National Defence | Défense nationale

Summer 1999

Flight Comment

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Canada

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Cover Photo by
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Ottawa, Ontario

The Canadian Forces
Flight Safety Magazine

Flight Comment is produced 4 times a year by the Directorate of Flight Safety. The contents do not necessarily reflect official policy and unless otherwise stated should not be construed as regulations, orders or directives.

Contributions, comments and criticism are welcome; the promotion of flight safety is best served by disseminating ideas and on-the-job experience. Send submissions to:

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Subscription orders should be directed to:
Publishing Centre, CCG,
Ottawa, Ont. K1A 0S9
Telephone: (613) 956-4800

Annual subscription rate:
for Canada, $19.95, single issue $5.50; for other countries, $19.95 US., single issue $5.50 US. Prices do not include GST. Payment should be made to Receiver General for Canada. This Publication or its contents may not be reproduced without the editor's approval.

ISSN 0015-3702
A-JS-000-006/JP-000

As I See It

Boring life...not for this guy

It seems a hundred zillion years ago that I joined the Royal Canadian Air Force, actually it's thirty-three. Back then we spent days and days playing the old RCAF game of "*euchre*". Weeks would go by between one aircraft inspection and the next and we would have nothing to do but wait, and play cards. Once in a while we would grab a mop and clean up some oil spots and that was it. I, as an AC DUCY (Aircraftsman of no particular class) had no specific duties other than to man a mop.

When I went home at night I was uninspired, bored, and lacked ambition to learn. Why is it when we have little to do, do we seem to feel worse than if we worked our fingers to the bone every day? The human body is a strange thing; with nothing to do we should feel rested at the end of the day — yet most often the very opposite occurs. For most of us when we go through the day, sitting around as the day drags on for every hour, at four o'clock it feels like ten at night. Yet a steady productive environment throughout the day brings a feeling of satisfaction at the days end. The listless feelings are gone and one often feels smug that an accomplishment was made.

There are other ways I get to feel good; at work that is. Doing a job well is OK, but knowing that the job is done well is better. That's why in my business I have checklists for everything. With all those squares ticked off I know that nothing was missed. It is surprising that I did OK in my career progression. After all with all that uninspiring time on my hands I obviously could have turned out to be a cross between a cabbage and a brussel sprout. Well it didn't turn out that way. I hate being bored. I hate being bored so much that I'll even work to overcome it. That's why I always found something to do. If the coffee percolator was busted, I'd fix it. If people complained about something, just to shut them up I would write a memo to get it fixed. Yes it worked. I wasn't bored. I would go home each day with that warm and fuzzy feeling.

Now here's one that often worked. When conducting inspections on aircraft I would use the positive approach and say to myself, "I'm going to find something wrong today". You know how many times it worked? Most days I'd find something, maybe not to the degree of causing a fleet wide inspection of the aircraft, but enough to once again give me that self-satisfaction and accomplishment.

Nowadays, I have a boss who wouldn't dream of letting me sit behind my office desk and not be productive. I supposed that's something to do with good supervision, but during the times that he's away, I still find things to do that gives me the same old feeling when I go home. So what am I telling you? Don't allow yourself to get bored, it brings about fatigue, stress and all those other nasty factors that affect us as aviation technicians. A little old lady once said, "*I intend to wear out, not rust out*" and that my friends, is the simple way to keep our minds alert: KEEP BUSY.

Chief Warrant Officer
PAUL JENKINS

Paul joined the RCAF in 1965 following employment as a Quality Control Inspector for Douglas Aircraft of Canada. Trained as an Airframe Technician, he was posted to Winnipeg where he worked on aircraft such as the Chipmunk, Tutor, T-33, C-45, C-47 and Albatross.

From 1971 to 1974 he flew on the C-47, Dakota as a Technical Crewman. In 1974 he was posted to Trenton and flew on the CC-115 Buffalo as a Flight Engineer. He later instructed on this aircraft.

Following Trenton he was posted to Greenwood on the CP-140 Aurora. In 1988 he was promoted to Chief Warrant Officer (CWO) and posted to Comox.

Paul retired in 1994 and holds an air force reserve position. He is presently employed as the 19 Wing Deputy Flight Safety Officer. It is in this position that he started HPM for the Canadian Forces.

From the Editor

Although I had promised you a listing of safety posters in this issue you'll notice it is conspicuous in its absence. Why? I couldn't bring myself to drop any of the things you'll see in edition. Well, what about those posters? By the time you are reading this all WFSO's and other flight safety principals will have had the new set of posters sent to them automatically for further distribution. Additionally, we will have sent them one copy of every poster that remains in stock. Requests for further copies of any poster are to be made through normal supply channels. If a poster does not have a National Defence Index of Documentation (NDID) number quote the poster's title on your request.

You'll see an Epilogue in this issue for Silverstar 454. You may be interested to know that according to our records three other aircraft have vanished without a trace since 1954.

- Silverstar 457 disappeared out of Gimli while on a navigation proficiency flight on 03 April 1956.
- Silver Star 356, also out of Gimli, went missing 25 July 1955 after conducting a practice forced landing to the airfield.
- Canuck 448, based out of North Bay, was never seen again after the pilot complained of vertigo and broke out of formation on 02 August 1956.

Although other aircraft remain listed as missing, in all cases wreckage, survivors, or associated personal safety equipment has been identified.

Fatigue and Circadian Rhythm

On exercises, as in war, tasking does not cease during the hours of darkness. For operational pilots, there is a requirement to maintain a high degree of proficiency in night flying. However, the responsibility does not end there. Every unit commander, supervisor, safety officer and indeed each individual must be aware of the problems of fatigue, especially when the circadian rhythm is disturbed.

Now is probably a good time to reflect on this as K95 will produce many long flying hours at all times of the day and night. Any member of the crew is susceptible to these problems which ultimately may cause death and destruction.

'The aircraft was on a flare dropping task in the early hours of the morning. Takeoff was at 0400 hrs local with the first flare dropped at 0410 hrs. Thereafter, single flares were dropped at intervals of about five minutes. After the fourth drop, the engineer, who had been dispatching the flares from the rear ramp whilst the aircraft was at 5 000 ft, suddenly realized that he had neglected to don his safety harness. He immediately rectified the situation and informed the aircraft captain of the oversight.'

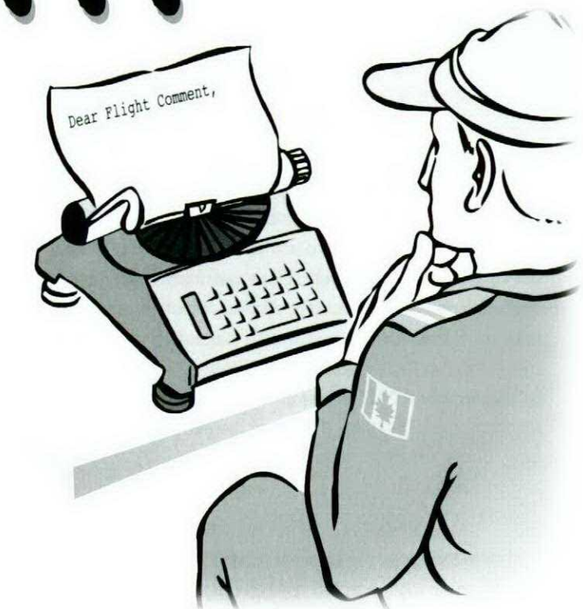
Fortunately the engineer was able to discuss this incident afterwards, and the crew and the squadron are commended for bringing the matter to light. However, how many similar incidents go unreported because of personal pride or fear of embarrassment?

A civilian parachutist photographer was not so lucky. Prior to his seventh jump of the day, he placed his parachute on the floor of the aircraft and then climbed on board. At the correct time and height, he jumped with the other parachutists, without ... you guessed it! The movie of the descent was good until he realized his fatal error. This accident occurred in April 1988. Something about familiarity breeding contempt. He didn't check his own equipment and obviously the rest of the team did not check each other.

We are trained to operate as a team, therefore we must get into the habit of checking each other to ensure that safety checks and actions have been completed.

Reprinted courtesy of ADF FOCUS 2/95

Letters...



Dear Sir:

You asked for comments on the format of Division Drivel, but I will answer with comments on the content. You have struck a chord.

An inordinate amount of time is spent with human factors people imported from all over the place who give us their version of human factors. We get all excited by James Reason's model which is nothing more than the same old scenario with new words to describe it. So we are beating the issue to death, trying to get many different perspectives on human factors, but the crucial question is what do we do with the information we have now. I have yet to see anyone propose an anti-"channelized attention" programme or a devise an "expectancy" antidote. Like I said to the expert in 1996 as he opened his human factors lecture, "I hope at the end of this lecture I will not have just learned some new terms, but will actually know how to do something about the problems." Needless to say, I was disappointed. So point number one is that we have our own human factors system, quite adequate I think, so let's not confuse the issue and waste time with other systems which we will not use in practice.

The study of human factors is really psych 101 or the study of human nature. We go to great lengths to discuss some pretty esoteric concepts that are listed in CFP 135 but which hardly ever occur in practice. I did some calculations on the aircrew cause factors, 1988-1995, and found that the leading cause factors were judgement 27% and technique 25%. The next three were each between 6 and 10% and the remaining 13 were all less than 6% each. So why not go after the big items, judgement and technique, and work on those as the easiest way to have an effect on the accident rate.

On that score, what can we do about judgement? No matter how much natural talent and savvy our young people have, they still need the supervision and corporate knowledge that flight commanders and senior captains possess. The FSO is one of those persons who, even though he is a junior squadron member, can provide such leadership through his actions as the FSO. He can do this by reading FS messages with critical rather than casual interest. Not all FS incidents are investigated as thoroughly as they should be and leave some questions unanswered — the FSO should be able to identify the shortcomings in the investigation and discuss the unasked and unanswered questions with squadron members. I am sure you could get a good sample of flight safety incident messages from across the communities which gave a sketchy appreciation of one aspect of the problem, but failed to touch on larger issues, like supervision, training, personal discipline, etc. Discussion of the larger issues will lead to a better appreciation of many aspects of risk management and this cannot help but increase a pilot's ability to make a sound judgement call. These could form the basis for my suggestion, a class on critical reading of FS incident messages.

The other major cause factor, technique, can also be addressed by the FSO. It is a little difficult, especially for a young lieutenant, to come out with comments on other squadron members' techniques, but he can help ensure that

Letters...

the foundation for correct technique is solid. This foundation is basic knowledge, an often-neglected part of squadron continuation training and something that is only considered once a year when the annual exams come around. He would need the support of the CO, but he could institute a series of short notice, closed book self-marking tests, to be available for those days when the fleet is down for an SI or the weather is marginal for even a Cat III approach. There are all kinds of essential information — AOI facts, IFR procedures, armament selections, etc — which, if dusted off every few months, will become common knowledge versus a potential contributor to a technique cause factor. So this leads to a suggestion for a class on what the FSO does when he is not writing out incident reports; something I think that is not covered in a specific class now, but is left as something that is intuitively obvious — and you may even find that the course candidates have more ideas from their particular disciplines.

Further to the technique cause factor, the reduction of training time has probably gone too far, and a resumption of previous "minimum" training time allocation which is higher than the current standard is a good place to start. However, this is not for the WFSO to pursue, it is for those FS staff who have the Commander's ear! Good luck!

So, those are my comments. Human factors are important, but let's not get carried away. The big ones are still, and always will be, judgement and technique. Look after the dollars and the pennies will look after themselves.

– Major T. Lee

Editor's note — This letter was originally addressed to 1 CAD FS and is reprinted with permission. The author poses an interesting argument. I look forward to printing comments in a future column.

Dear Sir:

I found the story about "The Accidental Journalist" very interesting, as I am both a journalist in civilian life, and a reserve Public Affairs officer in the CF. So I've seen the problem from both sides.

I agree fully that reporters do often write about highly technical subjects in simple terms. But that is their job. There is no point in a housewife or cab driver picking up a newspaper and reading that "the aircraft impacted the ground at sharp downward angle and suffered Cat A damage." This very phrase was inserted by your office in a story I wrote a few years ago, in place of the sentence "The aircraft crashed and was destroyed." I am often called upon to train senior officers in speaking with the media.

The biggest problem I face is getting them to understand that "attrit" is not a word and "impact" is not a verb. Also, people and equipment, aircraft, ships and tanks are just that... they are not "assets."

The techno-jargon gobbledegook and evasive euphemisms that pervade aviation are among the most difficult to understand. The same is true for just about any other field of human activity that involves danger to the public. Do you remember the trouble the character played by Jack Lemmon had with the word "accident" in the film "The China Syndrome"? I have been there, and it makes you scream with frustration when you see the wreckage, the flames and smoke, but can't get anyone in authority to admit that there has been a crash. They insist in using such words as "incident" or "uncontrolled impact with terrain" or some such.

It's true that it takes a long time to properly investigate a serious crash. However, my experience has been that many military officers, policemen and politicians use the excuse of an investigation to refuse to say anything at all. To use a technical term, it's an avoidance mechanism. Asking a simple question, for example about the present action over Kosovo, and getting back such terms as "strike package', "mission profile" and "impact error" are enough to make even the most even-tempered person see red. Left with no other alternative, the reporter has to try to explain these things to his readers, viewers and listeners, and is just as likely to get it wrong as is your mother-in-law. (Unless she's a pilot.)

I wear an army uniform and come from the combat arms. Yet I do a lot of free-lance writing in the aviation field, and find your magazine a great source of information. Lately, however, it has begun a gradual downward slide into techno-speak. Surely, the aim of publishing (making public) is to make sure your message reaches the widest number of people. Remember, you guys may be aircrew but the rest of us are passengers. We die in the back seat, screaming.

If I want to know what happened when a plane crashed, I'll read the newspapers. They may get it wrong at first, but they won't be deliberately trying to baffle me with baloney.

The easiest to understand and clearest books about major disasters are those written by the reporters who covered the event, sometimes devoting years of their lives to it. The official report usually makes a great paperweight.

Thanks for letting me sound off.

Cheers!

– *Captain Tony Keene*

Your letter raises a number of interesting points.

I have always thought that clear and precise use of language indicates clarity of thought. Unfortunately, many people appear to think that the use of convoluted prose or speech is an indicator of their professionalism. I was recently asking one of our investigators about the status of an aircraft component. He replied that it was "not abnormal" — perhaps "normal" would have been a better reply?

Certain words and phrases can become popular despite their misuse. I suspect that many of the people that use the word "impact" as a verb don't know the difference between the words "effect" and "affect". Sadly, their innovative use of the word "impact" guarantees a 100% failure rate whereas even if they had to guess between the use of "effect" and "affect" they'd have a chance of being correct. I note with some alarm that the word "mishap" is now being used around the office. Perhaps it is perceived that the word "mishap" doesn't sound quite as bad as "accident". A mishap is defined as "bad luck, misfortune" or "an unlucky accident". The definition for the word "accident" includes "an event that is without apparent cause or unexpected; an unfortunate event" and "a casual appearance or effect". If you fly into the side of a mountain because you made an error setting your altimeter I'd suggest you were involved in an accident and not a mishap. I once asked a member of a foreign air force why his organization had mishaps rather than accidents. I was informed that mishaps were preventable and accidents were not — I wish he'd take me to a casino!

We can also paint ourselves into a corner when we attempt to condense prose. I was searching through the intranet for a message. The message's subject was "air force degree completion programme". The subject was then shortened to "air force degree completion program (sic)". The subject was then further shortened to "degreed (sic) officer corps". Duh!

I certainly do not agree with your comments about the veracity of the media's coverage of aircraft accidents. Simple and often repeated errors such as "Tudor" for "tutor" or "griffin" for "griffon" (although why we named a helicopter after a vulture or terrier-like dog is beyond me) hardly lend credibility to an article. The public rightly expects aircrew to be completely professional in their actions. Why are we tolerant of errors that occur in the work of professional journalists?

Finally, should you ever find yourself in the back of an aircraft when everything is going pear-shaped, remember your Birkenhead drill.

If a pilot buries his head in the cockpit, sooner or later someone else will have to dispose of the rest of him.

Reprinted courtesy of Pakistan International Airways Air Safety

AVIATION TODAY

Dr. Georgette Buch

Project Director — Human Factors

Directorate of Flight Safety

Over the past half century aviation has gone from the Boeing 377 requiring five-flight crew and 16 hours of optimal conditions to cross the North Atlantic to supersonic flight and jumbo jets the size of a double-decker football field (Boeing 747).

Now we are into another generation altogether, with new technology and language. The change to glass cockpits and computer technology has been rapid. A safe flight in today's complex aviation environment involves more than knowledge, skill and experience. The human element plays a major role. Understanding the influences being exerted on it are just as important if not more in this age of glass cockpits and fly-by-wire, computer driven aircraft. The mental workload has never been heavier. We are now dealing with flight management systems automation saturation and computer complacency.

Simulators now train the pilot to deal with a spectrum of system failures; however, they cannot train for human failure. Furthermore the automated environment is putting extraordinary demands on the human operator. Today pilots rise to the challenge of dealing with leading edge technology. Many have demonstrated their ability at using innovative solutions in accidents that would have been considered unsurvivable. For example the United 747 out of Honolulu with an explosive decompression, two engines out and a gapping hole, it was the human operator that saved the day. This is where we are today; we are beyond technical skills and into innovation and ingenuity because no simulator can recreate these situations.

When referring to the human element we mean developing an intense awareness, realization, and understanding of all the factors involved in making a correct decision — the thought process. Each one of us interprets a situation with our own filters. These filters are very different and directly reflect our life experiences. These influence both cognitive and motivational factors and therefore the pilot's attitudes toward risk.

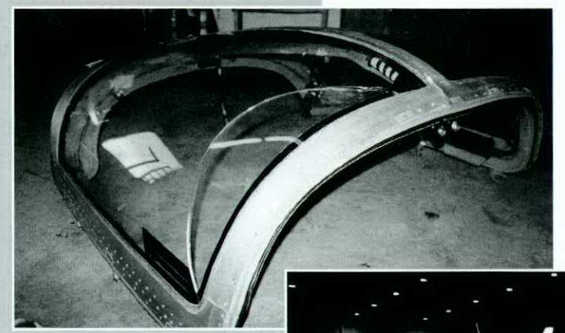
The current trend is for more flight deck automation. This has proved to be a mixed blessing. As our aircraft become highly automated, the irony is, this very skilled, knowledgeable individual, the pilot, with a type A personality is left to perform passive duties, as a system monitor. His duties are shifting from an active participant to a passive one of monitoring systems for hours on end. This unfortunately is not a human forte. Take this into consideration when the pilot has a Flight Management System (FMS) which offers a minimum of five ways for changing altitude; each of which results in a different outcome as to how the aircraft is controlled by the pilot. As a result we see more and more "automation surprises". This is when the automation behaves in a manner that is different from what the operator expects. Mode confusion is not uncommon and has been dubbed "clumsy automation" by many.

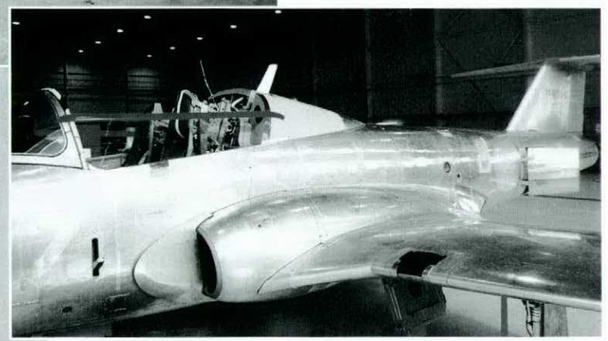
Over the years researchers have studied reactions and thought processes. It is evident that the decision making process develops gradually and takes on different directions depending on the experiences encountered. In other words, what we are, what we think and how we act is the result of what we know. Knowledge greatly influences our thought process and therefore our attitudes. Education is the key to broader knowledge and quality decisions at critical times. Pilots spend hundreds of hours during their careers memorizing technical material and practicing hands on skills. This is all vital preparation for when things go wrong. The inevitable question then is " How are these hours of passive monitoring affecting the pilot's knowledge, skills and ability to spontaneously react to "clumsy automation" ?"

Epilogue

TYPE: CT114006 Tutor
DATE: 09 Sep 97
LOCATION: Edmonton Municipal Airport, Alberta

On 09 September 1997 a CT-114 Tutor was being test flown from CAE Industries, Edmonton by a 15 Wing, Moose Jaw test pilot. During the departure and at about 10,000 feet ASL and 10 NM NW of the airport the canopy departed the aircraft. The canopy fell onto a golf course about 20 metres from some civilian personnel. The aircraft landed back at Edmonton Municipal airport having sustained damage to the horizontal stabilizer, the VHF antenna, the left and right canopy sills and various other canopy locking and operating mechanisms. The pilot elected not to perform a controllability check prior to landing the aircraft. No injuries were sustained. An extensive search of the golf course and surrounding areas failed to locate the canopy M3A1 initiator and M1A1 remover assembly. On 6 June 1998, a farmer found the device about one half-mile south of the golf course.





Technical analysis of the canopy system concluded that the canopy was not in the fully closed position when it departed from the aircraft.

The investigation concluded that the newly qualified maintenance test pilot had not fully closed the canopy on start-up. He then taxied at an unfamiliar airport while conducting pre-flight test items on the aircraft. Then, lining up into the sun where it was difficult to see the annunciator panel lights, he neglected to cross-check the canopy closed witness marks on the canopy sill. During the climb-out, the aerodynamic loading built on the unclosed canopy to sufficient levels to cause the canopy actuator shaft to fail in overload and, with the aid of windblast, the canopy departed the aircraft.

As a result of this incident the CFTO which explains the rigging procedure of the canopy interlinks was found to be vague and difficult to understand. Subsequently it was improved to increase clarity and precision.

Other specific safety actions were also made as a result of this incident. The need to do a controllability check any time that damage is suspected or there is an unfamiliar change of aircraft configuration, if time and circumstances permit, was emphasised to all aircrew as a "must do" item.

The pilot's experience level on the aircraft type was sufficient to merit selection as a candidate for test pilot but the low level of experience he had for this type of mission indicated that the local training program and corresponding mission selection for test pilots could be improved. 15 Wing has committed to examining this suggestion.

This incident illustrates the need to return to "first principles" when faced with a new or complex situation. In this case, the use of the pre-take off checklist, which includes checking the line up marks on the cockpit sidewall could have prevented this occurrence. The new aerodrome, a new and relatively complex mission and a bright day all contributed to set the stage whereby the pilot missed the open canopy on the pre-take off check. However, had all of the standard checks been completed, this oversight would have been discovered just before take off and would likely have just been a learning point for the pilot.

Epilogue

TYPE: CT133454 Silverstar
DATE: 22 Mar 56
LOCATION: 90 NM east Comox

Cudgel 5, a Mark III T-33, departed Comox at 0947 hrs local on 22 March 1956 on an instrument flying practice flight. The flight was intended to fly 60 NM East of Comox and then return for landing. The Ground Control Intercept (GCI) controller had been tracking the accident aircraft from departure out of Comox on a heading of between 020 degrees and 030 degrees magnetic to 60 miles and then to a left turn back to a heading of 190 to 220 degrees. The aircraft was tracked to within 15 miles of Comox when it disappeared from radar due to weather interference. At 1020 hrs local the GCI controller transmitted to Cudgel 5 the latter's position as "base 12 o'clock at 15 miles", to which there was no acknowledgement. More attempts of contact were unsuccessful and, eventually, an extensive search was conducted. This turned up no clues and the Board of Inquiry conducted at the time concluded that the aircraft had crashed and the pilots had suffered fatal injuries.

In 1974 a hiker discovered the aircraft canopy in dense woods approximately 90 miles East of Comox. The area in which the canopy was found was searched for other wreckage but none was found.

In September 1997 the main wreckage of the aircraft was discovered. Neither the aircraft ejection seats nor the crewmembers were found at the wreckage site. A further search was conducted but to this date they have not been located.

Initial analysis indicated that the aircraft had crashed with little or no fuel on board. Investigators focused their efforts on the state of the fuel system at impact. After thorough analysis of the applicable fuel pumps, valves, transfer systems and indicator lights the investigation concluded that the aircraft had indeed suffered complete fuel exhaustion.

There was, however, evidence which contradicted this conclusion. The fuel remaining indicator read 358 imperial gallons on impact. The aircraft clock read approximately 1050 hrs local on impact. With an estimated fuel burn of 4.4 gallons/minute and a take-off time of 0947 hrs local this would equate to a total fuel burn of 285 imperial gallons (33 gallons of unusable fuel). A witness recalled having read the aircraft Fuel State from the log set as 493 gallons. Also, the weight records for the aircraft indicated that there were approximately 585 gallons of fuel on board. So, was the fuel remaining gauge set properly prior to take-off? Was the clock accurate? Had the aircraft been refuelled correctly after the preceding flight? What was the actual fuel state on take-off? Was the weather a factor? Were the crew lost? These are all questions to which the answers can only be hypothesised.

If the aircraft had run out of fuel and had a normal fuel state for this mission been loaded, the crew would have been alerted through indicator lights as each fuel group

went empty. Did this experienced crew simply ignore these indicators and press on with a VFR flight? If they had time would they not have attempted to climb and at the very least make contact with an ATC agency to alert of their situation? Did the weather interfere with a transmission they may have made? They were loud and clear while working with GCI previously.

Their actions, or lack thereof, may lead us to believe that the fuel starvation came unexpectedly. How could this happen? Perhaps only the tip-tanks were refueled and the crew (evidenced by the fuel remaining indicator) thought that the aircraft had been refueled to a higher state. Due to the lack of concrete evidence and the absence of some critical files from the past, we can only theorize as to what may have happened on 22 March 1956 with Cudgel 5.

Even though this accident occurred in 1956, there are still some lessons that we can take away from it. It re-emphasizes the importance of fuel management and cockpit awareness. It also reminds us that we are human and humans do make mistakes. Refueling procedures must be carefully followed and, in our business, assumptions can lead to the tragic loss of both personnel and equipment.

Epilogue

TYPE: CH146480 Griffon
DATE: 16 April 1998
LOCATION: 17 NM SSE Cold Lake AB

The crew was conducting a night Visual Flight Rules (VFR) navigation mission without Night Vision Goggles (unaided). Prior permission had been obtained to conduct a confined area landing on private property. The crew arrived over the intended landing area, completed the confined area checks during a downwind racetrack pattern and executed a two-stage approach. The aircraft struck an obstacle during the landing phase causing "C" Category damage. The investigation into the accident is now complete.

According to the CH146 Standard Manoeuvre Manual (SMM) the landing light shall be retracted to illuminate the underside of the aircraft and at least two low and slow approaches are to be flown in order to land in a confined area unaided. The crew did not do this.

Historically, the Operational Training Unit (OTU) conducted only unaided night flying on the CH135 Twin Huey (3 lesson plans). NVG training was conducted at the individual units because there wasn't sufficient flight hours allocated to the course. The initial cadre of pilots attending the Griffon course were only given unaided night training as well. However, as the introduction of the Griffon became more established, the Course Training Standard (CTS) was amended to include the basic level NVG syllabus (6 lesson plans). This was achieved by removing the unaided night trips. The rationale for this change was to reduce the NVG training load at the unit level. The Category Upgrade Program (OJT) did not capture the requirement for unaided night flying skills. During the transition period between unaided night flying and NVG training at the OTU, there were numerous pilots who never received any formal instruction on how to fly the unaided confined area sequence. The AC (flying pilot) of the occurrence aircraft fell into this group.

Although he had not received formal instruction at the OTU, he stated that the Unit Standards Officers had provided sufficient guidance on how the unaided confined area manoeuvre was to be flown. Yet while executing this same procedure during his category upgrade flight, he failed to conduct the required second reconnaissance approach as well as neglected to retract the landing light for the FE. This was assessed as satisfactory with debrief by the Standards check pilot. These same two errors were repeated during the accident flight.

At the time of the accident, 1 Wing Orders required pilots who were not NVG qualified to complete a night confined area landing once every six months. Yet there were some aircrew who never received any formal instruction on how

to fly the unaided confined area sequence. This accident highlighted gaps between the training received by the aircrew and the flight sequences required in the orders.

1 Wing reacted quickly to the deficiencies highlighted by this accident. A risk assessment on the requirement for unaided confined area operations was conducted. The operational necessity to land in a confined area at night without NVG was considered remote; therefore the requirement to complete this sequence was removed from flying orders. The manoeuvre remains in the SMM as a sequence to practice in the CH146 simulator.

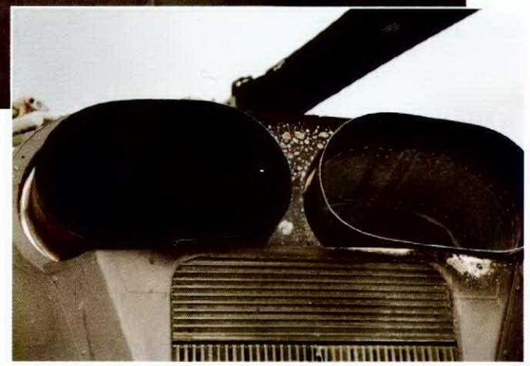
To ensure the maintenance of unaided night flying skills, 1 Wing has added unaided night training lesson plans to the Griffon OTU course and 1 CAD Orders have been amended to include a semi-annual requirement for unaided flight sequences for all crews (500' navigation, circuit and field approach).

Air force personnel are faced with changes to their operating environment at an ever increasing rate. This accident was a relatively inexpensive reminder of the need for increased vigilance whenever established practice is altered.

From the Investigator

TYPE: CH146486 Griffon
DATE: 7 December 1998
LOCATION: Owen Sound ON

Aircraft CH146486 departed the Owen Sound airport at 2310Z for a Night Vision Goggle (NVG) formation training sortie. Shortly after take-off the flying pilot experienced a 'wash out' of his NVG and transferred control of the aircraft to the non-flying pilot. During the transfer a 'twitch' was felt in the aircraft as well as a drop in #2 engine torque. The flight engineer heard popping noises emanating from the #2 engine. The crew rolled the #2 throttle to idle and turned back to the airport. Shortly after, the #2 'engine out' light illuminated and the #2 ITT (inlet turbine temperature) climbed rapidly. The non-essential bus dropped off line with the loss of the #2 generator causing the loss of the copilot's instrumentation lighting. The #2 engine "FIRE" light illuminated on short final to the runway and the crew initiated the emergency checklist procedure for an engine fire. Both fire bottles were discharged and the fire light extinguished during the emergency run-on landing. The crew applied the rotor brake at 80-90% Nr (rotor RPM) in accordance with emergency procedures and egressed the aircraft without incident. The aircraft sustained D Category damage.



The aircraft was recovered by road to CFB Petawawa 9 Dec 98. QETE investigators conducted a detailed visual and boroscope inspection of the air management system and engine 11 Dec 98. Field examination showed no damage to the first stage compressor but considerable heat damage to the turbine and exhaust sections. The turbine blades had been burned down approximately 25%. The engine was subsequently removed and prepared for shipment to manufacturer. QETE investigators accompanied the engine to Montreal and witnessed the manufacturer's strip analysis.

While preparing the aircraft for ground transport the maintenance crew discovered the tail rotor retaining nut was not properly torqued. This was the fourth incident in recent months and prompted the issue of a fleet wide Special Inspection.

The Flight Data Recorder (FDR) was removed by DFS Investigators and sent to the NRC FDR Playback Centre in Ottawa for analysis. Although the voice recorder provided an accurate depiction of crew actions and time lines, the FDR does not appear to have functioned properly. The MDAU (Maintenance Data Acquisition Unit) has been quarantined pending results of the engine strip. Peripheral issues to be examined are the systems powered by the non-essential bus and the NVG 'wash out' experienced by the pilot. The investigation will be completed by 1 Wing and forwarded to DFS for release.

From the Investigator

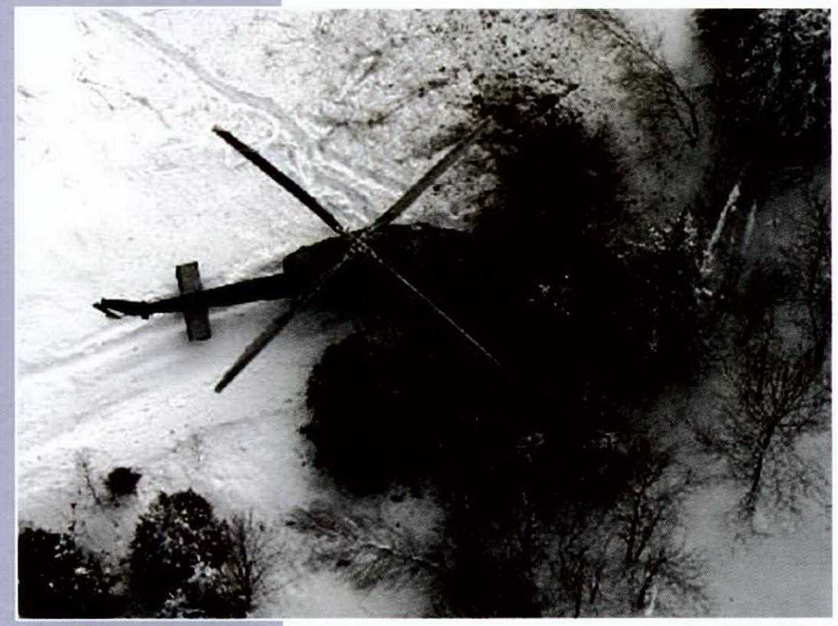
TYPE: CH146495 Griffon
DATE: 12 January 1999
LOCATION: Valcartier QC

The crew was conducting a VFR proficiency flight in the Valcartier training area. The aircraft departed the ramp area and was positioned for an approach to the Valcartier tactical strip. As the aircraft approached the ground the rotorwash caused a white-out (snowball) condition due to the re-circulation of the surface snow. The crew lost visual reference with the ground and drifted into the trees on the edge of the landing strip. Upon hearing the sound of rotors contacting trees, the Aircraft Captain (AC) lowered collective and landed the helicopter. The aircraft sustained D Category damage.

For the FO and the flight engineer (FE), it was the first flight after several weeks leave (Christmas break). Neither had experience with landing in snow conditions as both completed their flight training in the spring and summer months. The unusually light winter in Valcartier had yet to produce favorable conditions for practicing landings in obscuring phenomena. A layer of fresh snow had fallen the night before the flight and the crew anticipated that this would create low visibility conditions on landing. The crew did not discuss any of the techniques for snow landings during either the pre-flight or pre-landing briefings.

The first approach and landing was conducted by the FO. The approach was made parallel to a tree line so the crew would have better references. At approximately 4 feet AGL, the crew lost all outside references due to the snow ball. The FE regained partial references and noticed a tree less than half a rotor diameter from their position. The FE called steady right on a number of occasions but the FO and AC had lost their visual references and were unable to make proper corrections. The sound of rotor blades breaking through trees was heard shortly after and the AC immediately lowered the collective and allowed the helicopter to settle into trees. The crew completed the emergency shut down and egressed the helicopter.

Due to the extent of the damage to the helicopter it was decided that a Flight Safety Investigation would be conducted by the Base Flight Safety Officer. The report will be forwarded to DFS for release. The investigation is focusing on Human Factor issues.



From the Investigator

TYPE: CT114019 Tutor
DATE: 27 February 1999
LOCATION: Moose Jaw SK

The aircraft was number six of a 7-plane formation landing after an on-field air show practice at 15 Wing Moose Jaw on 27 February 1999. During touchdown on runway 29R, the aircraft experienced a firm landing and the nose-gear collapsed. The aircraft was kept on the runway and came to a stop without interfering with the rest of the formation. The pilot shut down the aircraft without further incident. There were no injuries.

The positions in the formation are depicted as follows:

	1	
3	4	2
7	5	6

As the formation touched down, number six experienced a firm landing. The aircraft then bounced and became airborne again. The nose of the aircraft then rotated quickly towards the ground and the nose landing gear contacted the runway surface heavily. The aircraft veered to the right, the nose landing gear collapsed and the pilot maintained directional control using differential braking. The aircraft then skidded to a stop. The pilot shut down the engine, turned off electrical equipment and egressed from the aircraft. Fire fighting vehicles and an ambulance arrived on scene within minutes, but were not utilised.

The team was under training for the 1999 air show season. Three members of this 7-plane formation were first-year team members (numbers 1,5 and 6). Numbers 2 and 3 were ex-team members who had joined the team partway through the training syllabus. They had replaced one team member, who had departed because of an imposed weight restriction on Tutor aircrew, and Snowbird 2, who had suffered fatal injuries in the December 1998 Snowbird accident. Investigators were eager to determine the effects of these events on the Snowbird team. Based on current evidence, it seems that the team had dealt with these set-backs effectively and responsibly.

The pilot was conducting this formation landing configuration solo for the first time, but had performed this manoeuvre with an instructor on two previous occasions. The investigation noted a weakness in the unit Standard Operating Procedures (SOPs) with respect to 7-plane landing emergencies. The team is currently reviewing the landing phase emergency section of the unit SOPs with the intent of improving clarity and completeness.

The link between each first-year team member and his/her second-year training "counterpart" is unique and essential in the learning and retaining of new sequences. This relationship was observed as being somewhat ambiguous and unclear. The "counterparts" role in this link is critical through the thorough and detailed briefing and de-briefing of all elements of each sequence. This concept is being re-emphasised to each team member.

The investigation has eliminated mechanical failure. It will also carry out an in-depth analysis of Unit SOPs and training procedures in order to determine the root cause of this mishap.

WARNING

This article contains humour, stereotypes and gross exaggeration. If you don't have a sense of humour, or if you are insecure and easily offended — read no further. You have been warned.

The Real Display Pilot

When you go to a show, you'll normally arrive the day before; prove that you're a real ace by arriving last and being in the bar first — it's easy. Most crews park their jet, kick the tires and put in enough fuel for the following day. Don't kick your tires (who knows, you might go U/S) and don't bother to refuel. Airplanes don't get thirsty. You do.

Most places put on a welcoming barrel of the amber nectar. If this doesn't happen, you should get a brew from the Ops O when he comes over for a friendly talk about your arrival. Don't worry — he's more embarrassed than you are. After all, he used to fly much lower when he was on squadron with you. No friendly talk means that you were too high and impressed no one. Or perhaps you were too fast and no one saw you, or you lit up the wrong 'drome. Better get a grip or you'll give your airplane a bad name.

You may find yourself drinking alongside or near to a navigator. Well, unfortunately, there's not much you can do about that, other than make the best of it and try to persuade her to buy you a drink. At least you can be sure that a navigator will be talking less BS than the tanker pilot. You'll notice that the training guys will be taking the most flak as

continued on page 29

I learned about flying from that

Photo by Captain M. Evans

In today's air force we emphasize crew resource management, but it hasn't always been this way. Although the story you are about to read happened to me — it could have happened to any crew.

Long ago and far away I was a newly minted SAR aircraft commander. During this period I learned a valuable lesson in crew management trying to balance being the aircraft commander while at the same time trying to be a team player and a nice guy.

Successful mission accomplishment depends upon a team that is usually is composed of varying skill and experience levels. The interaction between these individuals — young or old, bold or cautious, rookie or veteran — is facilitated by a series of checks and balances.

Our mission that weekend was to complete Civil Air Search and Rescue Association (CASARA) training flight. Groups of aircraft pilots and observers around the country offer their aircraft and time to conduct visual or electronic searches in areas that are remote from the main SAR bases. As they are closer to many search areas they can start an initial search while our SAR crews are en-route. SAR squadrons are frequently tasked to visit CASARA units to conduct spotter training and to allow our squadron to liase with them.

This tasking took us to a small northern community, which happened to be the hometown of one crew member. It was a cold and frosty Friday night when we arrived and parked the Buffalo at the small aerodrome. Our large yellow and red twin engine aircraft dominated the ramp in front of the local flying club, in sharp contrast with the many small single-engine Cessna's and Beech's sprinkled throughout the parking area. While the Flight Engineer wrestled to remove the battery from its rack in the wheel well and get it into the hanger I read a poster on the bulletin board of flying club. It announced highlights of the upcoming Winter Carnival — hey that's this weekend — Charity Auction, Parade, Bannock Cook-Off, Dog Sled Races, SAR Demonstration...

??? SAR DEMONSTRATION ???

SAR Demonstration? There was nothing in the trip folder about a SAR Demonstration. Maybe we were supposed to show off our SAR equipment or the CASARA folks were going to explain their capabilities at the *Winter Wasteland Weekend*. Regardless, it would be something to discuss at the debrief when we got to the hotel. As usual, the best laid plans of mice and men went awry. The crew was significantly smaller by the time we got checked in. One was off visiting his family. Two more had been shanghaied by an old buddy and were now at the Legion. The mysterious SAR Demonstration was never discussed as we had many phone calls to make to arrange for the next day's spotter training flights.

Next morning was foggy. A combination of freezing temperatures and vehicle exhaust created a misty and eerie landscape. Fortunately the sun was shining by the time we arrived at the airport. The pre-flight briefings and inspections went smoothly and Mother Nature co-operated by burning off all traces of the frost that had earlier covered the Buffalo. The classroom phase of Spotter Training was just wrapping up and the students were anxious to get aboard the aircraft and practise their newly learned skills.

Finally it was time to get down to work The thunder of the mighty GEs and the roaring of the props heralded our departure as we climbed smartly away after a STOL take-off. Not that the STOL take-off was entirely necessary, but it was impressive none-the-less. We flew to the practice area and set up a routine of letting each new spotter give a try at conning the aircraft around to simulated targets on the ground.

The routine had become boring by the third lift of the day. Finally the last set of spotters had been trained and we made preparations to do some SAR training. A scenario was briefed that would allow a drop of some bundles to a remote area of the airport. The sequence would conclude with a live para drop. An excellent use of valuable aircraft hours as far as I was concerned — CASARA training and quarterly requirements to boot. Alarm bells should have gone off in my head at that point, but the sun was shining and this would really impress the newly trained spotters safely strapped into the Yukon seats and well away from the open door and ramp.

The scenario proceeded normally and the bundles landed pretty close to the target. When the time came for the live para I was told that the drop zone would be a soccer field in the middle of town. This was the SAR Demo that I had read about the night before!!! It was all set, I was told. The Police would ensure that everything was all right and the chum from the Legion was an ex army jumpmaster. The recce had been completed the night before and our buddy would be waiting on the soccer field with a smoke flare and a radio to guide the jumpers to a successful and perfectly safe landing. This SAR Demo was to be the crowning event of the entire *Winter Wasteland Weekend*. How could I put the kibosh on this much heralded and greatly anticipated spectacle? The entire town had turned out to see their local son, who had gone away and joined the air force, give something back to the community. The event was set for 2 PM and that time was rapidly approaching. Isn't this what SAR was all about? Teamwork and doing the impossible no matter what the odds? The pressure was on and I felt compelled to go along with what everyone else assured me would be a public relations coup...

The Wind Drift Indicators showed light winds as we went "Over streamers" and "Over target" for the two man stick. I felt the pounding of the jumpers as they ran down the ramp and leapt, followed by the flight engineers call of "Jumpers Away" as he pulled in the static lines. His next call should have been "Two good chutes", but instead he said "One good chute".

My heart sank and my immediate thought was "I am going to jail for a long time". I could visualise the headline:

SARTECH KILLED DURING UNAUTHORIZED AIR DISPLAY

No thought of the poor jumper struggling with a tangled chute as he hurtled to the ground or of the throng of Winter Wasteland Weekenders traumatised for life. Just of myself.

"What about the other one?" I finally asked.

"Oh he didn't go yet," the flight engineer said.

"His static line got fouled on the life raft after going off headset. We'll need another pass to get him away," the flight engineer said.

The combination of light winds and experienced jumpers ensured a successfully parachute descent to the soccer field — by no means a certain thing in the age of round chutes. The Carnival committee was happy, the crew was happy, the CASARA group was happy. We had contributed to the success of the Winter Wasteland Weekend.

Upon reflection I became troubled by the impromptu SAR Demonstration. This was an air display. Authorisation was required. I had let myself go along with the plan even though I wasn't completely comfortable with it. Fortunately no one had been hurt and we had enhanced the prestige of our SAR personnel in that community. Had something gone wrong the potential for catastrophe was real and significant. Had the winds been stronger or some other malfunction occurred there were few outs for the jumpers. Homes, streets and hydro lines ringed the drop zone.

So why did I allow it to occur? Being relatively new to the SAR community I was uncertain if other crews normally did impromptu demonstrations.

Everyone else on my crew was certainly comfortable with the scenario. I had seen jumps into smaller areas during training, but we usually picked spots close to an airport or where we had drop zone teams already on the ground and a helicopter in the area to provide support and pick up the jumpers.

Obviously, now that almost 10 years have passed since that weekend, I would not allow myself to be suckered into such a situation again. The role of Aircraft Commander is not to be a nice guy. You have got to make the tough calls and risk unpopularity. Hopefully the rest of your crew recognises your responsibility and they will respect you for the unpopular decisions you have to make sometimes.

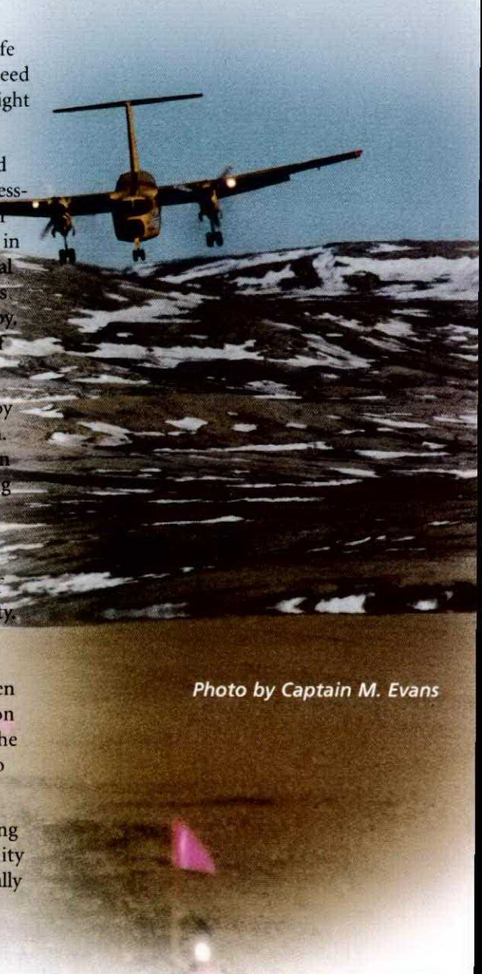


Photo by Captain M. Evans

Groundhog Day

IN SOUDA BAY

by Lt. Matt Testerman USN

AT 0230, THE SKY WAS CRYSTAL CLEAR, and the moon was bright. The last flight of our crew's detachment to Souda Bay, Crete was a mission we had flown so many times before that the crew referred to the 10hour flight as "Groundhog Day." The skipper was aboard as the EWMC. It was also the last mission in the squadron for the aircraft commander.

The EP3E Aries II has 24 ditching stations. Aft of the flight crew, the mission crew sits in single file from stations 5 to 19 (an arrangement that some have compared to a slave galley). As the senior electronic warfare tactical evaluator (SEVAL) under training, I was at ditching station 13, which is opposite the starboard overwing exit. My station had an altimeter, but no airspeed indicator or windows. When we landed, the tube was dark, and I was looking at the back of the head of the special evaluator at station 14.

From my station, the landing was not unusual. I listened in on the ICS as the AC coached the copilot through the approach to touchdown. As the EP3 rolled out, the aircraft swerved, but that wasn't unusual, and the pilots worked to maintain centreline. Then the AC announced, "I've got control." Another swerve to the left and then an enormous correction to the right. It felt as if the aircraft was in a power slide, probably because the port mainmount was actually sliding through the dirt on the left side of the runway. There was no doubt something was wrong. When I heard a pilot call, "Hold on," I braced for the crash. The aircraft slid back across the runway, then off on the right side. Another severe correction this one back to the left and again it felt like I was in a sports car rounding a corner too fast. I saw the special evaluator at station 14 press his head back against the seat, and I thought that was a good idea and did the same.

The first shock was not as bad as you might imagine for a 100,000 pound aircraft leaving the runway at approximately 80 knots. Then an old, concrete, machinegun bunker sheared off the port mainmount. My headset flew off, hitting the seat back of station 14. A 20 pound toolbox and the 10 pound crypto box slid out from where they were stored, becoming missiles in the tube as the aircraft left the runway.

The toolbox hit the petty officer at station 19 hard enough to give him serious doubts about his ability to move his legs. The crypto box struck the back of the flight engineer's seat just below the headrest. A parachute hit the secure communications operator at station 4 when it came off the bulkhead behind him. The galley trashcan came loose from its straps and, along with the now detached (and full) urinal buckets, created an obstacle to those aft of station 18.

The aircraft shuddered as it plowed across the rocky terrain. Then, all motion stopped, and the aircraft was dark (so much for emergency lighting being activated by 1.5 Gs). I still don't know if the loss of power came from the generators or as a result of the flurry of engine shutdown procedures going on in the flight station. Whatever the cause, there was no power available for either ICS or PA.

From up toward the flight station, someone said to evacuate the aircraft, then yelled it a second time. I heard no mention of fire, and I proceeded directly to the starboard overwing hatch. I removed the hatch, passed it back, and was out on the starboard wing. I slid down the flap into a ditch and helped others until one of the aircrew said he was the last man. At least one other crewmember also believed that he had been the last man and though the SEVAL tried counting heads, the two exit evacuation made the effort futile.

We walked about 40 yards away. At that point, an aircrewman drew our attention to the fire on the No. 1 engine. Flames climbed higher than the vertical stabilizer, mixing with the dust from our crash to create an eerie, glowing haze around the aircraft. We quickly moved farther away.

The NATOPS procedures for a ground evacuation were complete as 24 of us stared in disbelief at the wreckage of Ranger 26.

We verified that all crewmembers were present. We checked each other for injuries, finding only minor cuts, bruises, and some lightheadedness from the adrenaline rush and shock. The station 17 special operator had grabbed a first aid kit on his way out. We turned on the flashlights on our SV2s to keep from being run over by rescue vehicles I activated my strobe light, but it failed after two blinks.

The third pilot tried to call the tower and rescue team. Then he checked each crewmember's PRC90 to find an active guard beacon. Somewhere between exiting the aircraft and assembling the aircrew, I had removed my survival radio and activated the beacon, an unnecessary and confusing action. The third pilot told the tower there was no one on the aircraft and no serious injuries. He also relayed our position.

What did I learn from this experience? First, good training pays off. Our entire crew evacuated the plane in an orderly manner, and, though we were scared, no one panicked. The man at station 17 was on his first mission flight, as a trainee, and he automatically grabbed the first aid kit because he had been shown how to do it during a ditching drill we had conducted earlier that same flight.

Second, NATOPS does not cover all aspects of an emergency. The loss of power knocked out the PA system. Many of the aircrew did not hear the call to evacuate, and fewer still heard any call about which side of the aircraft to use. It still is unclear whether the No. 1 engine was on fire when five crewmembers exited from the port side. During the debrief, the navigator under training, and first man out the port side, said that it hadn't been on fire when he went out.

NATOPS suggests using all available exits at the direction of the pilot, normally opposite the side of the fire. What do you do in his absence? If you have one foot on a wing that is burning, do you head for the flap or climb back in to exit out the opposite side? The emergency is only half over when NATOPS says its final word: "Assemble well aft of the aircraft." Then what? While the evacuation almost ran on autopilot, once we were assembled, we had to evaluate the situation before proceeding. We had briefed to contact tower on 243.0 during our crew workups and before each flight during the planeside brief.

Finally, I learned the importance of preparing the cabin for takeoffs and landing. Switching to red lighting was important, because our eyes didn't have to adjust to the loss of power on the aircraft. With 24 aircrew on missions that typically last more than 10 hours, there is also a lot of personal gear on board, from helmet bags to duffel bags full of food. We also bring an average of six to eight locked boxes. Storage space is tight, but it is essential to secure all gear. Before evacuating, the SEVAL looked up and down the tube and couldn't determine if anyone was buried under all of the loose gear.

The last flight of Ranger 26 has given me a different perspective on flying. Any landing you can walk away from is still a good one, but I know now that walking away from the next landing has to do with more than trusting the single anchor guys. It depends on how the crew is trained, how the cabin is prepared, and how well I am prepared to work beyond NATOPS.

Lieutenant Testerman flies with VQ-2.

Reprinted courtesy of USN Approach January 1999

Smile!

It happens in a flash
but the memory of it lasts forever.
It cannot be begged,
borrowed or stolen,
but it is of no earthly
good to anyone
until it is given away.
So if, in your hurry
you meet someone
who is too weary to smile,
leave one of yours,
for no one needs a smile
quite as much as he
who has none to give!

Reprinted courtesy of Pakistan International Airlines Air Safety

Professionalism

Corporal Ghislain Aubin

Corporal Aubin was carrying out an after flight inspection on a Hornet aircraft when he noticed a series of small dents at the base of the trailing edge flap connecting links. Corporal Aubin carried out a complete inspection of the scissors assembly. Despite being hindered by poor visibility in the confined area it appeared to him that the assembly was bent. A comparison with two other aircraft confirmed the abnormality and Corporal Aubin immediately notified his supervisor.

Further examination revealed that the bushing on the bolt holding the actuator to the flap was missing. The bushing was found lodged between the scissors bracket and the trailing edge flap attachment bracket. The connecting link had been bent and the trailing edge flap bracket was warped. Had the condition remained undetected the attachment bolt would have fractured seriously effecting the aircraft's control surfaces.

Corporal Aubin's superior attention to detail, perseverance, and prompt actions resulted in the detection and elimination of a serious flight safety hazard. *Well done.*

Corporal Barney Barnett

Corporal Barnett was tasked to perform a portion of the acceptance checks on a Silverstar aircraft that had been returned from third line maintenance. While preparing the ejection seats for removal he reached behind a seat to disconnect the pin for the initiator telescopic rod. Sensing that something was amiss he decided to inspect the area visually prior to disconnecting the pin.

Corporal Barnett's inspection revealed that the pin was only in on the aircraft side and was not securing the rod to the aircraft. The pin is required to start the initiator during the ejection sequence. The initiator allows the seat to clear the aircraft and causes the lap belt to release thereby allowing the pilot to be pushed away from the ejection seat prior to parachute opening. Had the ejection seat been used seat/man separation would not have occurred.

A flight safety report was completed and the contractor has taken steps to ensure that all remaining aircraft will have properly pinned seats.

Corporal Barnett's professionalism and conscientious actions eliminated a potentially lethal deficiency. *Well done.*

Professionalism

Corporal Yvan Breton

Corporal Breton was working as a ground controller during a Maple Flag exercise. An exercise period had recently been completed and ramp activity was high. As a civilian Boeing 727 taxied out for departure Corporal Breton scanned the aircraft with his binoculars. He noticed an open access panel dangling below the number one engine.

Corporal Breton immediately radioed the pilot of the Boeing. The aircraft was stopped and a crewmember was dispatched to secure the panel. Had the panel been open during the takeoff roll serious damage could have occurred to the aircraft's number-one engine or the port side flight controls.

Corporal Breton's superior vigilance and professionalism undoubtedly prevented a serious flight safety occurrence and aircraft damage. *Well done.*

Corporal Will Brunskill

While conducting a before-flight check on the SAR standby Labrador helicopter Corporal Brunskill discovered that an inlet guide vane actuator lever on the second stage ring had become disengaged. The lever that is located at the nine o'clock position on the lower half of the compressor is very difficult to discern. The inspection of this lever is not a requirement of the before-flight check.

A subsequent local special inspection revealed that only three of twelve engines were serviceable. Nine inlet guide vane actuating levers were found to be in an advanced state of wear. National Defence Headquarters was immediately advised and a special inspection of all Sea King and Labrador engines was completed.

Corporal Brunskill's superior attention to detail resulted in the elimination of a serious flight safety hazard that could have led to an aircraft accident. *Well done.*

Corporal Trevor Larsen

Corporal Larsen was tasked to conduct an after-flight inspection on a deployed Aurora aircraft. Despite darkness and heavy rain he detected a very small wire protruding from the propeller deicing boot of the number two engine. Hangar space was arranged with the sponsor unit and the break in the wire was repaired. Sealant was applied to the deicing boot and the aircraft was made serviceable in time for the scheduled morning launch.

A serviceable propeller deicing system is a critical requirement for successful Aurora operations. Had the snag gone undetected a complete failure of the deicing system of the affected engine would have occurred. The subsequent engine shut down would have led to the loss of a crucial mission.

Corporal Larsen's dedication and perseverance resulted in the detection of a critical unserviceability and the prevention of an in-flight emergency. *Well done.*

Corporal Stephen Medford

Corporal Medford was installing the rear ejection seat bucket on a Hornet aircraft when he noticed that there was something unusual about the parachute risers on the combined harness. He investigated further and determined that the rear riser was not threaded through the buckle on the top of the shoulder harness. Corporal Medford consulted technical orders and confirmed that the rigging was incorrect. He reported his findings to his supervisor and all other combined harnesses were inspected.

Had the incorrect rigging continued to go unnoticed any pilot having to eject from that aircraft would have had his safety greatly compromised.

Corporal Medford's professionalism and attention to detail eliminated a serious flight safety hazard. *Well done.*

Master Warrant Robert Ouellet
Sergeant Serge Crépeault
Master Corporal Francois Bessette

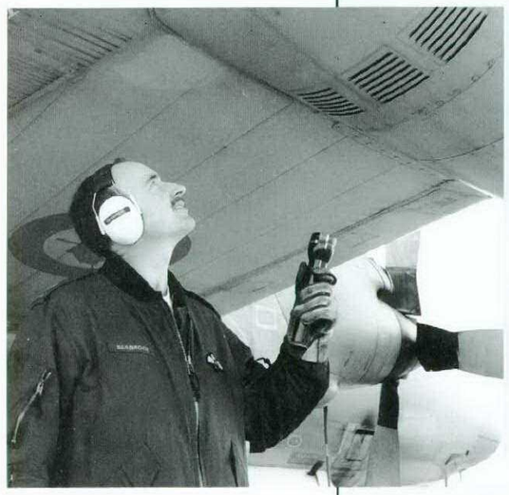
Master Corporal Bessette recognized that a safety hazard existed for crewmembers using the universal life preserver whilst engaged in Hercules tactical open door operations. When operating within one mile of open water, personnel who are required to be mobile in the cargo section of the aircraft must wear a life jacket underneath their parachute. The life preserver has an inflatable cell located at the neck area severely restricting the wearer's mobility and visibility. The life preserver also covers half of the parachute ripcord and, when inflated, restricts access to the quick release covers.

Using a systematic problem solving technique, Master Corporal Bessette determined that an underarm life preserver would be an ideal replacement. He prepared a detailed unsatisfactory condition report and forwarded it to the Directorate of Technical Airworthiness for action.

Master Warrant Officer Ouellet and Sergeant Crépeault immediately recognised the seriousness of the situation and the merit of Master Corporal Bessette's proposal. The need for a timely and effective solution to the problem was paramount. Within a period of five weeks they had: various types of life preservers delivered and available for trial, co-ordinated the trials, produced a report and ordered stock, obtained funding for minor modifications, delivered the new life preservers to the field.

The professionalism, initiative, and leadership displayed by Master Corporal Bessette, Master Warrant Officer Ouellet, and Sergeant Crépault eliminated a serious safety hazard. *Well done.*

Warrant Officer Ron Seabrook



Warrant Officer Seabrook, an Aurora flight engineer, was conducting a pre-flight inspection when he discovered a small access hole that he was unfamiliar with underneath the port wing. Upon further investigation he noted that the castellated nut on the aileron bell-crank assembly was not secured with a cotter pin. Warrant Officer Seabrook checked other installations and confirmed that the nut should be safetied. He immediately informed the aircraft commander and the aircraft was declared unserviceable.

The new access hole was a result of recent modifications to facilitate access to the aileron bell-crank assembly. The aircraft had flown two hundred hours since modification. Had the unsafetied nut loosened and backed off, aileron control would have been lost.

Warrant Officer Seabrook's diligence and professionalism in detecting a fault in an area that is not normally inspected by flight engineers likely averted a tragic accident. *Well done.*

Maintenance Mistakes & System Solutions

Alan Hobbs
BASI human performance investigator

Human factors is not just about people: it is also about improving systems. While the focus of this article is on airline maintenance, there are also lessons for general aviation.

Ask someone about the threats to the airworthiness of an aircraft and they will probably mention metal fatigue, corrosion, excessive wear of components or other results of aging and use.

Yet today, as aircraft become increasingly reliable, we have reached the point where the actions of the maintainers themselves lie at the heart of many airworthiness problems. According to Boeing, around 15% of major aircraft accidents involve maintenance error.

Human errors, and the frustration, sleepiness, misunderstandings and memory lapses which produce them, are powerful forces affecting the quality of maintenance and hence the airworthiness of aircraft.

There is now a worldwide effort to understand more about the human side of maintenance problems. This article deals with just a few of these issues.

Maintenance errors can have a significant impact not only on safety, but also on the financial performance of large and small operators alike. A single inflight turnback of a Boeing 747, with the need to accommodate passengers overnight, can easily wipe out $250,000 of profit. It has been estimated that in the USA, maintenance error could cost airlines one billion US dollars per year.[1]

The term 'human error' is used throughout this article in recognition of the fact that most aviation accidents do involve human error at some point in the chain of events. However, we need to recognize that these errors (or unsafe acts) tend to be just one link in a chain of events. A useful framework to use when considering human factors issues is the Reason model of accident causation outlined below (see fig. 1).

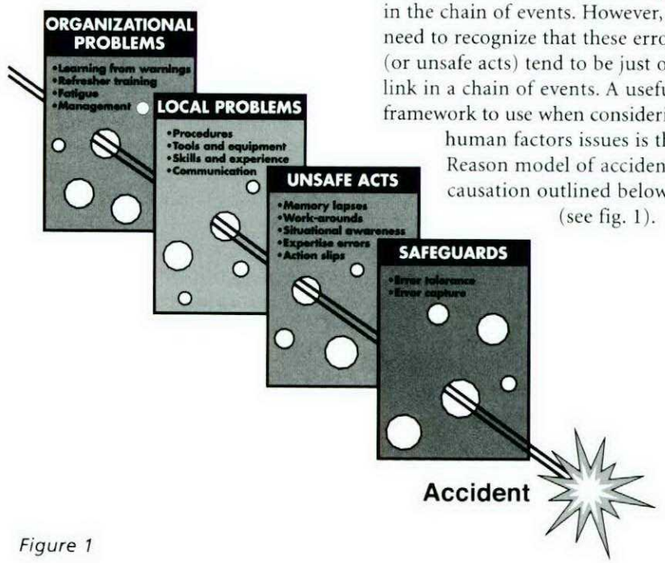


Figure 1

Photo 1

Unsafe acts are not just problems in their own right, but can be seen as *symptoms* of wider problems. For example, in March 1994 the number one engine and pylon of a 747-200 rotated downward during the landing roll and contacted the runway (see photo 1). There were no injuries to passengers or crew. The aft fuse pin on the pylon diagonal brace had migrated from its fitting and was found loose in the pylon structure. The type of pin fitted to this aircraft was normally secured in place by two retaining devices, but on this occasion, neither of these retainers could be found.

Approximately 10 hours after the accident, the missing retainers were found in an unmarked cloth bag on a work stand near where the aircraft had recently undergone a C-check. The C-check had included an inspection of the diagonal brace fuse pin lugs on the two outboard engines.

It was never established who had made the errors that culminated in the accident; however, finding the people responsible may not have helped prevent future accidents. The most important lessons learnt from this accident were not about individuals, but about the way maintenance was organized and carried out.

The US National Transportation Safety Board (NTSB) identified a range of system problems including an error-producing work environment, potentially dangerous scaffolding, poor lighting, inappropriate storage of parts, a lack of training in company maintenance policies and inadequate oversight by the US Federal Aviation Administration (FAA). Addressing each of these upstream problems would not only reduce the chance of the same errors happening again, but should also help to prevent a host of other quality problems.[2]

Unsafe acts: What goes wrong?

In order to understand the types of errors made by maintenance engineers, the Bureau of Air Safety Investigation (BASI) has collected information on over 120 maintenance unsafe acts from interviews with airline engineering personnel and from incident reports received during a study of the regional airline industry. Most of the unsafe acts were corrected before the aircraft flew, or resulted in only minor or consequences.

Over 80% of the unsafe acts of maintenance mechanics fell into one of five types.

1. Memory lapse: 24%
Memory lapses do not generally happen randomly, but often occur when a person is interrupted to go and do something else. Juggling maintenance tasks on several aircraft is a common situation which can lead to a memory lapse.

Being the only person on shift, I was responsible for both hangar and line maintenance. There was a fuel quantity problem on a (...) I had to move fuel plumbing to gain access, I was distracted from my task by heavy commitments with line defects. I forgot to check the tightness of the B-nuts causing the aircraft to develop a potentially disastrous fuel leak.

– *Deidentified incident report*

2. Workarounds: 23%
Typically, workarounds involve performing a task without all the necessary equipment, or in a more convenient manner than in the approved procedures. However, some are more serious, as in the case of workers faced with time pressure who decide not to document their actions or decide not to perform all the required steps in a task. On their own, workarounds may not necessarily result in an incident, but serious problems can result when other people are not aware that someone has taken a shortcut, or when a workaround is followed by an error.

It was a Friday afternoon and I was about to knock off for the weekend. I decided to do one last minute job and tighten the nosewheel steering cables on a twin engine aircraft. Not having an appropriate flagged rig pin I used a bolt through the aircraft floor to hold the rudder pedals in neutral. It got dark and everyone was anxious to go home, and I was holding them up. At the end of the job I signed off the Maintenance Release but forgot to remove the bolt. On the Monday I was asked if the aircraft was ready and I said 'yes'. The aircraft was flown for a whole day checking out a pilot with landings every 20 minutes. If they had feathered an engine or there had been an engine failure they would have been in real trouble, as the limited rudder movement was from this bolt flexing in the floor structure.

– *Deidentified incident report*

Maintenance mechanics are often faced with the pressure of being informed by companies to follow the procedures, but at the same time are encouraged to get work done to deadlines. One mechanic summed it up this way: 'Management tell us to follow the procedures to the letter, but then they tell us not to be obstructive and to use common sense'. A recent European study found that a third of maintenance tasks involved a deviation from official task procedures.[3]

3. Situational awareness: 18%
Situational awareness errors occur when the mechanic starts work without first gaining accurate picture of the situation being dealt with. Often, they don't realize that the situation is different from normal, as when a mechanic activates hydraulics without noticing that cockpit controls have been moved while the hydraulics were off. In other cases, an engineer may not be aware of work being done by other workers on the same aircraft.

4. Expertise: 10%
Errors of expertise happen when someone doesn't have the knowledge, skills or experience to do all aspects of their job. As might be expected, errors of expertise tend to involve less experienced workers. The fact that 10% of errors are of this kind could indicate deficiencies in training.

5. Action slips: 9%
Action slips occur when someone accidentally does something unintentionally. Slips tend to occur on routine, highly familiar tasks.

A mechanic accidentally put engine oil into the hydraulics system of an aircraft. Oil and hydraulic fluid were stored in nearly identical tins in a dark storeroom.

– *Deidentified incident report*

Local problems: Why do things go wrong?

The BASI analysis of maintenance incident reports found that for incidents which had airworthiness implications, the most common factors in the work area at the time of the incident were:

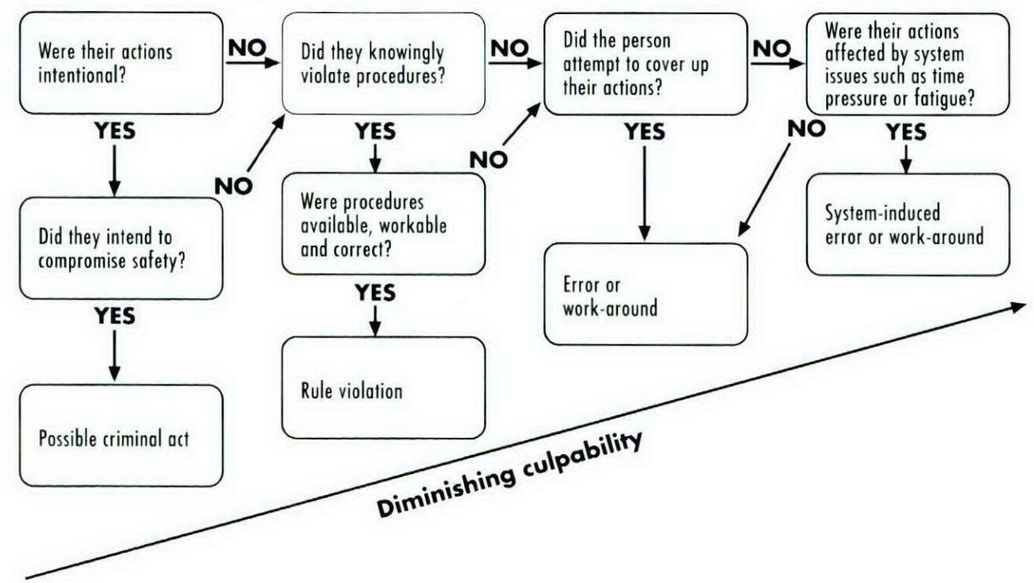
1. Confusion or misunderstandings or differences of opinion about procedures

It is not unusual to find that workers have a fairly limited understanding of a company's formal policies and procedures and instead follow informal practices developed on the job. Older, experienced workers will sometimes develop their own practices, which may be different from the approved procedures. Unworkable or inconvenient procedures prompt the sort of work-arounds described earlier.

2. Communication breakdowns between people

In a recent survey, senior US maintenance mechanics were asked to describe the most challenging part of their job. Their most common answer was

Figure 2. An example of a 'responsibilty policy', adapted from James Reason[5]



'human relations or dealing with people'.[4] Performing in a team requires more than technical know-how, and we often overlook the need to develop these important communication and people skills.

Pressure or haste

Since the early days of aviation maintenance personnel have faced pressures to get aircraft back into service. However, as aircraft become more complex and operators strive to reduce the amount of time that aircraft spend in maintenance, pressure is a growing fact of life for maintenance engineers. A particular risk is that engineers faced with real or self-imposed time pressures will be tempted to take shortcuts to get an aircraft back into service more quickly.

Maintenance systems have built in safeguards such as independent inspections and functional tests designed to capture errors on critical tasks. By necessity, these error-capturing safeguards generally occur at the end of jobs, at exactly the time when pressures to get the aircraft back into service are likely to be greatest and the temptation to leave out or shorten a procedure is strongest.

In the recent BASI survey, 32% of mechanics reported that there had been an occasion when they had not done a required functional check because of a lack of time. At the time, such a decision may have seemed safe and reasonable; however, decisions made under pressure do not always stand the test of hindsight.

4. Inexperience

Younger personnel need to know about the traps lying in wait for them, yet too often they are allowed to discover these for themselves.

5. A lack of tools, or equipment, or spares

Many workarounds occur in response to a lack of appropriate hardware or spares. It is understandable that airlines will try to reduce their stocks of expensive spares; however, in some cases relatively inexpensive spares such as O-rings are nil-stock items. Furthermore, a lack of major spares can lead to increased cannibalization of parts from other aircraft, which in turn doubles the disturbance to systems and increases the potential for human error.

A common theme underlying these problems is that maintenance personnel may need training in human factors areas such as communication, supervision, and dealing with pressure and frustration.

The great benefit of human factors training is not only that people change, but that people can see the opportunities to change the systems in which they work. For this reason, managers, who have the most power to change things, should not be excluded from human factors training.

My company ran a human factors course for all mechanics in 1996. It was very informative and I learnt a lot of things I hadn't even thought about before. As a result I have changed my attitudes and actions to increase my personal safety and awareness. This course should be given to all apprentices new hires. It is invaluable.

– Survey comment

Organizational factors: What are the weaknesses in the overall system?

Maintenance incidents can reflect a range of organizational problems. Three of the most important of these are dealt with below.

1. Lack of refresher training

The regulations state that maintenance personnel must receive "proper and periodic instruction". However, in reality, few maintenance engineers receive refresher training once they have gained their licences. Without such training, non-standard work practices can develop or engineers can lose touch with changes in regulations or company procedures. One senior airline manager put it this way: 'Maintenance engineers are like torque wrenches: they need to be recalibrated from time to time'.

2. Lack of learning from incidents

The conventional wisdom among safety experts is that for every accident there may be 30 or more previous minor incidents. When BASI interviewed maintenance engineers about incidents, it became apparent that before a serious quality lapse occurs, there are usually earlier incidents which could have acted as warnings of a problem.

Unfortunately we do not always learn the right lessons from these 'warning incidents, sometimes because they are never reported. It is never easy to admit a mistake; however, it is even harder when an organization punishes people who make honest mistakes, perhaps by docking pay or placing notes on personnel files. A punitive culture within the company or the regulatory authority creates an atmosphere in which problems are quietly corrected and places barriers in the way of learning from our mistakes. In the recent BASI survey of maintenance personnel, 66% of respondents reported that they had corrected an error made by one of their colleagues without documenting it, in order to avoid getting them into trouble.

One action which managers can take to ensure that they hear about the 'warning incidents' is to have a clear 'responsibility policy', which outlines how the organization will respond to maintenance incidents. Figure 2 illustrates how a responsibility policy might work, although every operation will need to tailor such a policy to its own requirements. Needless to say, no policy such as this can be expected to function if the regulatory authority penalizes those who report their mistakes.

Until the regulator's inspectors move away from the blame culture that is currently implemented, maintenance defects and incidents will always be covered up and hidden,

– Survey comment

Once an incident has been reported, the focus of an internal investigation should normally be on identifying system problems, not on identifying personal deficiencies of individuals.

There may be rare times when incidents are related to intentional acts of malice, but the great majority of maintenance mechanics do their jobs with diligence and integrity and most incidents reflect system problems which go beyond individual workers.

An internal investigation that only results in recommendations directed at the level of individuals, (such as reminders to engineers to 'be more careful' or to 'follow procedures more closely') are sure signs that the investigation did not identify the system failures which led to an occurrence. There are now structured methods to help managers identify system failings in maintenance, such as the Boeing maintenance error decision aid (MEDA) system.[6]

3. Fatigue

There is probably no way to avoid the need for maintenance to be done at night; however, this does not mean that fatigue levels cannot be managed. Unfortunately, almost all nightshift workers suffer from a lack of quality sleep.

Recent Australian research has shown that moderate sleep deprivation of the kind experienced by shift workers can produce effects very similar to those produced by alcohol.[7]

After 18 hours of being awake, mental and physical performance on many tasks is affected as though the person had a blood alcohol concentration (BAC) of 0.05%. Boring tasks which require a person to detect a rare problem (like some inspection jobs) are most susceptible to fatigue effects. After 23 hours of being continuously awake, people perform as badly on these tasks as people who have a BAC of 0.12%.[8]

One in five of the engineering personnel who responded to the recent BASI survey claimed they had worked a shift of 18 hours or longer in the last year, with some having worked longer than 20 hours at a stretch. There is little doubt that these people's ability to do their job would have been degraded. An important point to note is that like people who are intoxicated, fatigued individuals are not always aware of the extent to which their capabilities have degraded.

At a time when the dangers of fatigue are being recognized in areas as diverse as medicine and road transport, we must ask why there are no regulations to control the risks of fatigue among aircraft mechanics.

Safeguards: Reducing the consequences of maintenance errors

Minimizing the consequences of errors vs 'working without nets'

Functional checks and independent inspections are examples of safeguards designed to capture errors before they cause harm.

However, there is another approach to managing error which is sometimes overlooked. This is to acknowledge that errors will occur from time to time and that we need to design procedures and systems that can minimize the consequences of such errors. Special maintenance precautions applied to extended-range twin-engine operations (ETOPS) are an example of such an approach. When an aircraft is being maintained in accordance with ETOPS procedures, the performance of identical maintenance actions on multiple elements of critical systems is avoided wherever possible. Engines, fuel systems, fire-suppression systems and electrical power are examples of ETOPS critical systems on aircraft such as the B767 and B737.

However, these precautions are not generally applied to aircraft with more than two engines, or to twin-engine aircraft which are not being maintained in accordance with an ETOPS maintenance program.

For example, in 1995, a European-operated Boeing 737-400 was forced to divert shortly after departure following a loss of oil quantity and pressure on both engines. Both of the aircraft's CFM-56 engines had been subject to boroscope inspections during the night prior to the incident flight. High-pressure rotor drive covers were not refitted on each engine and as a result, nearly all the oil was lost from the engines during the brief flight.[9]

Several months after this incident a similar overseas incident occurred on a Boeing 747-400. Shortly after departing on an over-water flight, the crew noticed reducing oil quantities on the number one and number two engines. The aircraft was turned back to its departure point, where it arrived safely without any need for the engines to be shut down in flight. After landing, oil could be seen leaking from the engines.

Boroscope inspections had been carried out on all four of the GE CF6 engines. This inspection normally involves removing and then refitting the starter motor from each engine, and in fact the starter motors were removed from the number one and number two engines in preparation for the job. Because the tool to enable the engines to be turned by the starter drive could not be found, the starter motors for engines 3 and 4 were not removed and all engines were turned by an alternative method. A lack of spares had led to a practice of not replacing O-rings when refitting starter motors. However, on this occasion a mechanic did comply with documented procedures and removed the O-rings from the number one and two starters. The workers who refitted the starters apparently assumed that the situation was 'normal' and did not notice that the O-rings were missing a 'situational awareness' error.

This incident had a variety of causal factors, such as informal procedures which had evolved to work around the frequent 'nil stock' state of spares, poor lighting and inadequate leak check inspections. However, an important point is that because the aircraft had four engines, it was not protected by ETOPS standards. In essence, the mechanics were 'working without nets'. Had the job proceeded as originally planned, the starter motors would have been removed from all four engines, with serious consequences.

The extension of some ETOPS precautions to non-ETOPS operations would help to contain such maintenance-induced problems.

Boeing has encouraged operators as a general practice 'to institute a programme by which maintenance on similar or dual systems by the same personnel is avoided on a single maintenance visit'10. BASI has also published the following suggested safety action: 'Where possible, the simultaneous performance of the same maintenance tasks on similar redundant systems should be avoided, whether or not the aircraft is an ETOPS aircraft'.[11]

Conclusions

Unfortunately, advances in aviation technology have not necessarily been matched by improvements in the way we organize the work of the people who maintain aircraft.

The remarkable aspect about maintenance incidents is that many of them share similar features. A relatively limited number of unsafe acts, such as work-arounds, memory lapses and situational awareness errors typically occur in the context of problems such as unclear or poor procedures, a lack of equipment or spares, communication breakdowns, time pressure and fatigue. Because unsafe acts are generally symptoms of wider problems, human factors is not just about focusing on people but on the systems within which people work.

This article concludes with just five system-level improvements that may help to ensure safer maintenance:

1. Introduce refresher training, particularly on company policies and procedures.
2. Introduce a clear 'Responsibility Policy' to remove barriers that discourage people from reporting incidents.
3. Introduce a fatigue management program. This will almost certainly involve ensuring that workers get adequate sleep opportunities. If 12-hour shifts are being worked, a ban on extending shifts with overtime may be necessary.
4. Introduce human factors training for management and workers.
5. Minimize the simultaneous disturbance of multiple or parallel systems.

While striving for perfect performance by those maintaining aircraft, we should recognize that making mistakes is an unfortunate but unavoidable consequence of being human.

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Reprinted courtesy of Asia-Pacific Air Safety Issue 21 March 1999

The Real Display Pilot

Continued from page 13

usual. And don't forget to say hello to the Snowbirds when they arrive for their milk and cookies!

Remember to console the T-bag pilot who'll be in the corner crying into his beer. He arrived just after the F-15, overstressed his aircraft in the pitch, and was asked to park with the veteran and vintage bunch. Be polite to the helicopter pilot; he will only take about 30 seconds to bore you with his display sequence, at which point you can dump him on the Wing Fin O who will be on his annual visit to the mess for a free beer. Give the man in the flying suit adorned with badges a wide berth — he's the Log type from the local squadron trying to be one of the boys.

There may be some guys and girls missing, but don't fret — the Tac Hel types have probably been sent back to their base to get a clean airplane. The Tutor crew won't be here yet. With two QFI's on board they'll still be de-briefing their transit. The Herc crew will be downtown at the Hilton. Better chow down before the Aurora crew gets there — they eat like animals — must be all those box lunches. Remember to take along some TX'd charts and some cheesey kit to fob off on Joe Public in your continuing efforts to boost the squadron fund.

And finally on no account think about your display sequence. You've got the big guy's approval, so now you can really get on to it and rattle a few windows. Got the picture?

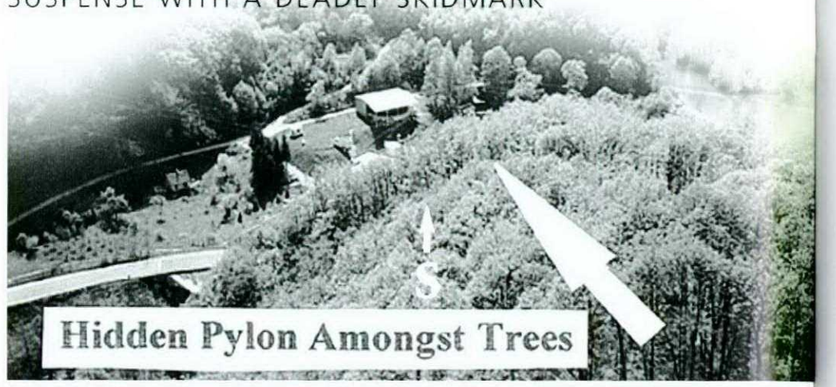
Reprinted courtesy of RAF IFS Display Flying Notes 1997 — modified by DFS editorial staff 1999.

WIRES,
THE UNSEEN ENEMY

by Lieutenant S D Leach RN
845 Squadron

A TALE OF TENSION AND SUSPENSE WITH A DEADLY SKIDMARK

It is a well established fact of aviation that all types of aircraft but especially helicopters do not as a general rule benefit in any way from tangling with wires. However, although this article concerns yet one more tale of tension and suspense, with a deadly skidmark, it does have a happy ending. Read on ...



The crew of a Sea King Mk4 were on their third day of a four-day duty at 845 NAS's Forward Operating Base located at Sipovo, Bosnia. Business involved a typical assortment of routine tasking pax moves from various locations and a few recces. The weather conditions were CAVOK, the crew had rested fully and takeoff time was a sociable 0855 Local. Two and a half hours later, however, life became suddenly very "exciting".

All was going according to plan and the next serial was to pick up two signallers who were on a crypto resupply to a rebroadcasting site on a nearby mountain. The pick up point was a well reconnoitred and frequently used sports field. Prior to the pickup from the Helicopter Landing Site (HLS) the crew had visually identified the one set of wires ahead which were marked on the map and no other wires were spotted. Once the two passengers were onboard, the aircraft transitioned westerly along the line of the valley towards the previously briefed and sighted set of wires. The associated pylons on either side of the valley had been identified and we flew towards a chosen one on the right. Then, at 70 knots in the climb and at approx 300ft AGL, events suddenly took on a rapid change for the worse and the atmosphere became almost electric, literally as a second set of previously unsighted wires, slightly higher and closer to us, suddenly became visible. Instantly a "Wires" call was initiated. The aircraft was flared rapidly and full power applied, by which time the wires were now directly in front of the aircraft at very close range. The three main electric power cables passed just below the nose of the aircraft but a thinner top wire impacted on the nose bay door. No wires were seen to go up into the main rotor disc. Luckily, with the climbing momentum and the relative thinness of the wire, the one across the nose bay parted after about 3 seconds and the broken wire was observed by the crewman to fall clear of the aircraft ... and the mighty 'King flew on away from what could so easily have been a fatal accident.

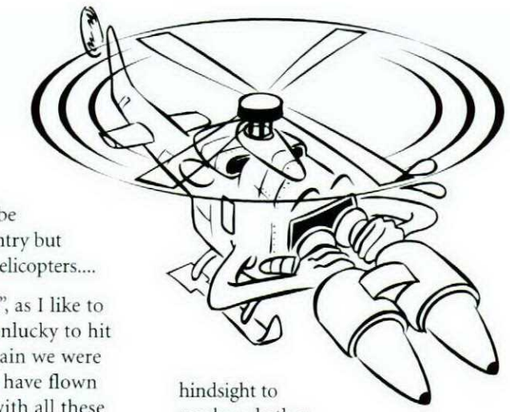
We immediately recovered to Jajce HLS without any further incident. All control responses were normal prior to landing. Once back on terra firma a thorough inspection of the upper and lower fuselage and the undercarriage was carried out. The only damage was some minor chafing on the nose bay door. After both pilots' and the aircrewman's heartbeats had returned back to those of normal human beings and the medic had awoken to find out what all the fuss was about, we decided to return to Sipovo, shutdown and await an engineering assessment and go for a quick change of underwear ...

Being the professional individuals that we aviators are, we tried to analyse what went wrong. As our various Flight Safety lectures have taught us, there is often an identifiable chain of events leading to an accident/incident. By breaking any one link, we are conscious that we might avert the potential "occurrence". But at the time, try as we did, we could not come up with any list of things that we had done to place us in the situation with which we were faced no "chain". In hindsight, however, (which is always a great thing!) I can come up with three factors that played a part in the incident.

These are:

Cognitive. We had only sighted one set of wires when in fact there were two. Does that mean that we all needed glasses? Or was it just that there was only one set marked on the map so that, mentally, we only EXPECTED TO SEE one set? Also, the unsighted set was cunningly masked by the terrain, with its pylons hidden amongst the wooded slopes of the valley. The Mark One Eyeball is a marvellous tool, however it does have its limitations and can only represent a picture of the information that it gathers. It can be tricked and deceived and that's where the brain tries to analyse the information and give a sensible solution. On the day in question our eyes/brains could only see one set of wires on the approach to the HLS and it was only in the latter stages of departure when things went 'twang' that we discovered the second set. Yet we DID know that we were in "Wire Country".

Maps. The maps we use in theatre are 1:100,000 ... they are the best available, but were printed in July 1992 and based on source information from 1991. Since then the country has gone through political, military and social turmoil and only now, with the efforts of the Deighton Agreement, have the various warring factions managed to rebuild the country's infrastructure and return to some form of normality. This process means rebuilding bridges, roads, railways and buildings, for all of which electricity is required. Therefore, new power cables have been built and old sets are being refurbished. This may be great news for the country but not for unsuspecting helicopters....



The 'X' Factor. "Luck", as I like to think of it. We were unlucky to hit the wires, but then again we were lucky (very lucky!) to have flown away from them. As with all these things someone, somewhere, will be looking at the various potential contributory components Human factors, Environmental factors, Ergonomic factors, etc. — and, since we were privileged to be able to walk back to the (de) briefing room, we really ought to pass on what we learned from the experience.

On reflection, one of the more startling aspects of an experience such as this is the speed with which it happens. In a 'normal' airborne emergency situation, the time scale and reactions follow a well known pattern of control and containment, diagnosis and FRC actions, followed by a definitive plan. But in this "incident" everything happened so quickly that the relationship to a typical 'Beefers' check ride was, let us say, a bit tenuous. Actions carried out were immediate, leaving hindsight to resolve whether these ought to be put down to training, instinct, self preservation or sheer panic!!!!

So, what do we conclude (noting that 'Hindsight is a great afterthought ... in hindsight!')? The answer is to hoist in the virtues of foresight, to be mentally "on your toes" to EXPECT THE UNEXPECTED. It is all very much a case of establishing the right "mindset". Going into Wire Country? Then watch out! "Wire bouncing" is a sport only for the foolhardy. There are many other better ways to get the adrenaline flowing through the body far less hazardous too.

By Editor Cockpit

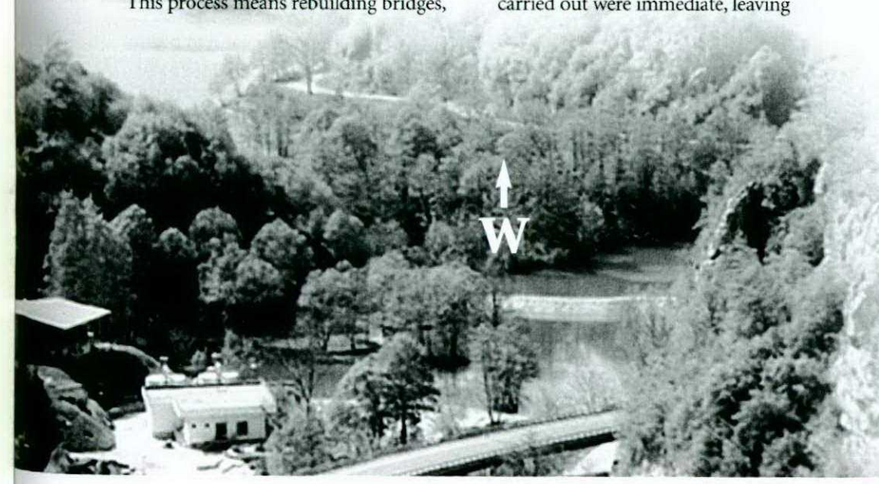
During a recent visit to Bosnia I was flown to Jajce and invited to spot the wires. Despite a detailed brief on the ground at the HLS, I failed to see them until very late as the aircraft transitioned towards them.

This near-accident happened to a crew that has spent many months in this environment. Most of us do not have this level of experience and thus must take great care you have been warned.

Reprinted courtesy of Royal Navy Cockpit Issue No. 160 1997

By Editor Flight Comment

It doesn't matter where you are — new lines are always being built. If you are on deployed operations be especially careful. Do not expect your charts to include all obstacles.



When the Playing Field Changes

I must come out of the closet, I am a die hard sports fan. Some would take issue with that as I cheer for the Maple Leafs and the Argonauts, but as a matter of course I love to follow several professional sports. Interestingly I find many parallels in the sports world and the world of flight safety. In particular I find amazing similarities between the two disciplines when dealing with human factors and what causes highly trained professionals to make seemingly unexplainable errors. However, when the athlete makes an error the result is a lost game or worse, a championship, i.e. no bonus money! When the aviation professional makes a mistake the ultimate consequence is loss of life. That's what makes us so special!

As an air force we report over 2000 incidents per year. These range from the seemingly innocuous failure of an aircraft system to the hair raising close call of two C-130s, at night, inside of 100 feet. The good news from all this is the openness and honesty of our reporting. It offers us the opportunity to learn from our mistakes, or more importantly the mistakes or misjudgement of others... "for free"! Regrettably though some choose not to learn from the past. Some choose to forge on ahead, "damn the torpedoes" if you will, and inevitably find themselves repeating history.

Let's return to our sports friends on the gridiron. Imagine that you are in the Grey Cup. The clock is running down and this is your last chance to win. It is a third down gamble(CFL here folks!) and one yard to go. The offensive co-ordinator assesses the hazards be they the weather, the opponent or themselves. He calls the play, an off tackle run with your all-star fullback. All you need is one yard and you have the best offensive line in the game. Piece of cake. But would you say to that same play if your all-star running back was injured? What if you got a penalty and it was now third down and six? What if your all-star linemen were out of the game? As our quarterback steps up to the line of scrimmage he notices this 340 pound tackle right where you plan to run. Does he call an audible or maybe even a time out? Now take away the football field and players, put yourself on the flight line and reflect for a moment: "Have you ever started out with plan A but in a very short time found yourself dealing with Option E?"

When we conduct a mission or start a maintenance task, like the offensive co-ordinator a risk analysis is done. We have trained and prepared as best we can for all eventualities. The hazards are assessed and the risks identified. The hazards can range anywhere from weather, aircraft limitations, crew limitations, equipment limitations or the dreaded "audible" at the servicing desk: "Okay stop what you're doing, we have a higher priority"! If we stop and reflect for a second, at the moment when "we" the QB step up behind the centre to assess the defence, do we call an "audible" or better still, call for a time out? How many times have you started a task with a known set of hazards and their associated risks and then have the situation change dramatically. Do you forge on ahead? Do you have the time to assess all the new hazards? If time available is not an option then have you structured your training accordingly? Let's review a few game films.

It is the start of the flying day and all your mules are unserviceable. The flying schedule is soon to begin and you must get the choppers out of the hangar. Do you reassess and advise ops there will be a delay or do you get an alternate vehicle on which the driver has not been trained? Easy choice you say; however ask the technician who was injured when Option Two was chosen. The driver who was not familiar with the brakes touched the pedal to slow down during towing. The result was a severe pitch down of the choppers tail and the resultant injury to the tech steadying the stinger.

You step to your jet and the canopy is covered in dew. The adversaries are lined up for take-off and you don't want to miss the hop or let your formation members down. Do you take the time and have maintenance get the proper cleaning wipes to clean the windscreen, or do you press on and use the windshield rain remover after start-up? Option B was chosen once again. The rain remover cleared a small six inch corner of the windshield in the lower quadrant. The aircraft hit a taxiway light as the pilot attempted to taxi out "blind" in a very congested area. Add insult to injury as he missed the entire mission!

These are but two examples, but I could go on and on. Have you ever missed a maintenance action due to shift change or returning to a job that you were taken away from for a higher priority? Have you ever put undue pressure on yourself to meet a take-off time, despite the fact you are now in the third spare? Have you ever done that, got airborne, and then had a panel open in flight or ops call and state that the aircraft is in fact unserviceable? If you haven't let me assure we have volumes of case files on those who did. One has to wonder why someone didn't call an audible or a time out?

Risk assessment is something that we do on a daily basis. It is merely the process of identifying the hazards, assessing their associated risks, formulating the means to mitigate those risks and then implementing those measures. If we embark upon any task with a given set of resources and/or people, every time one of those items is changed, so is the validity of our risk assessment. Once we have identified that our hazards and risks have changed then we must seriously consider "changing the play". We must identify our high level goal, i.e. what is that we are trying to achieve, and assess if we can still get there. If we don't we will continue to injure our folks and damage our sparse aviation resources. Most folks, if not all, do an excellent risk assessment when they begin planning for a mission or a task; however with change being a constant, we all must become better at reassessing the risks "when the playing field changes".

Mission accomplishment through smart risk. Our number one priority!

Lieutenant Colonel G. Hook
1 CAD SO FS

Basic ditching techniques and procedures

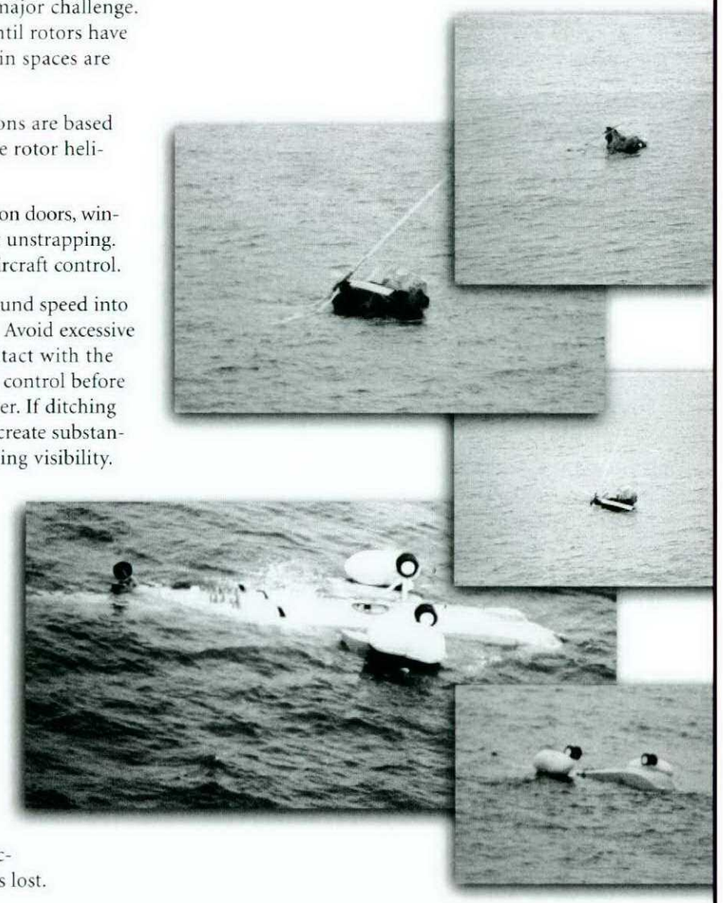
Before you skip this article, thinking "Ditching? That doesn't apply to my unit's mission," think about this: Even if you don't routinely fly over open water, if you ever fly over any water including lakes and rivers along your flight routes you should keep yourself up to speed on the ditching techniques and procedures outlined in FM 20151: *Aircraft Emergency Procedures Over Water.*

Ditching a helicopter should pose no serious problems since it can be landed with little or no ground speed and, therefore, negligible decelerative violence. However, without built in flotation characteristics, the aircraft may sink rapidly, making timely egress a major challenge. Evacuation often cannot be started until rotors have come to a stop. In the meantime, cabin spaces are filling with water.

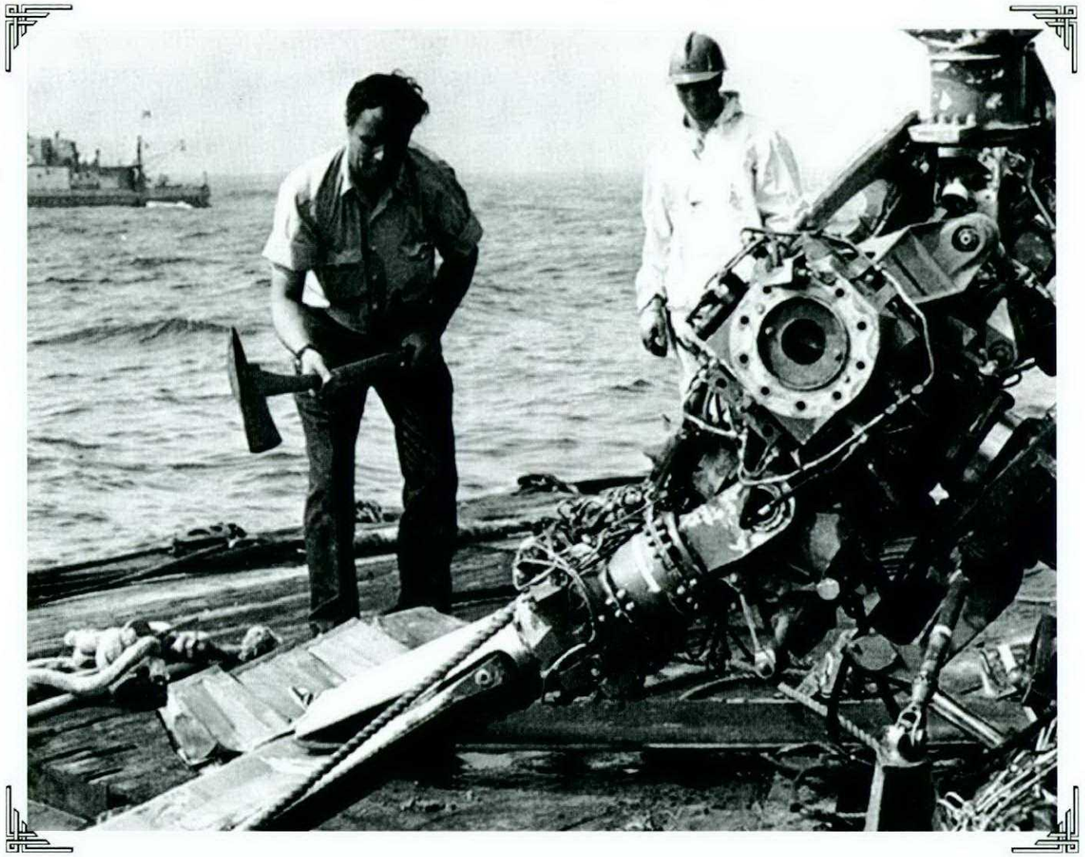
The following general recommendations are based on actual ditching experience in single rotor helicopters without built in flotation.

- At or just before water contact, jettison doors, windows, and emergency exits without unstrapping. Premature jettison can endanger aircraft control.
- Make a normal landing at zero ground speed into the wind at minimum rate of sink. Avoid excessive tail flare; premature tail rotor contact with the water may cause loss of antitorque control before the main fuselage settles in the water. If ditching under power, expect rotorwash to create substantial amounts of water spray, reducing visibility.
- Apply main rotor brake (when available), and keep the aircraft level while rotor rpm decays. As the fuselage settles in the water keep pulling pitch until the aircraft shows a tendency to roll. At the time, apply cyclic in the same direction so that water contact will stop the main rotor without violent reaction or the chance of flipping the aircraft in the opposite direction. If one side of the aircraft offers a preferable exit opportunity, roll the aircraft in the opposite direction before effective rotor control is lost.
- If you're ditching without power, remain strapped in (all occupants) until the main rotor has stopped and egress can begin. This will minimize disorientation with respect to the nearest exit regardless of aircraft attitude after submersion. If you're ditching with power, bring the aircraft to a hover, have all occupants egress, hover several hundred meters away from them, and ditch the aircraft.

Reprinted courtesy U.S. Army Flightfax February 1999 Volume 27 Number 2



Photograph Caption Contest



Try your hand at giving this photograph a witty caption. E-mail your submissions to the editor. I'll print the best entries in the next issue of Flight Comment. All published captions will be credited.

Flight Safety Word Search

By Captain J.J.P. Commodore

HINT (8 letters) "FLIGHT SAFETY IS EVERYBODY'S"

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AERIAL
ANSWER
AUDIENCE

BETTER
BRIGADIER

CHANNELIZE
CHECK

DELEGATE
DELETE
DEMOGRAPHIC
DEPTH
DETERMINE

ERUPT

FEATURE
FICTIVE

GULL

HALTER
HERETIC
HISTORICAL

LEVER
LOWER

MAGAZINE
MEADOW

MONEY

NATURE
NEUTRAL

OPTIONAL

PLANNING

QUEAN
QUESTIONNAIRE

RANK
REACH
REQUESTED
RIDDLE

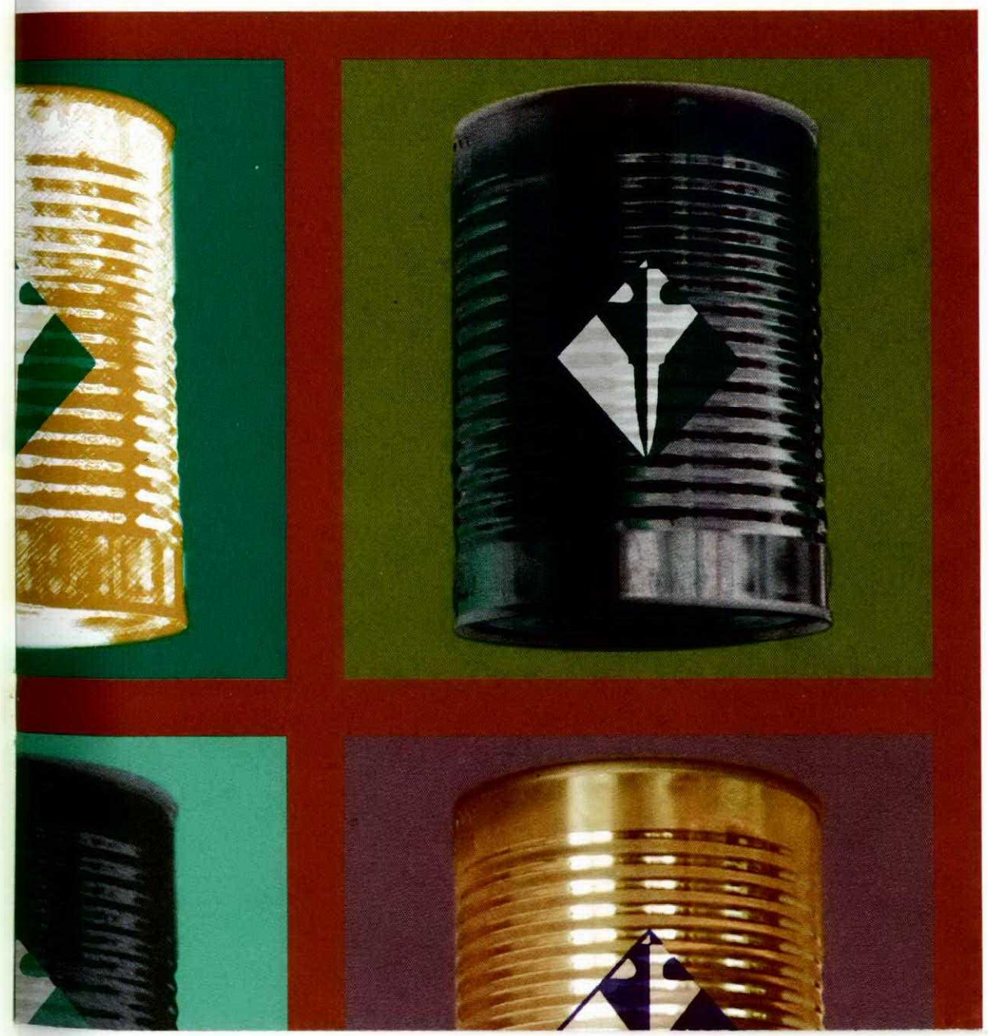
SPECIFIC
SUBMISSION
SUMMER

TANKER
TARGET
TEAM
TENANT

UNSURE
UPCOMING
USAGE

WEATHER
WINTER

Flight Safety is



No Matter How You Look At It

HINT (8 letters) "FLIGHT SAFETY IS EVERYBODY'S"