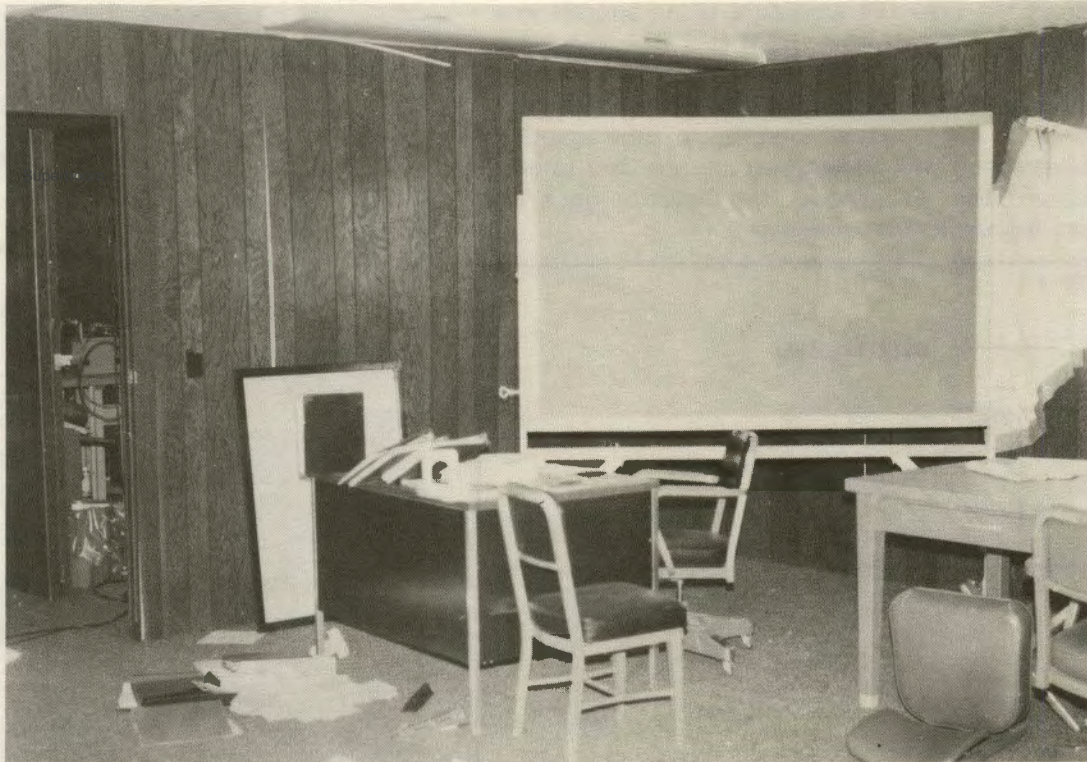
While these factors affect the intensity of sonic booms, the single biggest factor involved is aircraft maneuvering. Figure 1 shows the pressure signature from a sonic boom of an aircraft in steady supersonic flight. This is called an "N" wave because of the resemblance to an N. Now, compare that wave to figure 2 which



shows the pressure signature of an aircraft in a level acceleration from .98M to 1.2M. The wave now resembles a "U" with stronger compression fronts and a well defined low-pressure region between. The actual severity of the ground overpressure will depend on altitude and rate of acceleration. In general, the severity goes up with higher acceleration rates.



SUPERBOOM



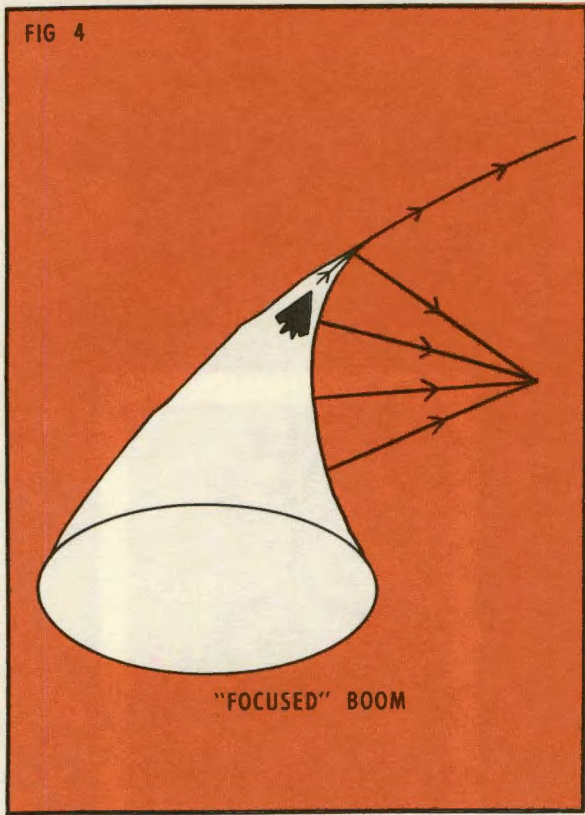
Why does this occur? Well, as the aircraft accelerates, the shock waves which are formed tend to become "focused." They actually augment one another to form a stronger pressure front, and thus the severity of the shock wave is increased. The best example of this is an aircraft turn or pushover. Figure 3 shows an aircraft in straight and level supersonic flight. The shock wave from the aircraft is actually a cone. If the same aircraft enters a level turn, the cone is deformed. The inside portion of the cone becomes concave. This results in a focusing of the shock wave on the inside of the turn. (Figure 4) This focusing results in an area of more severe shock and perhaps a "superboom."

The actual severity of the "focused" boom shown in figure 4 depends, of course, on the aircraft, altitude, and airspeed but is equally dependent on the turn rate and radius of the aircraft. The tighter the turn, the more severe the overpressure. The overpressure is also more significant at the lower mach numbers with the worst problems occurring from 1.0 to 1.7 mach. The minimum bank angle before a boom becomes "focused" is very small in this region. An aircraft at 50,000 ft and 1.2 mach can only bank 5 degrees. Above that bank angle, the

FIG 3



STRAIGHT AND LEVEL BOOM



shock waves will focus and form an enhanced sonic boom.

How severe can this enhanced boom be? An average military aircraft such as the F-4 might create a pressure differential of 1.4 psf (pounds per square foot) in straight and level supersonic flight above 30,000 ft. If the same F-4 were to

pull a tight turn, the pressure differential could be multiplied 2 to 5 times the normal level. Extreme superbooms of up to 14 psf differential have been measured.¹ This is well into the region of structural damage.

It is theorized that the low pressure region between the two compression fronts comes into play in superbooms and ground damage. When equipment vans have their windows and instrument gage glass blown out, this has to be a result of some level of explosive decompression --the type that could very well come from a superboom's low-pressure pulse.

Every time that you fly an ACM mission, you are creating "focused" sonic booms--shock waves with the potential of producing damage to structures on the ground. What can you do to avoid doing damage to things on the ground? First, keep your supersonic flight to a minimum. Secondly, fly only in authorized areas. (This will help, but remember that shock waves travel large distances. You can easily "boom" someone 10 miles or more away.) Third, stay as high as possible. The lower you are, the more intense the shock wave is when it hits the ground. Above all, be aware of what your aircraft is doing and where any sonic booms you may create will go. This will go a long way in preventing damage such as shown in the pictures accompanying this article. Remember to "look out below!"

¹Jean Claude Wanner, et al. "Theoretical and Experimental Studies of the Focus of Sonic Booms," *The Journal of the Acoustical Society of America*, Vol 52, #1, Part 1. Lancaster, Pennsylvania: 1972.



Letters

Editor

Those of us flying the desks at HQ TAC enjoyed the little story about the pilot who flew a "limp stick" F-4D. Flying with a "limp stick" is certainly better than not flying at all. One important note, even the desk jocks know that the master arm switch should be in the off position IAW checklist procedures (see photo). As an asides, the "limp stick" mod may aid in transitioning 106 drivers to F-4s.

Keep up the good work!

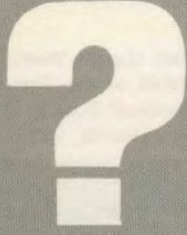
THE DESK JOCKS AT TAC/XPPC

Dear Desk Jocks,


What can I say? You caught us with our switch armed. It is apparent that you gentlemen are sharp-eyed individuals. Thanks for your interest in the magazine and the safety program.

Ed

**Did You See
Page 11**



**TAC
Flight Safety
Trophy Winner**



**363 TRW
SHAW AFB, SC
17 May 78 - 16 May 79**

Hey! pass it along... nine others are waiting.



TAC TALLY



TAC			ANG			AFR			
MAY	thru MAY		MAY	thru MAY		MAY	thru MAY		
	1979	1978		1979	1978		1979	1978	
CLASS A MISHAPS	5	17	12	0	6	7	0	3	1
AIRCREW FATALITIES	3	15	9	0	5	4	0	2	0
TOTAL EJECTIONS	8	20	13	0	4	5	0	3	1
SUCCESSFUL EJECTIONS	5	10	11	0	2	4	0	1	1

CLASS A MISHAPS	➔
AIRCREW FATALITIES	➔
TOTAL EJECTIONS	➔
SUCCESSFUL EJECTIONS	➔

TAC'S TOP 5 thru MAY '79

TAC FTR/RECCE		TAC GAINED FTR/RECCE		TAC/GAINED Other Units	
class A mishap free months		class A mishap free months		class A mishap free months	
29	347 TFW	52	156 TFG (ANG)	111	193 TEWG (ANG)
24	363 TRW	33	184 TFTG (ANG)	98	USAFTAWC (TAC)
16	479 TTW	32	123 TRW (ANG)	94	919 SOG (AFR)
15	33 TFW	17	121 TFW (ANG)	67	1 SOW (TAC)
11	56 TFW	17	108 TFW (ANG)	62	302 SOG (AFR)

CLASS A MISHAP COMPARISON RATE 78/79
(BASED ON ACCIDENTS PER 100,000 HOURS FLYING TIME)

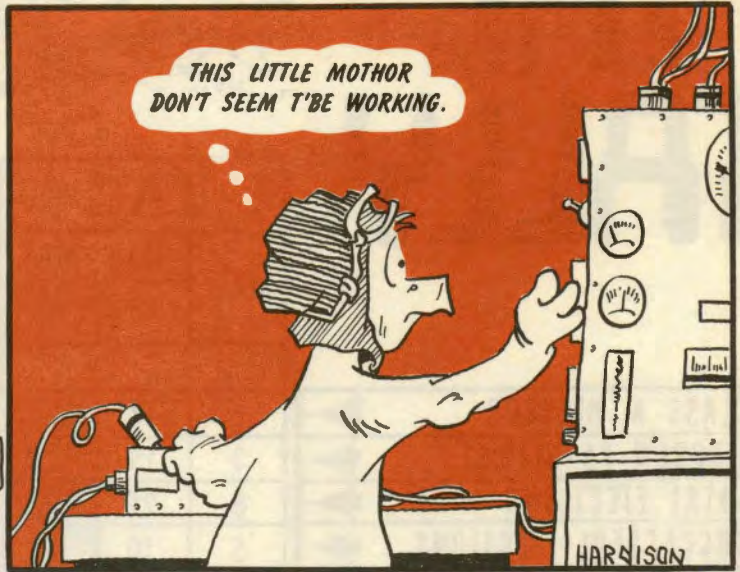
	78	16.0	12.4	8.3	7.5	5.8							
TAC	79	6.9	7.0	5.9	6.6	7.5							
ANG	78	0.0	3.4	4.0	5.9	8.1							
	79	0.0	11.4	9.0	9.7	7.5							
AFR	78	0.0	0.0	10.9	7.8	6.0							
	79	0.0	0.0	19.9	23.1	18.1							
	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	

FLEAGLE

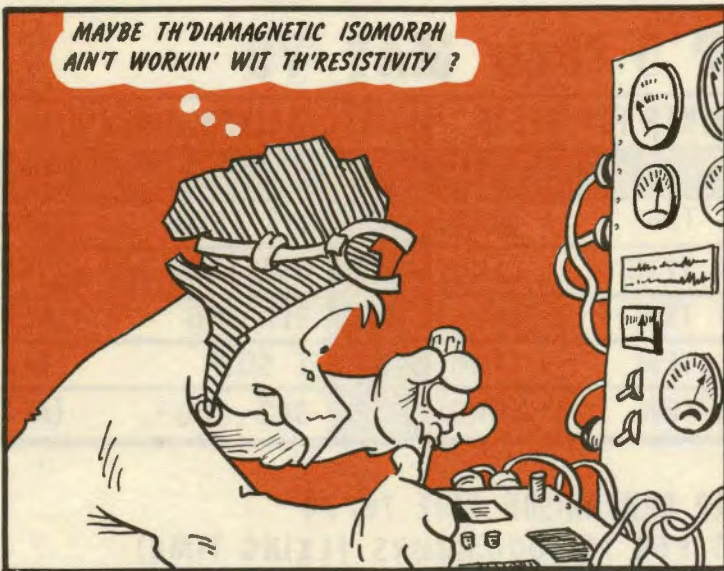
NOW, CONNECT THIS FRAMULATOR TO TH' MILLIVOLTAMP.



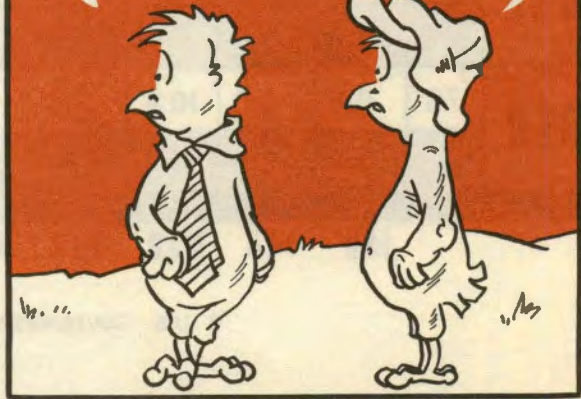
THIS LITTLE MOTHOR DON'T SEEM T'BE WORKING.



MAYBE TH'DIAMAGNETIC ISOMORPH AIN'T WORKIN' WIT TH'RESISTIVITY ?



LOOKS LIKE FLEAGLE DIDN'T CONNECT TH'FRAMULATOR TO TH'MILLIVOLTAMP. OR HE'S BEEN MESSING 'ROUND WIT TH'DIAMAGNETIC ISOMORPH AND TH'RESISTIVITY 'FOR HE DISCONNECTED TH'ELECTROCOUPLA.



© Stan Harrison, 1978