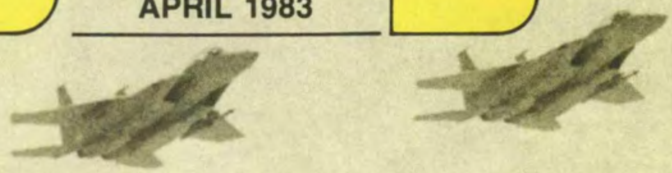
flying
SAFETY
APRIL 1983



1983 Aircraft Mishap Forecast

THERE I WAS . . .

■ . . . starting engines on my B-52 when I noticed that Number 7 engine had no fuel flow and no ignition. I called for maintenance to check out the problem.

Hoping this would be a short delay and quick fix, I continued the checklist, asked the ground crew to clear the aircraft for taxi, then waited for an ETIC (estimated time in commission) from maintenance. I was initially given a 15 minute ETIC. After 30 plus minutes, I decided to shut down some engines to conserve fuel. Maintenance had no fix for the problem.

I left Number 4 and 5 engines running for electrical power and other systems operations. Suddenly, the Number 5 generator tripped off the line. Seconds later, the crew chief reported smoke coming from Number 5 engine. I shut down Number 5 and accomplished dash one emergency procedures.

When I keyed the MIC switch to call Tower for fire coverage, I realized I had no electrical power for the radios. Scenes of burning aircraft flashed through my mind, and I told the crew chief to have a maintenance truck call for fire coverage. I realized motoring the engine was of no value, so I accomplished shut down and ordered the crew to evacuate the aircraft. The ground crew began extinguishing the fire with the portable fire bottle.

After we were clear of the aircraft, I realized the fire department wasn't on the scene yet and was not in sight. Those scenes of burning aircraft flashed through my mind again. Finally, the fire department arrived and the fire was put out with only minor damage.

As I stood there watching and waiting, I began to wonder what I would have done differently. Would I have done anything different? Given the same situation, would I have obtained external power and shut down all engines? Would I have kept Number 1 or 3 running for electrical power? What would I do? What would you do if you were there? ■

At one time or another, every crew faces a delay for maintenance. The problem comes when our normal, orderly sequence of events is interrupted. When we start to improvise we sometimes fail to consider all the consequences.

In this case, the crew was lucky. The fire was not too serious and so, despite the delay in fire department response, the damage was minimal. This is one more example to reinforce the axiom t[hat] a crew must be especially alert when things became nonstandard.

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page 2

page 5

page 23

SPECIAL FEATURES

2 **An Interview With The Director of Aerospace Safety**
General Williams gives his thoughts on safety

4 **The 1983 Aircraft Mishap Forecast**
Our challenge for '83

5 **The Crystal Ball**

8 **A-7**

10 **F-4**

13 **F-5**

14 **Safety Awards**
Recognition for the Air Force best

16 **T-38**

17 **C-5**

20 **C-135**

23 **G-induced Loss of Consciousness**
Airplanes are now stronger than pilots

REGULAR FEATURES

IFC There I Was

28 News For Crews

DEPARTMENT OF THE AIR FORCE • THE INSPECTOR GENERAL, USAF

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An Interview With The Director Of Aerospace Safety

CECILIA PREBLE
Assistant Editor

■ The outstanding 1982 Class A mishap rate of 2.3 — the best to date — is the result of many years of studying, planning, and hard work. The Air Force, as always, will continue to strive for a better record. Making the most of lessons learned is crucial to avoiding the repetition of mistakes. In an effort to tap the stores of experience the Air Force has accumulated in the field of aviation safety, we interviewed Brigadier General Gordon E. Williams, Director of Aerospace Safety at Norton Air Force Base, California.

The 1982 Class A mishap rate was the best in USAF history. What do you think made this success possible?

This success belongs to many different people. Commanders are the ones who influence the safety business more than anyone else and they deserve the lion's share of credit for that success. They are, of course, supported by lots of hard working safety people in the field who support them from the staff point of view.

Do you attribute this success to any particular policy?

No, I don't, because there haven't been any fundamental changes in policy. I attribute it more to the well engrained, solid, and mature safety attitude throughout the Air Force today. Again, commanders are most responsible for that. We take people into the Air Force from a society which, at times, has a very indifferent attitude toward safety. Take any particular group of people in the Air Force and compare them to a group of similar age out of the Air Force and you'll find we do much better. Our leadership is instilling the right attitude about safety in our people and it's paying off.

The fighter/attack rate is also the lowest ever and has been coming down steadily for several years, despite increased realism in training. What are we doing different to improve our safety record so steadily?

In your question you say "despite increased realism in training." I don't know if I would phrase it that way. Realism in training is one of the imperatives of readiness. But at every level the Air Force is taking a more critical look at what is realistic. We've had some false starts along that line and it has cost us in our accident rate. For example, some time ago we decided we needed to fly very far at very low altitudes and, as a result, experienced a rash of losses. When we looked at it more practically, we found there really wasn't that much of a tactical need to fly *that* far and *that* long under those very demanding conditions. So we backed off. We are seeing good judgment on the part of commanders who are first, assessing what is realistic, and, second, balancing the risk versus the gain. It's one of the most difficult things a commander has to do and there is no substitute for experience and judgment in making these decisions.

The BROAD LOOK teams have completed their reports. What are their findings?

The report has been briefed at the Air Staff and is about to be published. The genesis of BROAD LOOK was a question from the Deputy Secretary of Defense to all the services that noted increased costs of aircraft mishaps and what appeared to be a leveling out of the rate curve over the last few years. He asked that we take a look to see if there were any fundamental changes we could undertake to improve that rate. In the study we tried to look at things from a very basic and fundamental stand. The result was five main findings which focused for the most part on a lack of experience and training shortfalls in both maintenance and operations. We also found deficiencies in the safety modification process.

The BROAD LOOK study took a little more than a year and as we looked into each of these issues it was encouraging to find numerous positive steps already being taken throughout the Air Force that address the problem areas identified. There are few easy solutions. Making fundamental changes in training, for example, is going to require considerable expenditure of resources. That's something senior managers in the Air Force have to wrestle with, considering all the competition for funds.

Recently, you wrote an article for *Flying Safety* magazine on protecting safety information. Why should aircrew members be concerned about this subject?

Protecting safety information is important to *everybody* in the Air Force. We simply must protect the information gleaned from mishap investigations more carefully than we have in the past. We've had some bad experiences. Information has been obtained from people who are promised confidentiality and later that confidentiality was compromised. In a few cases the cause was a deliberately callous act on the part of a few people, but generally it's been laxity. We've put a great emphasis on confidentiality because we aren't sure everyone understands how important it is. It's at the very heart of the safety investigation system and mishap prevention and we need to make sure that we take good care of that information. We've taken some specific steps from an administrative point of view and it's important that we get everybody out in the field on board and prepared to be more careful about how they handle this information.

Do you plan any new initiatives for flight safety within the Safety Center?

I think there are a number of things we need to focus on. I'm particularly interested in the human factors end of this business. In the past 5 to 8 years we have made great strides in our capability to analyze hardware trends. We're better equipped to identify areas where there's a high potential for mishaps. Frankly, in the human factors business, and let's face it, somewhere between 50 and 75 percent of our mishaps in a given year are caused by human errors, we simply don't have that capability. While there's been ongoing research on this particular subject in the Air Force ever since we started to fly, we need to know how to apply it better.

Closely related to this is the matter of second-level causes. Again, we are often dealing with these elusive human factors. We have been able to categorize and define second-level causes, such as over-motivation, stress, task saturation, complacency, etc., but we don't know how to analyze them well, either individually or in the aggregate. And as for what I would call a third-level cause, such as relating a mishap back to initial selection, we haven't scratched the surface. This leads to no end of frustration when a perfectly good airplane crashes with a pilot who should have been able to handle the task at hand but didn't. Where do you turn?

We need to work hard on this throughout the Air Force if we are to continue to reduce our mishap rate.

What do you see as the greatest challenges for Air Force flight safety in 1983?

Our challenge is to continue to do better — that's not going to be easy. Our ability to keep reducing the mishap rate gets more difficult every year. We've made so much progress in the past that when you measure next year's success against that it probably won't seem very dramatic. We're operating at the margin, so we'll need to work even harder to achieve perhaps even less. But a steadily improving rate is what I hope we can achieve. I'm confident we can do that. ■

1983 Aircraft Mishap Forecast

AEROSPACE SAFETY

Last year the Air Force flew nearly two million sorties. More than 99.9% of those sorties were completed safely. As good as the success rate was, the 78 sorties which resulted in Class A mishaps represented an irreplaceable loss of combat capability valued at $474 million dollars. Even more significant than the dollar cost was the tragic loss of lives associated with those mishaps.

There were 82 Class A mishaps forecast for 1982. The decisive efforts of a lot of folks resulted in a 5% reduction of the predicted losses. The difference was not a matter of luck – anymore than the forecast mishaps are an inevitable product of chance. Things happen or do not happen because of our actions or inactions. The credit for the best mishap rate in Air Force history must be shared with the many who made it happen.

Each year the total effort required to further reduce the mishap rate increases. This year will be no different. The cold, hard facts are that it is going to take more from everyone if we are to realize the smallest reduction.

The forecast numbers for 1983 are genuine cause for alarm to commanders, supervisors, and operators. The forecast, like the actual year-end results, is not a matter of chance or luck either. The major premise of the forecast is that if we keep doing things as we have and don't change something, this is going to happen. The forecast is a prediction – before the fact. Our forecasts have been disturbingly accurate in the past, but the statistics are not inevitable or preordained. It can happen, but it does not have to happen.

The safety directorate logo depicts some hands holding a bird-like figure. There is a story which adds meaning to the symbol.

There was a skeptical youth who doubted the credibility of the village wise man. He decided to trick the old man and come to him with a bird cupped in his hands. He asked the wise man, "Is the bird I hold alive or dead?" If the wise man answered "dead," the youth would release the bird and let it fly away. If the old man answered "alive," the youth would instantly kill the bird in his hands.

The youth asked his question. The wise man replied, "It is in your hands."

The 1983 forecast is history. The future, as always, is in your hands.

Gordon E. Williams
Brigadier General, USAF
Directorate of Aerospace Safety

The Crystal Ball

LT COL JAMES I. MIHOLICK
Directorate of Aerospace Safety

■ The 1983 mishap forecast is by no means a goal. Our Air Force objective is to beat this forecast by taking additional prevention effort in those areas identified as having high mishap potential. We at the Safety Center believe that the Air Force operational and maintenance professionals are going to do just that in 1983.

The AFISC 1983 aircraft mishap forecast predicts 81 Class A mishaps, 82 aircraft destroyed, and 17 Class B mishaps. Fighter/attack will account for 57 mishaps (30 operations factors and 27 logistics mishaps). These are just some of the things which will happen if the 1983 forecast is correct. This forecast is, as always, a reflection of the mishap potential that currently exists in the way we support, maintain, and operate our aircraft. The forecast is based on three basic assumptions: (1) That we have accurately defined the types of mishaps our aircraft are likely to have, (2) That we have accurately assessed current trends, and (3) that nothing changes in the way we support, maintain, and operate our aircraft in terms of procedures, policy, tactics, etc. It also presupposes that we will fly the 3,459,070 flying hours programmed for 1983.

The following pages show a detailed breakout by type aircraft and type mishap from which the forecast is derived. The Class A and B mishap potential is really the weighted rate multiplied by programmed flying hours. Where the potential is too low to predict a mishap (as in the KC-10) the individual categories are deleted.

To determine the number of mishaps your unit might experience based on the forecast, merely reverse the standard rate formula to calculate the number.

$$\text{Number} = \frac{\text{Class A Pot} \times \text{Unit Hours}}{100{,}000}$$

For example, if your unit is programmed to fly 10,000 hours in the A-10 this year:

$$\text{Total Number} = \frac{6.37 \times 10{,}000}{100{,}000} = .637 \text{ mishaps}$$

That's a potential for a little over a half a mishap for you in 1983. The potential by type mishap should give you a good idea where that "almost happening" may occur.

As you see in this example, the finer you cut the forecast, the smaller the numbers. You know your unit best, can best evaluate your unit effectiveness in each area and determine whether that potential belongs to your unit or some other unit. If you get a "twinge," then it's probably time to focus your prevention efforts toward that area of potential.

If being forewarned is truly being forearmed, we must find ways to decrease the exposure in those areas identified by the forecast as having the highest potential. If we are successful, we will reach our goal of beating the 1983 forecast. ■

1983 forecast by aircraft and mishap category

AIRCRAFT		CONT LOSS	COLL GND	RNG	MID AIR	LDG (PLT)	T/O (PLT)	OPS OTH	FLT CONT	GEAR	FUEL SYS	ENG	ENG FOD	HYD/ PNEU	ELEC SYS	STR-UCT	BLD AIR	INST	LOG OTH	BIRD STRK	WX	UND MISC	TOTAL	FLYING HOURS
USAF	A POT	14.7	11.4	2.8	4.0	4.2	1.5	5.2	6.8	2.2	4.6	13.0		1.9	2.5	.7	1.1		3.9	1.4		3.3	85.2	3,459,070
	DEST	16	11	2	7	4	1	3	6		3	17		2	2	2	1		1			4	82	
	CL A	16	11	2	4	4	1	3	6		3	18		2	3	2	1		1			4	81	
	CL B					2				3		10				*			1	1			17	
	B POT		.4		.7	2.4	.3	1.4		1.1		7.1	.4	.4	.4				.3	2.5	.7	.7	19.1	
A-7	A POT	.73	.68	.32		.32						.60							.35				3.00	81,714
	DEST	1	1									1											3	
	CL A	1	1									1											3	
	CL B																						0	
	B POT		.33																				.33	
A-10	A POT	1.10	1.50	.98	.63	.32		.87	.38													.57	6.37	228,258
	DEST	1	1	1	2			1															6	
	CL A	1	1	1	1			1															5	
	CL B											2											2	
	B POT					.80						2.58	2.51							.79			6.67	
A-37	A POT		.46																				.46	30,052
	DEST																						0	
	CL A										NO MISHAPS FORECAST												0	
	CL B																						0	
	B POT																						0	
B-52	A POT		.26				.37			.32		.28											1.23	106,109
	DEST		1																				1	
	CL A		1																				1	
	CL B																						0	
	B POT											.23								1.71			1.95	
FB-111	A POT	.74																				.31	1.04	18,161
	DEST																					1	1	
	CL A																					1	1	
	CL B																						0	
	B POT																						0	
C-5	A POT											.84											.84	55,092
	DEST																						0	
	CL A											1											1	
	CL B											1								1			2	
	B POT									.40		.45								.73			1.59	
C-9	A POT																						0	30,006
	DEST																						0	
	CL A										NO MISHAPS FORECAST												0	
	CL B																						0	
	B POT																					.38	.38	
KC-10A	A POT																						0	6,673
	DEST																						0	
	CL A										NO MISHAPS FORECAST												0	
	CL B																						0	
	B POT																						0	
CT-39	A POT																						0	77,919
	DEST																						0	
	CL A										NO MISHAPS FORECAST												0	
	CL B																						0	
	B POT																						0	
C-130	A POT		.37			.35										.32			1.06			.70	2.78	383,627
	DEST															1			1			1	3	
	CL A															1			1			1	3	
	CL B									1													1	
	B POT					.34				.72													1.05	
C-135	A POT				.30	.32	.34	.32	.34		.30												1.92	258,520
	DEST						1																1	
	CL A						1																1	
	CL B											1											1	
	B POT									.34		.64								.34			1.32	
C-141	A POT		.67							.35													1.02	291,900
	DEST		1																				1	
	CL A		1																				1	
	CL B																						0	
	B POT															.33							.33	
E-3	A POT																						0	28,340
	DEST																						0	
	CL A										NO MISHAPS FORECAST												0	
	CL B																						0	
	B POT																						0	
E-4	A POT																						0	1,511
	DEST																						0	
	CL A										NO MISHAPS FORECAST												0	
	CL B																						0	
	B POT																						0	
F-4	A POT	3.96	2.39	.90	.29			.59	.95		1.62	1.86		.99	.73		.66		.91	.36			16.20	331,[illegible]
	DEST	4	3	1	2			1	1		2	2		1			1						18	
	CL A	4	3	1	1			1	1		2	2		1			1						17	
	CL B					1				1		2											4	
	B POT					.58		.57		.30		1.99								.30	.30	.32	4.35	

Totals under A and B potentials may not add up because of rounding of individual categories.

1983 forecast by aircraft and mishap category

AIRCRAFT		CONT LOSS	COLL GND	RNG	MID AIR	LDG (PLT)	T/O (PLT)	OPS OTH	FLT CONT	GEAR	FUEL SYS	ENG	ENG FOD	HYD/ PNEU	ELEC SYS	STR-UCT	BLD AIR	INST	LOG OTH	BIRD STRK	WX	UND MISC	TOTAL	FLYING HOURS
F-5	A POT	.32	.30		.66									.37					.39				2.05	30,546
	DEST	1																					1	
	CL A	1																					1	
	CL B					1																	1	
	B POT					.36		.33				.35											1.04	
F-15	A POT	.54	.91		.76	1.01			.97	.54	.34											.82	5.89	169,414
	DEST	1	1		1	1			1													1	6	
	CL A	1	1		1	1			1													1	6	
	CL B											1							1				2	
	B POT				.51							.89		.41					1.22		.43		3.45	
F-16	A POT	2.52	.49	.50	.45	.45	1.29	.94	1.15	.61		9.65			4.56					.50		.85	23.96	153,007
	DEST	3	1		2	1		1	2			8			2							1	21	
	CL A	3	1		1	1		1	2			8			3							1	21	
	CL B									1													1	
	B POT																						0	
F-105	A POT		.17						.05			.11							.06			.05	.45	4,430
	DEST																						0	
	CL A										NO MISHAPS FORECAST												0	
	CL B																						0	
	B POT																						0	
F-106	A POT							.27	.53		.55	.28		.27									1.89	50,761
	DEST										1			1									2	
	CL A										1			1									2	
	CL B																						0	
	B POT					.27											.27						.53	
F-111	A POT	.34	.40		.39		.29		1.40		.43	1.50			.70		.34			.31			6.10	81,489
	DEST		1						1			2											4	
	CL A		1						1			2											4	
	CL B											1											1	
	B POT											1.11			.42					.45			1.97	
H-1	A POT					.37										.35			.33				1.06	49,321
	DEST															1							1	
	CL A															1							1	
	CL B											1											1	
	B POT											.33											.33	
H-3	A POP					.67																	.67	28,575
	DEST					1																	1	
	CL A					1																	1	
	CL B											1											1	
	B POT					.41						.40											.81	
[illegible]-53	A POT		.74					.71			.36												1.81	14,883
	DEST		1																				1	
	CL A		1																				1	
	CL B																						0	
	B POT																						0	
O-2	A POT		.26	.18				.34	.16			.32											1.26	31,043
	DEST											1											1	
	CL A											1											1	
	CL B																						0	
	B POT																						0	
OV-10	A POT	.69			.60							.32											1.60	28,786
	DEST	1																					1	
	CL A	1																					1	
	CL B																						0	
	B POT																						0	
T-33	A POT	.65	.34								.32	.67										.36	2.33	52,345
	DEST	1										1											2	
	CL A	1										1											2	
	CL B																						0	
	B POT																						0	
T-37	A POT	1.96						.36				.65											2.97	336,202
	DEST	2										1											3	
	CL A	2										1											3	
	CL B																						0	
	B POT																						0	
T-38	A POT	.66	.84			.51		.66	.70	.49		.82								.35			5.02	385,522
	DEST	1				1			1			1											4	
	CL A	1				1			1			1											4	
	CL B																						0	
	B POT						.34	.35				.47											1.15	
T-41	A POT					.36						.39											.75	19,565
	DEST																						0	
	CL A										NO MISHAPS FORECAST												0	
	CL B																						0	
	B POT																						0	
[illegible]43	A POT																						0	20,066
	DEST																						0	
	CL A										NO MISHAPS FORECAST												0	
	CL B																						0	
	B POT																			.33			.33	

In this issue AFISC project officers continue our series of analyses. The A-7, F-4, F-5, T-38, C-5, and C-135 aircraft are reviewed including the statistics for 1982 and the prospects for 1983.

A-7

LT COL DOUGLAS M. CARSON

■ The A-7, an all-weather attack aircraft, entered the USAF inventory in 1968. Approximately 400 A-7D and K model aircraft are currently in service, mainly with the Air National Guard. The fleet flies about 90,000 hours per year and passed the million hour point in mid-summer of last year.

We have experienced 73 Class A mishaps with the A-7, from the first major (Class A) mishap in 1970 through the end of 1982, which gave us an overall Class A mishap rate of 7.0. This compares favorably with other USAF fighter/attack aircraft. It has the fifth lowest overall Class A mishap rate (out of 14 different fighter/attack aircraft), which is even more significant when the low altitude environment in which it continually operates is considered. The 73 Class A mishaps resulted in 73 destroyed aircraft and 30 fatalities.

Chart 1 shows the Class A/major mishap rate by year from the first mishap in 1970 through the end of 1982. This is the "big picture," and the overall trend looks very good, but to make it more meaningful, let's break it down into operations-related and logistics-related mishaps. We'll look at ops and logistics, especially over the last five years, and then go into more detail with last year's Class A mishaps.

There have been 43 operations-related mishaps through the end of 1982. The largest single category, loss of control, was responsible for the loss of 18 aircraft and 11 lives. Not surprisingly, most departures from controlled flight occurred in air combat tactics (ACBT). Six aircraft and three pilots were lost on ACBT missions. The second largest category involved collision with the terrain.

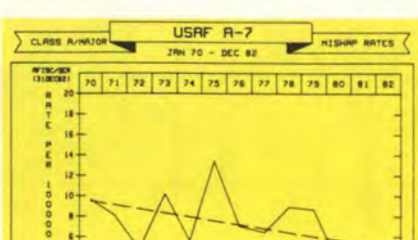

Chart 1

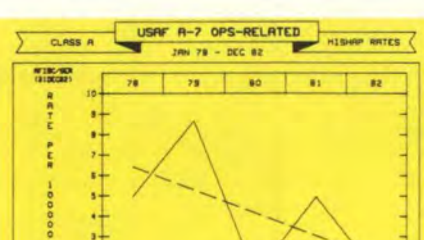

Chart 2

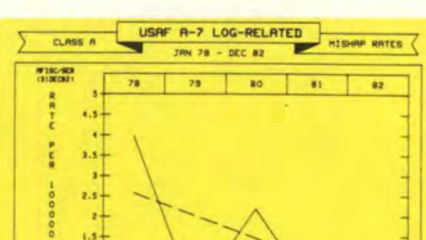

Chart 3

Unfortunately, the fatality rate in this type of mishap is rather sobering. Fifteen aircraft were destroyed and 14 pilots were killed! Eleven of the mishaps occurred on air-to-ground ranges, and four were non-range collisions with the ground. Five midair collisions claimed seven aircraft and two lives. Miscellaneous causes accounted for the remainder of the ops-related losses. Figure 2 shows the operations-related mishaps and the trend for the last five years.

Now let's take a look at Class A mishaps which were attributed to logistics. Logistics-related mishaps accounted for 30 destroyed aircraft but only three fatalities.

Engine failures were the biggest single problem we had with the A-7. Twenty-six aircraft have been lost, and many close calls were experienced. The major problem areas included compressor vanes, turbine vanes, bearings, fuel system, and oil system. Block 76 engine modifications, which incorporated fixes in weak areas, were evaluated in a lead-the-force program. They proved successful, and a program was started to modify all engines in the fleet. The corrective action appears to have licked the problem. The engine fixes are about 97 percent complete, and there have been no engine-related Class A mishaps for the last three years.

Canopy losses/failures cost us three aircraft and one life. Inadvertent ejections resulted when the resulting wind blast pulled out the face curtains. Face curtains have been removed and defective canopies purged from the system. Miscellaneous causes accounted for the four remaining logistics-related losses. Chart 3 shows the logistics-related Class A mishap rates for the last five years.

The A-7 fleet experienced two Class A mishaps in 1982. Both aircraft were destroyed, and one pilot was fatally injured.

The first mishap was operations-related. The mishap aircraft was Number 3 in a three-ship flight on a surface attack mission to an overwater range. The mishap pilot had proceeded ahead of the other flight members in order to clear the range and provide the first element with a threat detection intercept. As he leveled at 500 feet and approached the target at high speed (550-600 knots) for his visual check, he encountered unexpected conditions where visual illusions may have played a critical part in the mishap. The weather at enroute altitude was clear with a sharp horizon. At low altitude in the vicinity of the target, the weather met the minimum requirements, but the sky was gray, there was no discernible horizon, and the water was glassy smooth.

After the pilot overflew and visually checked the target, the environmental conditions made the aircraft instruments his primary reference for aircraft altitude and attitude. However, he was keenly interested in visually acquiring the other flight members for the intercept. He evidently paid too much attention to his visual search and insufficient attention to his instruments. The aircraft entered a gradual descent after overflying the target, impacted the water at high speed, and was destroyed. The pilot made no attempt to eject and was fatally injured.

The second mishap was logistics-related. The mishap aircraft was on its first functional check flight (FCF) following depot maintenance. As the mishap pilot rotated the nose for take off, the right wing folded at the hinge point, and as the aircraft became airborne, separated from the aircraft. The aircraft immediately went into a hard right yawing roll which he instinctively attempted to counter with left aileron and full left rudder. The right wing contacted the ground, and the aircraft departed the runway at a 45-degree angle in a steep right bank.

The pilot correctly analyzed the situation, recognized that he was out of the ejection seat's safe escape envelope, and continued to attempt to reduce the bank angle. As the bank angle dropped below 20 degrees, he executed his timely ejection decision and pulled the ejection handle with his left hand while still applying left aileron and rudder. The aircraft was about 10 feet in the air in a 15-degree right bank when the seat departed. It impacted off the right side of the runway, cartwheeled, and exploded. The pilot made one and one-half swings in the parachute before landing on the ramp near the burning wreckage.

That's a brief rundown of the mishap experience for the USAF A-7 fleet. At the end of 1981, the analysis folks at the Inspection and Safety Center predicted five Class A mishaps for the fleet in 1982. I'm happy to report that you proved them wrong! The two mishaps gave us a 1982 A-7 Class A mishap rate of 2.4, the best year ever!

Well, what about 1983? I'm not quite as pessimistic as the analysis guys because I know you ANG fliers and maintainers are good — really good. Unfortunately, the law of averages will try to catch up with the best of us. My personal prediction for 1983 is three A-7 Class A mishaps which will result in three destroyed aircraft and two fatalities. The breakdown will look like this:

Collision with terrain	1
Control loss	1
Logistics-related	1

Even though I'm not as pessimistic as my friends, the computer folks, you could try to prove me wrong — especially about the fatalities. ■

F-4

LT COL GARY L. STUDDARD

■ The F-4 aircraft is a multi-role fighter which remains an effective element in the USAF tactical inventory. Since 1963, the F-4 fleet has accumulated approximately 8 million flight hours and has an overall Class A mishap rate of 6.4 per 100,000 flight hours. The fleet now accomplishes approximately 330,000 flying hours a year by flying roughly 20,000 sorties a month. The F-4 is in the midst of a large conversion program affecting all tactical commands. In general, newer aircraft (F-15, F-16, A-10) are being deployed to tactical units in USAFE, PACAF, and TAC. These units are sending their F-4s to the ANG and AFRES. The ANG and AFRES now possess 38 percent of the fleet while TAC possesses 37 percent of the F-4 fleet. The F-4 is programmed to remain in the inventory at least until the year 2000. Therefore, many modifications to improve the aircraft's reliability and capability are still being accomplished.

In 1982, the F-4 fleet experienced 13 Class A mishaps, the lowest number of mishaps since 1964 (Chart 1), and the 1982 Class A rate of 3.8 is the lowest rate recorded since the aircraft have been in the USAF inventory. If we take the Class As and break them down into operational causes versus logistic causes, then overall 59 percent of the mishaps are operation/or pilot caused, and 36 percent are logistic/maintenance mishaps (Charts 2 and 3). The remaining 5 percent are classified as miscellaneous/undetermined.

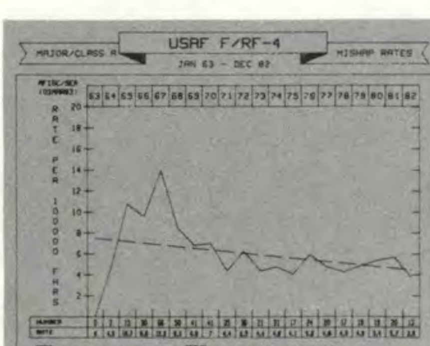

Chart 1

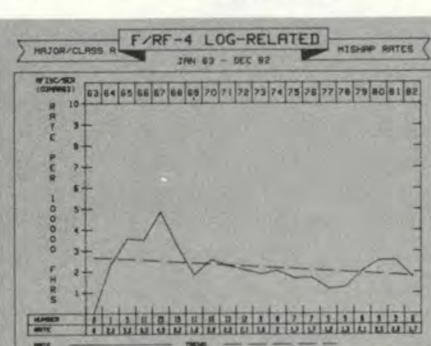

Chart 2

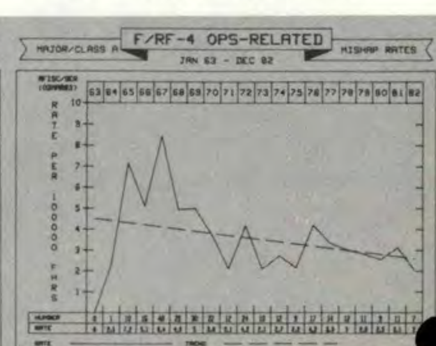

Chart 3

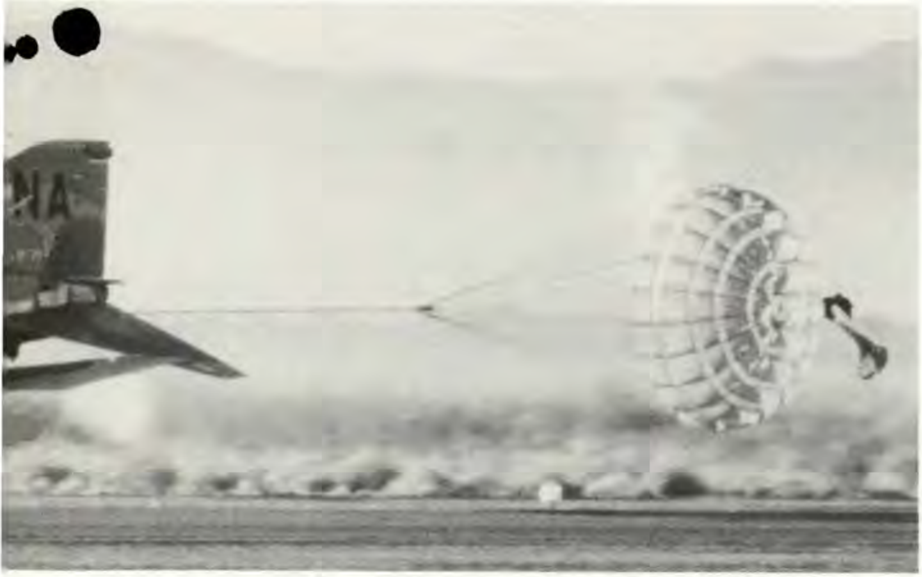

Figure 2
Logistic Factor Class A Mishaps

	1980	1981	1982
Flight Controls		1	
Gear*	—	—	—
Fuel System	1	2	2
Engine	3	1	2
Hydraulic/pneumatic	1		
Electrical	1	3	
Bleed Air		1	1
Undet/Misc	2	1	
	8	9	5

**There were no mishaps in this category 1980-82.*

The trend line for the operation factor mishap shows a decreasing trend overall, but for the last six years, we have averaged 11 mishaps per year. We saw no improvement in 1982, with eight Class A operation factor mishaps for the year. The added capabilities we are building into the F/RF-4, coupled with more realistic training and changing tactics, may help to explain some of these occurrences. However, in the majority of our operation factor mishaps, second-level cause factors such as pressing, distraction, overcommitment, or breaches of flight discipline were often identified. Figure 1 shows the categories in which we have experienced our operation factor mishaps for the last three years. Control loss and collision with the ground non-range are the leading contributors and present the greatest challenges to our aircrews.

Figure 1
Operations Factor Class A Mishaps

	1980	1981	1982
Control Loss	6	6	3
Coll w/G non-range	2	2	4
Coll w/G range	2		1
Midair		1	
Landing or Takeoff (PLT)*	—	—	—
Miscellaneous/other		2	
	10	11	8

**There were no mishaps in this category 1980-82*

The demanding scenarios in which we fly today require the closest of supervision and continued self-discipline. Both are imperative for successful operations to insure our aircrews recognize their personal limitations and not push those limits in any flight regime. Realistic training and safety must, and can, go hand-in-hand.

In the logistic arena, pinpointing the main contributors of our mishaps is not as easy. Chart 3 shows the steady increase in our logistic Class A mishaps since 1977 with five in 1978, seven in 1979, eight in 1980, and nine in 1981. Considerable emphasis has been placed on proper maintenance of these aging aircraft because of this increase, and in 1982 five logistic mishaps occurred. Hopefully, this indicates we are solving our problems and are reversing the trend. Figure 2 shows the systems involved in our logistic mishaps for the last three years. For the most part, analysis shows basically random occurrences within the major systems.

One system repeat in 1982 from the preceding years was the afterburner fuel pump. Failure of the pump has accounted for a Class A mishap in 1980, 1981, and 1982. This particular system is being aggressively worked by the ALCs, and pumps are being modified with a reduced shear section to protect the pump's case from penetration. The pump turnaround program will not be complete until early 1984. In the meantime, aircrews have received guidance not to treat an afterburner malfunction lightly and to land as soon as possible. Also, early detection procedures have been implemented to include oil samples and tempilabels installed on the pump to detect any heat buildup which may indicate impending failure.

All of our logistic mishaps are being aggressively worked to prevent recurrence. Hardware changes or increased inspections alleviate most of the problems. Unfortunately, we still have the "human error" factor in some of our logistic mishaps because of improper assembly, inspections, or installation. All in all, the F-4 remains a very busy system in the logistic area. Many safety related programs are ongoing, too many to mention all, but here are a few of the more significant ones.

- A structural integrity program is in existence to identify airframe structural problems before they result in failures. TCTO 1273 calls for replacement of the centerline

continued

F-4

continued

splice and adds a plate at the aft end to eliminate stress corrosion. TCTO 1274 calls for modification of the outer wings because of the development of fatigue cracks. TCTO 1302 implements improvements in the pylon attach fitting which will require removal of the existing guide and installation of a new universal guide.

■ A voice warning system has been developed which will interface with the present radar altimeter. This system will provide aircrews better warning of ground proximity. This modification started in January 1983 and will be complete by December 1984.

■ Because the present fire warning system is prone to false indications resulting in unnecessary engine shutdown, a new system is now being installed. This system operates on pneumatic change principles in response to temperature change and is less susceptible to corrosion and crimping. This modification is approximately one-third complete, and all aircraft should have the new system by the end of next year.

■ The engine bay and fuel system have five ongoing TCTOs to correct previously identified safety problems. TCTO 1160 replaces the present clamps in the engine bay and standardizes routing of tubing and wire bundles to reduce potential chafing problems. This is now more than 65 percent complete. TCTO 1267 and TCTO 1206 strengthens the number 2 fuel cell floors and sides to eliminate cracks. This is now approximately 30 percent complete. TCTO 646 was recently released to correct similar problems in the number 7 fuel cell. TCTO 1276 will start in May 1983 to eliminate chafing/fuel leaks in the aft fuselage vent line system. This modification enlarges the bulkhead holes through which the vent line passes, relocates the pencil drain and installs brackets to stiffen the vent line.

■ The F-4 has been approved for conversion to a new hydraulic fluid which has better fire resistant characteristics than the present fluid. The conversion is presently ongoing.

■ Installation of a hydromechanical steering system to replace the nosewheel electrical steering control system is nearing completion, and all aircraft are programmed to be modified by June 1983.

In conclusion, there are a great many special programs involved in maintaining and operating the F-4 to insure our missions are conducted as safely and effectively as possible. It's clear the F-4 will remain an essential part of our tactical air forces for many years to come.

Figure 3
F-4 1983 Predictions

Operations Factor		Logistic Factor	
Control Loss	4	Flight Controls	1
Collision with Gnd	3	Fuel System	2
Range	1	Engine	2
Midair	1	Hyd/Pneumatics	1
Misc/Undet	1	Bleed Air	1
	10		7 = 17

AFISC makes an annual prediction of the number of mishaps expected for the year. Figure 3 shows this prediction of 17 Class A mishaps-10 operations and seven logistics. My goal, and hopefully yours, is to do even better than we did in 1982. ■

F-5

MAJOR ERNEST A. BRIGGS, CF

■ The USAF operates approximately 100 F-5 aircraft. Tactical Air Command is the primary user with over half the fleet. The other main users of the F-5 are PACAF and USAFE. The aircraft is used mainly in aggressor squadron operations.

The year 1982 saw us log four Class A mishaps with the F-5. These mishaps accounted for the destruction of five aircraft and one fatality. Five aircraft lost in one year is the worst aircraft destroyed rate since the F-5 has been in service with the USAF.

Since its introduction into the inventory through the end of 1982, we have had 27 Class A major mishaps. This gives us an overall Class A mishap rate of 9.58 for the F-5 weapon system. These Class A mishaps have caused the destruction of 28 aircraft and the loss of 10 lives.

A breakdown of the 27 Class A major mishaps shows that 17 of these mishaps were operations-related and 10 were logistics-related. The four Class A mishaps in 1982 were equally divided — two operations-related and two logistics-related.

Here are brief descriptions of our recent mishaps:

■ The mishap aircraft was e .gaged in a dissimilar air combat tactics mission with an F-15. The aircraft were equipped with airborne instrumentation system (AIS) pods. The mishap F-5 came under attack, and while the pilot attempted to defeat the attack, the aircraft departed controlled flight and entered a flat spin. The pilot ejected at 10,000 feet and sustained no major injuries. The aircraft impacted the water and was destroyed.

■ The aircraft was on a functional check flight following extensive maintenance. During the mission, the aircraft experienced successive failure of both the hydraulic systems. The pilot ejected at 12,500 feet and sustained no significant injuries. The aircraft was destroyed on ground impact.

■ The two mishap aircraft (an F-5B and an F-5E) were on a BFM training mission and had a midair collison. The solo student (F-5E) ejected successfully. The rear seat pilot of the F-5B ejected successfully; the IP (front seat of the F-5B) ejected but received fatal injuries from parachute entanglement and opening shock. Both aircraft impacted the ground and were destroyed.

The F-5 weapon system is continually monitored for trends, and engineering efforts are constantly underway to improve reliability and safety.

One investigation currently underway is the problem of fuel cell foam breaking down causing fuel filter blockage and flameout. Improvements in this area should be made this year.

The new lap belt is scheduled for installation in the F-5 early this year. This new system will improve safety and dependability, especially during ejections.

The J85 engine Component Improvement Program (CIP) continues to work hard for gains in reliability and safety.

Overall, the F-5 is a dependable aircraft, and most of our incidents are related to human factors rather than material failure.

For 1983, our experts in analysis and forecasting are predicting only one F-5 Class A major mishap. All of us involved with the F-5 system must continue our best effort to prove the experts overestimated our 1983 F-5 mishap rate. ■

SAFETY AWARDS

THE MAJOR GENERAL
BENJAMIN D. FOULOIS
MEMORIAL AWARD

AIR TRAINING COMMAND

ATC achieved the combined lowest Class A and Class B aircraft mishap rate in its history. Class A mishaps totaled three, equaling their previous all-time low in 1975, and for the first time ever, the command did not experience a Class B aircraft mishap. Safe mission accomplishment while flying two-thirds of a million flying hours with more than 500,000 sorties and 1,650,000 landings attests to an effective flight safety program with strong command support and leadership and to a high degree of professionalism among instructor pilots, aircrews, and support personnel.

THE CHIEF OF STAFF
SPECIAL ACHIEVEMENT AWARD

TACTICAL AIR COMMAND

The Tactical Air Command Class A aircraft mishap rate was reduced to 4.2 per 100,000 hours for 1982, the lowest rate since 1974, and sustained a downward rate trend for the fourth consecutive year. Class B aircraft mishaps were also reduced nearly 70 percent compared to the previous year. The command flew more than two-thirds of a million hours in 21 different types of aircraft and performed a demanding tactical operations training mission, which included numerous exercises, special missions, and deployments. These achievements attest to strong command support and leadership and the highest degree of professionalism among aircrews, support agencies, and all other members of the command.

SECRETARY OF THE AIR FORCE
SAFETY AWARD

Major command that flies more than 2% of the total USAF flying time.

STRATEGIC AIR COMMAND

SAC experienced the second lowest number of Class A aircraft mishaps in the history of the command, and for the first time ever, did not have a single Class B aircraft mishap. These achievements were attained while flying more than one-third of a million hours of worldwide, strategic operations. Impressive accomplishments in other safety disciplines complement the flight safety achievements. The nuclear safety mission, largest and most complex in the USAF, was performed in an outstanding manner. The explosives safety mission, also among the largest in the Air Force, was accomplished without experiencing a single Class A or Class B mishap. Ground mishap fatalities were reduced to the lowest number in the history of the command, and government motor vehicle mishaps were more than 60 percent lower than the previous year.

SECRETARY OF THE AIR FORCE
SAFETY AWARD

Major command with a small, or no, flying mission.

ALASKAN AIR COMMAND

AAC did not experience a single Class A or Class B aircraft mishap while performing flying operations in a demanding flight environment. Accomplishments in other safety disciplines were also impressive. Military injuries and government motor vehicle mishaps were reduced significantly compared to the previous year. In weapons safety, only two Class C explosives mishaps were experienced, and there were no air launched missile mishaps.

T-38

MAJOR ERNEST A. BRIGGS, CF

■ The T-38 is used primarily by Air Training Command for undergraduate pilot training. Tactical Air Command and Strategic Air Command also operate T-38s.

Since its introduction into USAF service in the early 1960s, the T-38 system has experienced a total of 160 Class A major mishaps through the end of 1982. These mishaps have resulted in 151 aircraft being destroyed and caused the loss of 61 lives.

The majority of the mishaps are operations-related. Of the 160 total Class A mishaps, fully 97 are operations-related. This compares to 51 logistics-related mishaps, with the remainder classified in miscellaneous categories. The Class A mishap rate for the T-38 is 2.05.

During 1982 we experienced three Class A major mishaps for a rate of 0.8. This is the lowest yearly rate ever for the T-38. Unfortunately, these three Class A mishaps accounted for six destroyed aircraft and the loss of five lives.

Recent T-38 mishaps are briefly described:

- The mishap aircraft were on a four-ship aerial demonstration mission. During the final portion of a line-abreast loop, all four aircraft impacted the ground. The aircraft were destroyed, and the four pilots were fatally injured.
- The mishap aircraft was on a solo student training mission. When the gear and flaps were lowered on the second landing pattern, control difficulties were encountered. The pilot ejected at 900 feet AGL with no major injuries. The aircraft was destroyed on ground impact.
- The aircraft was on a solo cross-country flight and entered an area of thunderstorm activity. Both engines flamed out, the aircraft descended into a severe part of the storm, and aircraft control was lost. The aircraft was destroyed on ground impact, and the pilot was fatally injured.

Some areas where improvements in safety and reliability are being made are: A contract has been awarded to reduce the speed of the displacement gyroscope thus decreasing the heat generated and increasing the service life.

The T-38 is one of the aircraft that will be fitted with the new lap belt this year.

Wing flap rod ends are being changed on T-38s for a new stronger model that will greatly increase the dependability of this item.

General Electric is continuing the J85 Component Improvement Program (CIP). One area presently being investigated is the material and/or blade redesign of the compressor blades.

The T-38 system is monitored for trends, and efforts at every level continue to develop improvements in safety and reliability.

The wizards who forecast aircraft mishaps say that 1983 will produce four T-38 Class A major mishaps. We have already experienced two T-38 Class As with two aircraft destroyed and one fatality.

Safety articles will not by themselves prevent mishaps or injuries. Safety is not a paper program, but rather a part of the real world. Everyone involved with aviation is part of the safety system, and everyone's efforts are required to reduce our mishaps. ■

C-5

MAJOR KURT P. SMITH

■ 1982 was not one of the Galaxy's better years! The C-5 experienced one Class A and two Class B flight mishaps. The Class A involved an engine combustor failure which resulted in almost $1.5 million worth of damage. The Class B's included an engine compressor rear frame failure, costing $242,000, and a birdstrike mishap that resulted in damage to all four engines. In addition to these events, the aircraft experienced 31 Class C and 14 High Accident Potential (HAP) mishaps.

For you rate watchers, the 1982 Class A flight mishap rate was 1.99 mishaps (per 100,000 flying hours), which is slightly higher than the lifetime rate of 1.75. The one Class A brought the lifetime total to 10 Class A flight mishaps. The 1982 Class B flight mishap rate was 3.98, which is higher than the lifetime rate of 2.74. The two Class B's brought the lifetime total to 16.

The C-5 does, however, have a number of impressive records. First, and most impressive, the aircraft has experienced only one fatal mishap (1975) in its 14-year history. Second, only two aircraft have actually been destroyed as the result of flying accidents. Last but not least, of the original 81 aircraft produced, 77 remain in the inventory.

No new trends were observed. Problems with the engine (TF-39) and landing gear systems continued to lead the list of logistics-related problems, with only the numbers changing. In 1981, engine problems accounted for eight mishaps. In 1982, the number jumped to 13, including one Class A and one Class B. Landing gear problems resulted in four mishaps in 1981 compared to 14 in 1982. Only the number of slat problems remained stable at two mishaps. On the "ops" side, we continued to experience taxi and jet blast mishaps. However, in this case, the number of operations-related mishaps dropped from six in 1981 to 2½ in 1982; one jet blast mishap, one taxi mishap, and a gear problem/incorrect crew procedure mishap. The number of "other" mishaps (birdstrikes, cargo spills, engine FOD, and physiological problems) increased from 11 in 1981 to 14 in 1982; primarily because of an increase in the number of birdstrikes from three in 1981 to 10 in 1982.

C-5 Flight Mishaps (1979-82)

	Class A's	Class B's	Class C's	HAPs	Total
'79	0	2	26	21	49
'80	1	3	26	23	53
'81	0	1	20	15	36
'82	1	2	31	14	48

FIGURE 1

NOTE: For all you nonsafety types, a Class A flight mishap is an airplane accident resulting in a fatality (or permanent total disability), or destruction of the aircraft, or when the total cost exceeds $500,000. A Class B mishap is an accident that results in cost between $100,000 and $500,000 or a permanent partial disability. A Class C mishap is a mishap that costs $1,000-$100,000, and HAPs are significant hazards to crew or aircraft.

continued

C-5

continued

Figure 2
Types of Mishaps (1981 vs 1982)

	1981	1982
Logistics	**19**	**31½**
Engines	8	13
Landing Gear	4	13½
Slats	2	2
Other	5	3
Operations	**6**	**2½**
Jet Blast	2	1
Taxi	1	1
Other	3	1½
Other	**11**	**14**
Birdstrikes	3	10
Cargo Spills	5	2
Physiological	1	2
Other	2	0

Engine Problems

Problems with the TF-39 continue to plague the C-5. In addition to problems identified in earlier mishaps, two new ones came to light in 1982. The most significant was a combustor failure that resulted in $1.5 million worth of damage. A one-time inspection was performed and inspection intervals reduced to every 30 days to identify and replace the defective combustors. The IC engine update (six engines per month) should provide a permanent solution by installing an improved combustor. The second problem was a fatigue failure of an engine compressor rear frame. Inspection procedures to identify fatigue cracks have been beefed up and inspection intervals reduced to identify and replace the defective compressor rear frames.

With the wide range of engine problems, it can be pretty confusing trying to figure out what the problem is. However, there are a few common factors in most engine failures/fires. An AFISC study of 20 mishaps involving engine fires (1971-1982) revealed:

- The fire detection system failed to provide an adequate warning of an engine fire/overheat in 17 of the 20 mishaps.
- The majority of the engine failures/fires occurred on take off (11 of 20) or during touch-and-go's (3 of 20).
- The severity of the engine failures/fires is increasing. The last three C-5 Class A mishaps have been engine failures/fires.
- In all of the mishaps, the crew successfully handled the emergency and got the airplane safely on the ground.

The bottom line of the subject of engine problems is that you need to be prepared for the worst. Even with all the corrective action underway, the chance of a serious engine problem is still present. Know the Dash One procedures for engine problems and be prepared to handle these emergencies; particularly in situations where power is applied such as take offs and during touch-and-go's. Whatever you do, don't become complacent!

Landing Gear Problems

Landing gear problems accounted for the largest number of mishaps (14) in 1982, an increase of 10 over 1981. The main landing gear (MLG) accounted for 10 and the nose landing gear (NLG), four. Problems with the NLG created the most excitement. Two of the mishaps resulted in NLG-up landings, bringing the C-5's lifetime total to nine. According to the folks in the know, there is no common denominator in these mishaps. One was the result of a door opening hydraulic safety relief valve failure and the other, a broken electrical wire. In the latter case, the crew should have been able to lower the NLG by using the hydraulic overrides. The wiring in the NLG area is being rerouted to help prevent this type of problem. More hands-on training may also help prevent crew embarrassment. One of the other problems involved the loss of two of the NLG wheels on landing. Although the investigation failed to identify a cause, improper installation is suspected.

No new trends were observed in the 10 MLG mishaps. The crews were able to cope with the emergency and get "green wheels" in all but one of the mishaps. In that case, the failure of a 123-degree gearbox resulted in a landing with the forward MLG retracted. As with engine problems, the crew's knowledge of procedures and systems saved the day!

Windshield Heat Transformer

The chance of experiencing a cockpit fire as the result of a windshield heat transformer failure/fire has been all but eliminated. The replacement of the transformer resulted in no cockpit fire/smoke mishaps in 1982.

Crew Error Mishaps

Aircrews were responsible for only 2½ mishaps in 1982. This is an improvement over 1981 when aircrew errors resulted in six. The 1982 crew error mishaps included a C-5/C-5 taxi mishap, jet blast mishap, and a crew procedural error.

The taxi mishap involved a C-5 taxiing into an improperly parked C-5 at a crowded enroute station. The mishap was almost identical to earlier C-5 taxi mishaps. A taxiing C-5's wing tip cut through the radome of an improperly parked C-5. Unfortunately, the number of extenuating circumstances did little to erase the embarrassment to the maintenance personnel who set up the "bad" parking spot or to the C-5 crew. As you can imagine, the parking problems have been resolved; however, the chances of getting set up are always present. Hope you don't get caught.

The jet blast mishap involved a C-5 blowing away the VASIs at a northern base while making a 180-degree turn.

The half mishap was one of the nose gear up landings. Although an electrical wire broke in the NLG area, the crew should have been able to use hydraulic override to extend the gear. An improvement to the wiring and more hands-on training should resolve this problem.

All in all, C-5 crews have an outstanding record. None of the 10 Class A's has been the result of crew error. Only one Class B mishap has been the result of crew error. Congratulations are in order. Keep up the good work!

The Birds and the Leakers, etc.

After looking at the logistics- and operations-related mishaps, all that's left is the "other" type mishaps these include birdstrikes, cargo leaks, physiological problems, and engine FOD. The C-5 experienced 14 of these types of mishaps in 1982, compared to 11 in 1981.

The major contributor to this all-inclusive category in 1982 was birdstrikes. The aircraft experienced 10 birdstrikes in 1982, with one ending up a Class B. In 1981, we only had three of these mishaps. The birdstrikes occurred at these locations: Dover AFB, DE, 3; Travis AFB, CA, 3; Altus AFB, OK, 1; Ramstein AB, GE, 1; Torrejon AB, SP, 1; and one somewhere between RAF, Mildenhall UK, and Dover AFB, DE. Most frequently, damage occurred in the engine, radome, and leading edges of the wing.

Although there is not much a pilot can do to avoid these mishaps, you should be aware of the fact that six of the 16 Class B mishaps have been birdstrikes. All have involved damage to the engine(s). For what it's worth, be prepared for the worst.

Cargo leaks resulted in two flight mishaps in 1982 compared to five in 1981.

The two physiological mishaps included a case of a passenger fainting and a crewmember experiencing a "post-micturation syncope."

What Can You Expect in 1983?

If you guessed more of the same, you probably wouldn't be far off. That is not to say nothing is being done. Efforts are continuing to improve the TF-39 engine and to correct landing gear deficiencies. However, these modifications take time and until complete, the chance of experiencing one of these mishaps is still present.

The major area of concern in the C-5 is engine problems, whether from an internal failure of the engine or a failure from a birdstrike. Remember, the majority of the Class A and B mishaps result in engine emergencies. The obvious answer is know your engine-related emergency procedures.

The C-5 safety record is a good one. The record of the C-5 aircrews is even better. Keep 'em safe in 1983. ■

C-135

MAJOR ARTHUR P. MEIKEL, III

■ The 745 aircraft C-135 fleet is made up of 34 different models the majority of which are KC-135As(567). These aircraft are operated by NASA, the Navy, and nine major commands from 50 locations around the world. Oklahoma City Air Logistics Center manages the C-135 fleet, and Strategic Air Command operates the majority of C-135 resources (565).

In this article, we will limit ourselves to certain safety aspects of the aircraft — recent mishap experience, current actions, and anticipated problem areas.

Mishap Experience

Last year's C-135 flying time is estimated to be within 1,000 hours of 1981's 259,000 hours. There were two flight Class As last year compared with three in 1981.

The first Class A mishap was a midair collision with a light aircraft. The light aircraft was in violation of Federal Aviation Regulations (FARs), and the KC-135 was struck as it emerged from the clouds on an IFR approach. This mishap could just as easily have happened to any other aircraft in the sky, but the KC-135 crew was in the wrong place at the wrong time. Near midair collisions (a part of the Hazardous Air Traffic Report program) are an indication of increasing air traffic congestion. In 1981, 17 near midair collisions were reported involving C-135s, compared to 26 in 1982.

The second Class A mishap involved fuel ignited by an unknown source during an enroute descent. Fuel system efforts will be covered under current actions.

There were no Class B flight mishaps in 1982 compared to two in 1981. The change in Class B dollar criteria takes engine failure mishaps (historically, the cause of most C-135 Class Bs) out of the Class B arena.

The Class C flight mishap numbers increased slightly from 155 to 167. A general analysis compares the last two years by general category.

Class Cs (flight)

1981	Category	1982
35	Birdstrike	31
28	Air Refueling	32
5	Physiological	14
8	FOD	11
9	Engine	10
6	Landing Damage-Boom/Nacelle	3
3	Flight Controls	5
2	Fuel System	5
3	Gear	4
5	Lightning/Static	2
4	Generator	[illegible]
2	Flap System	[illegible]
9	Autopilot	1

Class C's continued

5	Hyd System/ Tire Failure	7
6	Antiskid/ Tire Failure	4
2	Tire Failure	1
3	Trailing Wire Antenna	1
6	Cartridge	1
16	Other	27
155	Total	167

Significant 1981-1982 Trends

■ **Birdstrikes** The largest category of Class Cs in the last two years. If you believe that potential Class As are a reflection of Class Cs, it is time for new and increased anti-bird programs.

■ **Air refueling** A summary of air refueling mishaps (*Flying Safety*, January 1983) shows that the worst trend is large aircraft which exceed inner limits at night and damage the ice shield, often without realizing it. The tanker and receiver solution is recognition and earlier disconnects. Eye examinations and HUDs are two possible ways to enhance early recognition.

■ **Cartridges** There were three cowling explosions last year. In 1981, there were at least seven (cartridge problems may be reported as explosive, ground, flight, MDR, or aircraft nonflight mishaps). Progress is being made and partial cartridge burns are better than cowling explosions.

■ **Autopilot** The number of autopilot-related mishaps in 1982 dropped from nine to one. The one autopilot incident involved an uncontrolled altitude loss of 26,000 feet and overstress of the aircraft in excess of design limits. Mishap numbers are suspect because of the special autopilot reporting during the 1981-1982 time frame. The special autopilot report showed that approximately 100 minor malfunctions a month are occurring presenting opportunities for this type of mishap. Autopilots may have been improved by maintenance resulting from the report, or safety officers may not have felt dual reporting was required. More on the autopilot under current actions.

■ **Physiological** There were 14 physiological mishaps last year and five in 1981. Better crew system knowledge could improve this figure somewhat. Strategic Air Command's tanker training office is distributing a training videotape on the subject.

■ **Flap System** A new trend is the failure of the cove-lip doors; there were two such failures reported in 1981 and seven in 1982. Although the exact cause is still to be determined, preliminary investigation shows unlatching as the reason.

A brief summary of the 25 C-135 aircraft nonflight mishaps includes eight FOD incidents, four flaps damaged by assorted equipment, three APU incidents, and three external-power problems. Ground mishaps include four towing mishaps and three aircraft that rolled and hit objects, despite being chocked.

Current actions the Safety Center has been following closely include:

- Fuel System
- Autopilot System
- CFM-56 Re-engining

■ **Fuel System** OC-ALC directed Hayes Birmingham to accomplish a 35-aircraft sample of PDM aircraft for fuel cell problems. Each fuel bladder is removed and inspected. Also inspected are the cell cavity and electrical components in the cavity area. As a result of that sample, all fuel cells on all aircraft are being removed and inspected at PDM. The majority of the cells themselves are in good condition; however, fuselage ribs, rivets, and hydraulic components are causing wear.

In addition to fuel cell problems, electrical and AR manifold problems were discovered. Thus far, an average of four significant electrical discrepancies per aircraft have been found. Wear and cracking in the air refueling manifold are being repaired to prevent unscheduled transfer of fuel when AR pumps are on. Since up to four years are required to fix electrical problems through PDM, other inspections can be anticipated.

■ **Autopilot** Because of the numerous autopilot malfunctions, the system manager has gone to Boeing for a study of alternatives. Boeing has recommended a new autopilot system. Oklahoma City ALC is now in the procurement phase.

■ Fin tip floodlight installation began in February 1983.

■ Re-engining tests on our one KC-135R are continuing. The CFM-56 is experiencing normal test problems and minor changes are being made. The civilian airlines' experience with the engine will help refine the military's product. Funding will determine the schedule for 300 plus KC-135Rs.

There are other safety-related modifications in the works which are too numerous to mention. Most of these are the result of aircraft age (i.e., rewiring of landing gear, corrosion programs, etc). continued

Anticipated problems deal with the age of the fleet. The 135 was not originally designed to fly this long. Parts designed for 10,000 to 20,000 hours of service are wearing out. Likewise, flexible parts designed for a 15- to 20-year service life are becoming brittle. Consequently, new problems are being encountered that are normal but cannot be precisely anticipated. Many parts are operating well beyond their expected service life. As these parts reach their limits, new inspections are required. One-time part changes may become necessary, and crews may experience problems not previously encountered.

This situation presents a unique challenge for the C-135 community. Crews must have a better-than-average system knowledge to cope with uncommon failures. For example, there have been two instances of unscheduled fuel transfer through leaks in the AR manifold. Anytime the manifold was pressurized, fuel leaked into a body tank from cracks near AR pumps.

Field level maintenance units face perhaps the greatest challenge. Under the PDM concept, specific depot tasks are contracted for, based on past failure trends. A large part of the burden of discovering new failure modes falls at unit levels. Good writeups, thorough troubleshooting and in-depth inspections led to the discovery of several major problems in 1982.

In order to show the type of problems we might encounter in the C-135's future, a list of some of 1982s one-time inspections follows.

- TCTO 1155. APU fuel-line tubing inspections to insure clearance from RMLG wheelwell door mechanism.
- TCTO 1156. Solar APU fuel box inspection to insure proper fuel draining.
- TCTO 1144. APU insulation blanket inspection to check for improper construction/patching material.
- TCTO 1145. MK-1 skid detector electrical plugs and hardware inspection.
- TCTO 1154. External power receptacle inspection to insure wiring was in good condition.
- TCTO 1153. Inspection of 960 bulkhead located in wheelwell to check for cracks in a major structure.
- TCTO 1158. MLG and wing fillet inspection.
- TCTO 1164. Checks for cracks in aft fuselage.
- TCTO 1167. Inspection of rudder tabs.
- TCTO 1170. Aileron followup wiring on autopilot system.
- TCTO 1151. Inspection of PCU wire routing.
- TCTO 1160. Hydraulic accumulator end cap inspection. ■

G-INDUCED LOSS OF CONSCIOUSNESS

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■ The mishap aircraft was an F-16A, the pilot a highly experienced IP. During the third one-versus-one BFM engagement beginning at 18 to 19,000 MSL, the mishap aircraft initiated a slice back. The slice back began "easy," but then increased to a hard turn. Approximately 20 seconds later, the aircraft hit the ground in a steep dive at a high velocity. The pilot made no transmissions and did not attempt to eject.

The safety investigation board (SIB) concluded that this pilot passed out during the high G turn and did not regain useful consciousness in sufficient time to recover the aircraft. The SIB further felt this pilot's G tolerance may have been compromised by: (a) A recent illness, increasing susceptibility to fatigue, (b) No high G flying in the previous six days, deconditioning his G tolerance somewhat, and (c) Physical exertion, pulling Gs during the first two engagements which fatigued him and hampered his ability to perform an effective and timely anti-G straining maneuver on the third go.

This is not an isolated instance. G-induced loss of consciousness (LOC) has been documented at least three times in the F-16. In two instances the IP recovered the aircraft. One of those two instances was recorded on the HUD VTR. In that instance, during the third BFM engagement, the student initiated a defensive left turn which quickly peaked at 7G, then declined. His first straining maneuver was clearly heard on the recording, but midway through the second straining maneuver, even though the G level was dropping through 4.8, his grunting faded away. The aircraft continued into a descent, the G level dropped to 1, airspeed climbed to

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G-Induced Loss of Consciousness continued

Mach 1, and the pitch attitude fell to 65 degrees nose down.

Comments from the IP in the rear seat who had a reputation for being unflappable, indicate he thought the student was still flying the aircraft. The IP finally took control just as the student began to come around again, pulling over 9 G, and missing the rocks by very little. When questioned, the student initially stated he'd "blacked out," but then said he'd "grayed out." Repeated timing of this incident shows he was out cold for at least 17 seconds and effectively incapacitated for at least 21. (The student later noticed his anti-G suit had become disconnected. After some G training on the centrifuge, he returned to flying the F-16.)

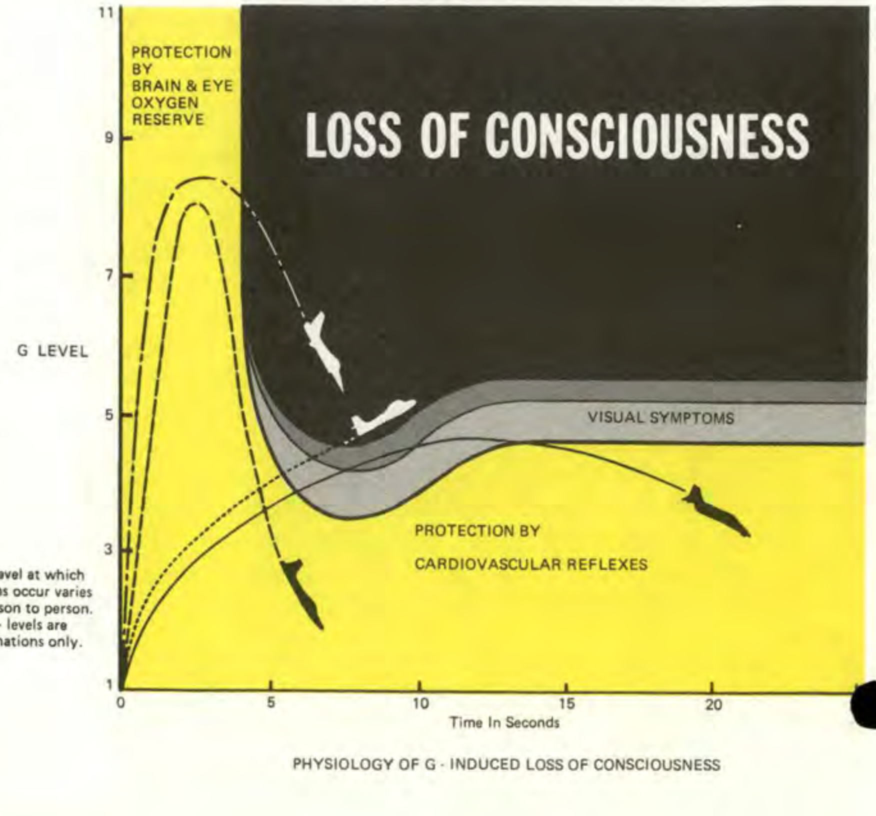
The third F-16 LOC was reported anonymously by the pilot as a HAP (High Accident Potential), also associated with inadvertent disconnection of the anti-G suit. This pilot was also in a one-versus-one BFM engagement. He reports that he started a left slice at 21,000' MSL. He achieved 6.8 Gs and then "blacked out" in a dive, which, by VTR, reached approximately 25 degrees. He determined that he "woke up" 18 seconds after losing consciousness and recovered the aircraft to level flight at 11,200 MSL. He looked down and saw his anti-G suit disconnected, though he distinctly remembered connecting it during strap-in.

G-induced LOC has been recognized for decades, mainly as a minor annoyance in UPT. The classic case is that of a T-37 student who has his lights put out by the IP or, on occasion, even does it to himself while dual. The T-37 lacks anti-G suit capability, and students commonly fail to properly perform the protective coordinated anti-G straining maneuver. Figure 1 shows the rise of G-induced LOC reported in the A/T 37 over the past 12 years (110 total). Note that these are reported instances only. There has doubtlessly been under-recognition and under-reporting of this phenomenon. Of these 110 T-37 episodes, six were reported by solo students.

Recently, one such episode was associated with a destroyed aircraft. While performing over-the-top aerobatics, a T-37 student pilot misread his airspeed indicator and started 100 KIAS fast. A combination of trim for the planned lower speed plus pull normal for the maneuver overstressed the aircraft tail and rendered the student unconscious. When the student began to awaken, though confused, disoriented, and hampered by "tunnel vision," the picture he saw consisted only of ground and canopy. He felt the aircraft was inverted, rolling, and in a high-speed dive, and in his compromised state did not feel he could recover it. Nearly simultaneous with his ejection, the tail actually separated from the aircraft. The SIB estimated the duration of his LOC at 15-20 seconds.

Over the past 12 years, G-induced LOC has been reported in several other type of aircraft: the T-28,

Figure 3



The G - level at which symptoms occur varies from person to person. These G - levels are approximations only.

PHYSIOLOGY OF G - INDUCED LOSS OF CONSCIOUSNESS

T-33, T-38, and F-15. In all these cases, the pilot recovered the aircraft.

There have also been mishaps in which G-induced LOC was strongly suspected involving an F-105D, an A-7D, and two F-4Ds. None of these crews survived, so we'll never know for sure.

The physiologic effects of G force on the eye and brain are due to the attendant drop in blood pressure and in blood flow, and consequent lack of oxygen or hypoxia. Each G drops the blood pressure 22mm Hg (down the vertical).

The eyeball has an inflation pressure of 13-18 mm Hg, which the heart must overcome in order to pump blood into the retina. The eye and brain are situated about the same distance above the heart and receive approximately the same level of perfusing blood pressure. But because of its inflation pressure, signals of hypoxia usually occur in the eye before they occur in the brain. These eye signals are well known to anyone who's pulled 3 or 4 Gs unprepared: tunnel vision, gray-out and, possibly, even black out. The good news about these visual signs is that they reverse immediately upon relaxation of the Gs or upon the performance of an effective coordinated straining maneuver which raises the blood pressure and resumes retinal perfusion.

Both the brain and the retina (which is really an extension of the brain) store a little oxygen, about 5-6 seconds' worth. As long as blood flow is interrupted no longer than that, not much happens. Of course, repeated insults can deplete this oxygen reserve, thus shortening the time required to produce visual or brain signs of hypoxia.

There's some bad news, too — it's what happens to the brain when its blood supply stops. Once the brain's oxygen reserve is depleted, it shuts off, just like a light switch. And once it turns off, it stays turned off for a variable period of time, regardless of blood supply. Volunteer studies on the human centrifuge at Brooks AFB have been quite revealing. There is a definite period from LOC to recovery of consciousness, plus an additional period of confusion or disorientation lasting another 5 seconds or so.

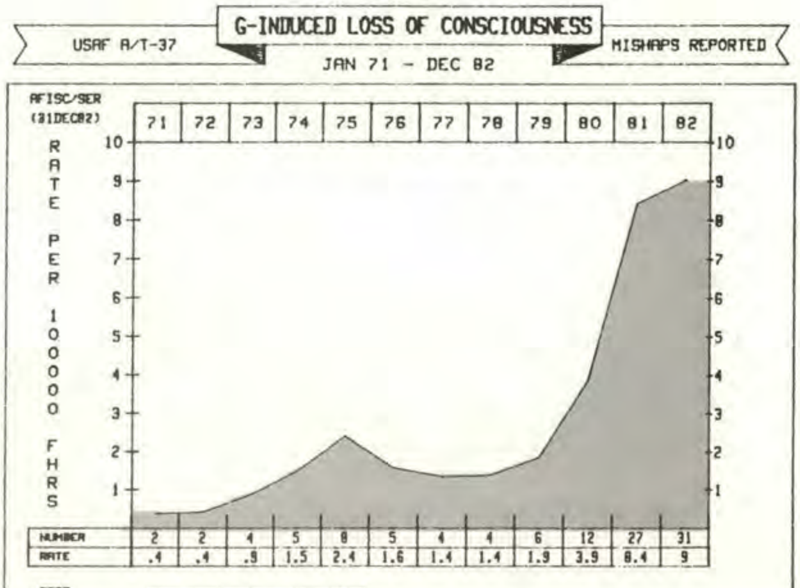
Once actual loss of consciousness occurs, the minimum duration of incapacitation is about 9 seconds, the mean or average time is 15 seconds, and the top end is about 21 seconds. These episodes are commonly accompanied by a muscle twitch or two all the way up to violent, purposeless thrashing of the arms, legs, and head, depending on the individual. Normally, there is complete amnesia for the LOC event. The victim may recall only the onset of visual signs, gray-out or blackout. The next thing he knows is that he is now at a different attitude and airspeed. He has somehow "lost" 10-20 seconds but doesn't know why.

A typical story is that of an F-15 pilot. This pilot went canopy-to-canopy versus an adversary at 23,000' and racked into a hard left turn. The next thing he knew, he was in a spiraling descent, passing through 10,000'. He had no idea what had happened, but he wasn't about to tell his flight surgeon. Several weeks later, he mentioned it to his buddy at the bar. His buddy, also an Eagle driver, confided the same thing had happened to him.

There's not much margin between visual signals and losing consciousness — only a few mm of mercury drop in blood pressure. A lot of bad things can happen to an aircraft when its sole occupant is totally incapacitated for 10-20 seconds.

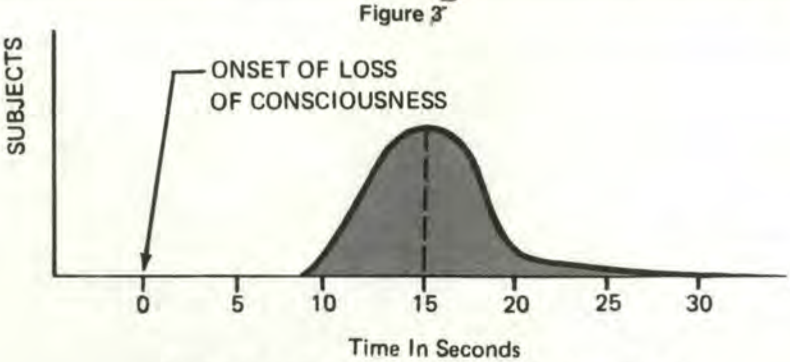
The physiology of G-induced

Figure ~~2~~ 1



G-Induced Loss Of Consciousness

Figure 2



DURATION OF EFFECTIVE INCAPACITATION

visual and brain effects is illustrated in Figure 1. When Gs are applied gradually, the body has some built-in reflexes that begin to raise the blood pressure, thus increasing G tolerance. Similarly, if an aircraft momentarily pulls 7-10 Gs — no problem physically. Though perfusion ceases, the 5- to 6-second oxygen reserve averts LOC. The problem arises when the aircraft is capable of putting the G on quickly and keeping it on, or even putting it on less quickly, but capable of sustaining levels which exceed the natural and artificial (i.e., straining maneuver and anti-G suit) compensating mechanisms.

It is also possible to produce LOC without any visual signs. As shown in Figure 1, rapid onset and high sustained G can deplete the oxygen reserve of the retina and of the brain simultaneously, producing loss of consciousness without any visual warning.

There are several factors affecting G tolerance. Factors reducing G tolerance include lowered blood pressure, long vertical heart-to-brain distance, dehydration, heat stress, hangover, fatigue, skipping meals, hypoxia, hyperventilation, any illness, being out of shape, and being out of shape for pulling Gs by laying off for more than several days. Factors abetting G tolerance include elevated blood pressure, a short vertical heart-to-brain distance, and a snug anti-G suit, properly connected and functioning.

By far the most important factor, improving G-tolerance, however, is the performance of a timely, well coordinated anti-G straining maneuver. The first part of this maneuver, known as the L-1 or M-1, consists of a quick inhalation followed by a strain or a more prolonged, forceful, straining type of exhalation lasting no less than 2 seconds and no longer than 3. The only difference between L-1 and M-1 is the position of the "glottis," the trap door at the top of the airway. Straining against a closed glottis is just as effective as straining against an open glottis, and being less noisy, does not interfere as much with communications or irritate the vocal cords.

The quick inhalation sucks venous blood into the chest; the prolonged (2-3 second) and forceful strain keeps the blood pressure up between heart and brain. This breathing pattern is only one important element but it needs to be performed correctly. If inhalation is prolonged, pressure in the chest drops, blood pressure drops, and LOC can occur. If exhalation is too prolonged, venous return to the chest is impeded; this reduces the volume of blood pumped by the heart and the results are the same — LOC. For that reason, the straining phase should not last more or less than 2-3 seconds. The straining pattern of the correct breathing maneuver is somewhat similar to that used in weight lifting.

The other part of the maneuver involves tensing the large muscles of the arms, legs, thighs, and abdomen. About 75 percent of one's blood volume is pooled in large veins in these areas and this blood must be squeezed back into the chest before the heart can pump it back up to the brain. The entire maneuver, the coordinated muscle tensing and strain breathing, like any motor skill, requires some practice. And, like any motor exercise, it requires some strength and some stamina, plus recurrent exposure to stay in shape for pulling Gs. Also, like any feat requiring strength, stamina, and endurance, the G-response can be fatigued.

Even when a pilot correctly performs the coordinated straining-tensing maneuver, the blood pressure response lags somewhat. For that reason, it is vital to anticipate high Gs and begin straining early, i.e., get a jump on the Gs. Once behind the power curve, it may be too late to catch up. The only recourse then is to back off on the Gs, and do it quickly. Granted, it takes awareness to realize one is behind, honesty to admit it, and supreme self-discipline to unload soon enough — especially when the bandit is either in one's sights or has just called "Fox 2." But the consequence of any solo G-induced LOC episode is potentially disastrous, and constitutes, but for the grace of God, one dead pilot.

Pulling Gs is very fatiguing, and one should train properly to be in shape for it. Weight training is strongly recommended. Cardiovascular conditioning is also important, but there is some question as to the advisability of long distance marathon class running. Distance runners tend to show increased responsiveness of the autonomic nerve which slows the heart (the vagus nerve). Besides slower heart rates, they tend to have lower resting blood pressures. While great for longevity, their blood pressure may rise too slowly under G. Also, the straining maneuver, which normally stimulates the vagus nerve, may slow the heart rate so much that insufficient blood is pumped to the brain. All the answers are not in on this one yet, but in the meantime, some moderation is probably wise. Twenty-to-thirty minutes of aerobics daily should be sufficient for cardiovascular conditioning and yet be safe as far as G-tolerance is concerned. Marathon-class training may, however, be counterproductive.

Then, there's the anti-G suit. If well-fitted and snug, it provides, by itself perhaps 1½ to 2 Gs protection. The real advantage of the anti-G suit is that it gives its wearer something to tense and strain against, and it is the proper execution of this coordinated tensing-straining maneuver that elevates blood pressure and raises G tolerance. The anti-G suit is important. No pilot anticipating rapid onset, high Gs should leave home without it. It's important to insure the suit is well fitted, that it's snug, and that it's properly connected. The suit should be tested by pressing the G valve before pulling high Gs.

Finally, another aid to improving G tolerance is reducing the heart-head column by hunching over forward. Of course, this may hamper ability to see outside, and since a properly performed M-1 or L-1 maneuver is sufficient, hunching forward is not considered necessary. By the same token, stretching out that heart-to-head distance, say by looking back up over one's shoulder during pull-off to see where the bomb hit, can put the brain out of reach of a marginal head level blood pressure, causing LOC.

F-16 pilots are especially susceptible to G-induced LOC. There have been at least 3 documented cases. In one case the pilot was incapacitated for 21 seconds.

IN SUMMARY:

- The potential for G-induced LOC mishaps is increasing yearly because of the increasing influx into the active inventory of aircraft capable of rapid-onset, sustained high G.
- G-induced LOC is a real killer, not only in high performance aircraft but also in less capable aircraft lacking anti-G suits.
- The margin between visual signs and loss of consciousness under G is narrow.
- With rapid G onset, LOC can occur without visual warning.
- Once LOC occurs, one is committed to a period of total incapacitation lasting 9 to 21 seconds.
- Amnesia for the event is the rule.
- G-induced LOC can be prevented by proper training, preparation, and equipment.
- Training should include mastering the coordinated strain breathing/muscle tensing protective (L-1 or M-1) maneuvers. It should also include a physical conditioning program to improve strength, stamina, and cardiovascular shape. Weight training conditions muscles and develops breathing patterns which minimize fatigue during these maneuvers and is, therefore, recommended. Simultaneous cardiovascular conditioning is also recommended. However, there is some question as to the advisability of long distance marathon-class running.
- Preparation should include staying in shape and avoiding situations known to compromise G tolerance before committing to high G exposures. It also includes the anticipation of high Gs, getting the jump on the straining maneuver, and possessing the self-discipline to reduce the Gs before losing consciousness, should one "get behind the power curve."
- Equipment involves a properly fitted anti-G suit, properly connected, and properly rechecked before engaging in high Gs.
- G tolerance can be fatigued. A fatigued pilot has less reserve, reacts more slowly, tends to drop his guard, and may become a little careless or complacent when it is time for the Gs. The smart pilot should be aware of these pitfalls and avoid becoming a victim of G-induced loss of consciousness.

Note: Two convincing video tapes can be ordered through any base audiovisual library beginning 1 April 1983. Order by the following titles:

- High G Survival Kit
- F-16 HUD VTR During G-induced LOC ■

NEWS FOR CREWS

Career information and tips from the folks at Air Force Manpower and Personnel Center, Randolph AFB, TX.

CAPT TOM JACKSON AND CAPT JACK MOHR
Rated Officer Career Management Branch

Major Weapon System Selection (MWSS) Process

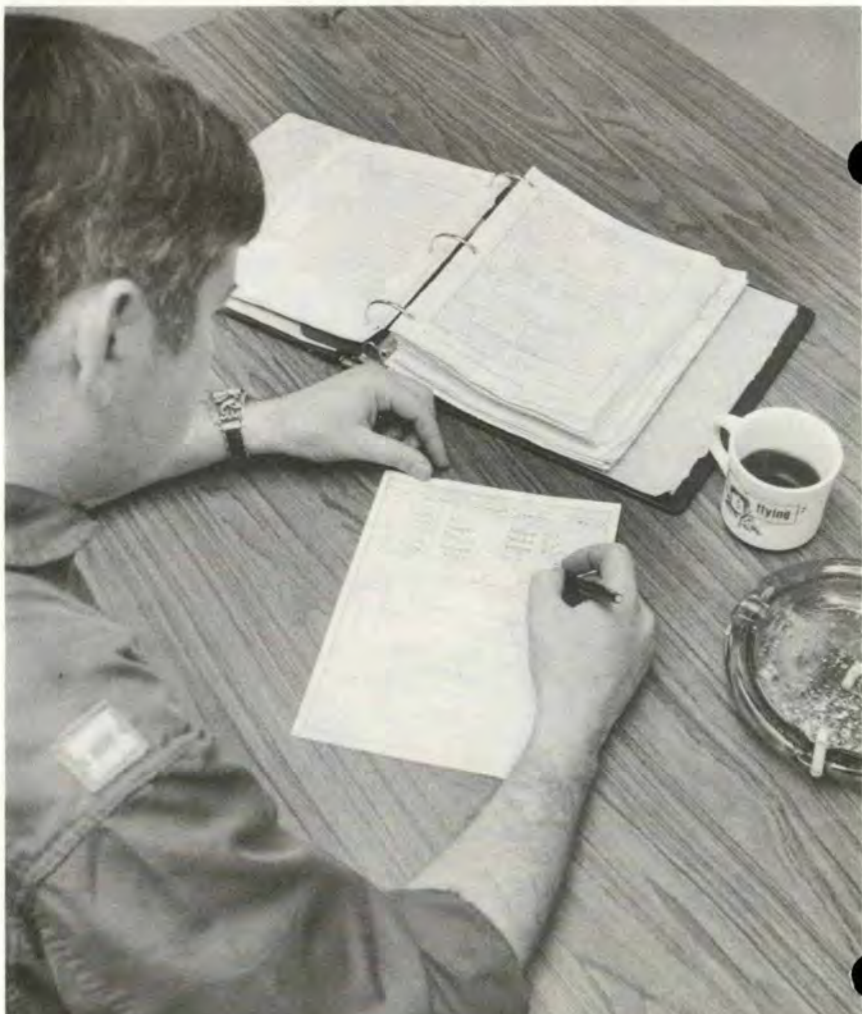
■ *If you have been wondering why and how pilots who have not flown a major weapon get to do so, this article may be of interest to you. First, a brief explanation of who falls into the "no major weapon system" category – those whose first assignment out of UPT is as an ATC instructor pilot, "mission support" pilots (T-39, T-43, C-12) and those in ASTRA, AFIT or similar duties.*

Generally speaking, it is important that Air Force pilots have a major weapon system identity – so they are able to contribute in a combat role – which also broadens their potential for key jobs later on in their careers. That's the "why" of it, here's the "how."

The Assignment Process

Most of the action takes place at AFMPC Rated Officer Career Management Branch. We work assignments for pilots who don't have a major weapon system identity on a quarterly basis. The assignments are worked about six months prior to the end of tour. For example, pilots available in October/November/December would be worked in June and their assignments announced six weeks later.

Here's what is involved. The assignment process is competitive. A merit rank order is accomplished by a five member board with representatives from MAC, SAC, TAC, and ATC. It is chaired by the Chief of the Rated Officer Career Management Branch at AFMPC. The board procedures are very similar to those of USAF promotion boards in that each board member scores the candidates record in half-point increments on a scale from six to 10. The total of the scores from the five board members determines the rank ordering of



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FY83 MWS — TRAINING DISTRIBUTION

FTR/RECCE/INTCP		BOMBER/TANKER		AIRLIFT/HELO		TRAINER
F-16	20	FB-111	4	C-9	8	50
F-15	33	B-52	6	C-141	25	
A-10	11	E/R/KC-135	17	C-5	35	
F-4	10	E3A	8	C-140	1	
F-4G	5			WC-135	1	
F-111	11			C-130	35	
RF-4	19			HELO	10	
F-106	6					
	115		35		115	

FTR/RECCE/INTCP	36.5%	AIRLIFT/HELO	36.5%
BOMBER/TANKER	11.1%	TRAINER	15.9%

FIGURE 1

each individual within the overall group.

The board evaluates the officer selection folder (maintained at AFMPC) and career brief. The selection folder contains the official photograph, training reports, awards and decorations, and all officer evaluation reports. The career brief is a summary of duty history including rated progression, academic, and professional military education. All candidates may update relevant information prior to the board. A letter from the officers' supervisor may be sent to AFMPC/MPCROR6 emphasizing duty performance since the last effectiveness report. Based on this composite data, the group is rank-ordered based on the whole person concept — the most challenging step for the board member.

Assignment Match

The quarterly package is now a merit rank order of records, each with the officer's assignment preferences (AF Form 90). Our next step is to determine aircraft assignments. Major weapon system training allocations are made in annual blocks. We break these allocations down into four quarterly blocks based on the number of available candidates. Under this distribution system each officer has equal opportunity for major weapon system training regardless of month available or size of group. Figure 1 shows the FY83 annual training allocation for the Major Weapon System Selection Board process.

Aircraft are assigned to the rank-ordered package based on qualification and AF Form 90 desires. If the top officer in the package is qualified according to AFM 50-5 criteria, he or she gets the highest available AF Form 90 choice. If the first preference of the highest ranked officer is not available, we would go to the second choice, and so on, until we came to the highest currently available preference. The bottom line in the merit rank system is that we won't work the tenth person until the ninth has an assignment. Therefore, the primary factors that affect an assignment are:

- Available training;
- The officer's qualification for training;
- The rank ordering of the group; and
- Preferences of officers who rank higher in the package.

After all the aircraft are assigned, the package is forwarded to each MAJCOM for review. Once the aircraft assignments are confirmed, the records are distributed to the various weapon system resource managers, who will then work with the officer to determine the end assignment and training sequence.

Putting "You" In The Process (AF Form 90)

Unless forced by unusual circumstances, we simply will not work an officer's assignment without a current AF Form 90. We feel that no games should be played with the AF Form 90, and every block and the remarks should "tell it like it is!" A workable AF Form 90 — one that helps both you and us — should list all available weapon systems, as shown in Figure 1, in your priority order.

That's where we stand today — what we're doing, why we're doing it, and how it's being done. Our commitment to you and the Air Force is to keep the process fair and responsive. Two direct links to this process are:

- Your CBPO, by keeping your records and AF Form 90 up-to-date, familiarizing yourself with AFP 36-6 (Assignment Information Directory), and
- The rated teams at AFMPC.

You play a big role in this process, so don't hestitate to send us a note, call, or visit if you have further questions. AUTOVON 487-6124/6125, or HQAFMPC/MPCROR6, Randolph AFB, Texas 78150. ■

About The Authors

Captains Jackson and Mohr are Trainer Career Management staff officers at AFMPC. Captain Jackson is responsible for T-38 instructor pilot assignments and Captain Mohr for T-37s. They also work follow-on assignments to major weapon systems through the Major Weapon System Selection Board. Captain Jackson's background includes tours in the C-130 and the T-38 where he recently completed an assignment as a Vance AFB flight examiner and class commander. Captain Mohr has flown the T-37 aircraft at Laughlin and Randolph AFBs with extensive ATC experience as a class commander, check pilot, and pilot instructor training stan eval member.


SPATIAL DISORIENTATION CAN KILL
STICK TO GOOD INSTRUMENT PROCEDURES