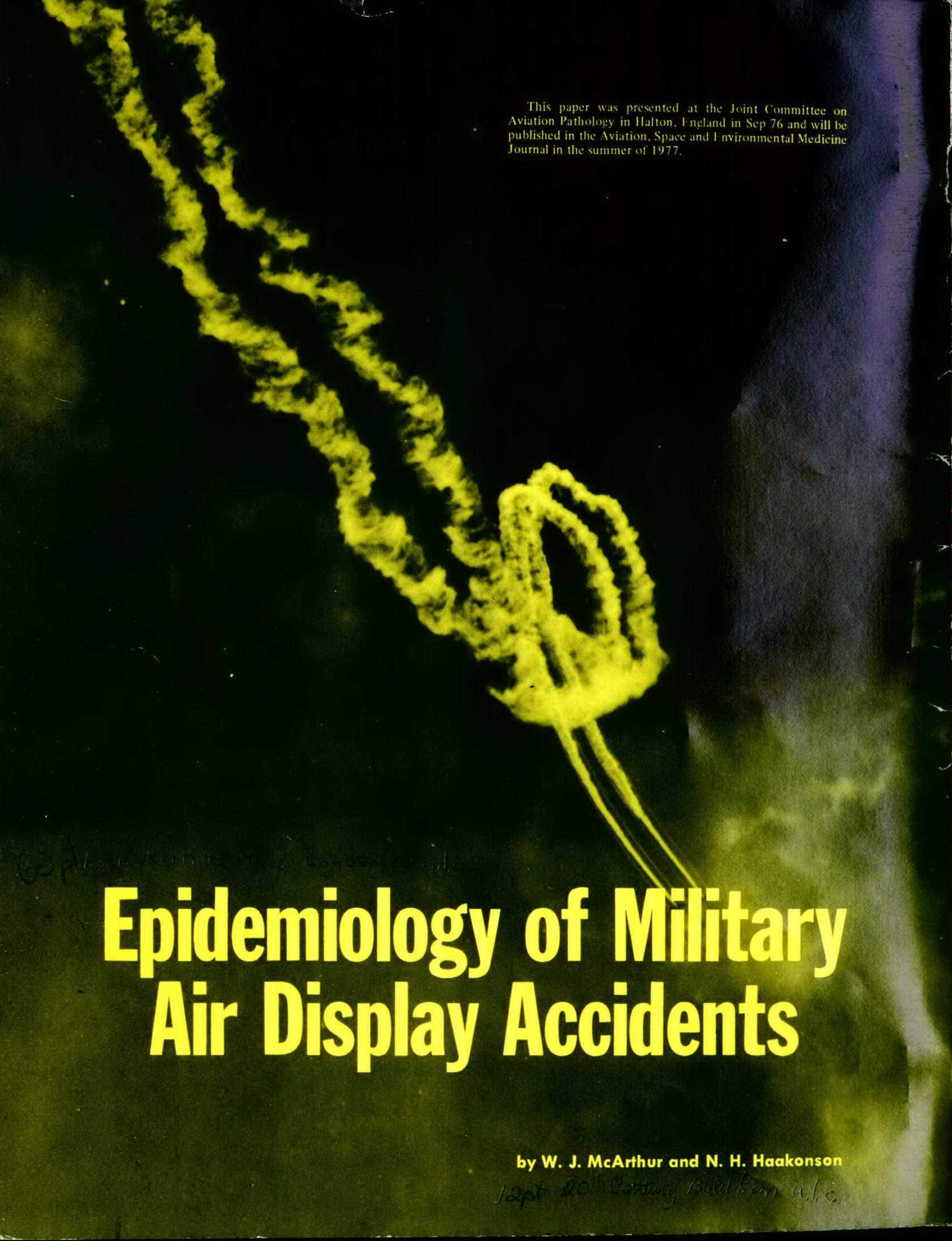
# FLIGHT COMMENT

THE FLIGHT SAFETY DIGEST OF THE CANADIAN ARMED FORCES

EDITION 2 1977



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# Epidemiology of Military Air Display Accidents

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## ABSTRACT

The paper examines fatal Canadian military air display accidents occurring between 1 March, 1956 and 1 March, 1974. They are discussed in detail from a human factors point of view. It was found that single and separated pilots tended to be at high risk compared with their married counterparts and most of the fatally injured pilots had less than 2,000 hours total flying time. Time on type was shown to be less important than total flight time and age in itself was unrelated to the incidence of fatal accidents. Spontaneity and deviation from pre-arranged plans featured in many of the accidents. Human failure in the cockpit appears to be less frequent in air display fatalities than in fatal accidents occurring in routine operations; however, human failure in supervision accounted for 30% of the cause factors, a figure much higher than in non-aerobatic fatal accidents. Finally, evidence indicates that it is possible to select and operate an aerobatic team in which the risk of a fatality is low, provided a few simple guidelines are observed by the team selectors and the team members.


Air displays have been popular throughout the world since the inception of aviation 70 years ago. The first Canadian military air display accident occurred at what is now Canadian Forces Base Petawawa in August, 1909, when J.A.D. McCurdy and F.W. (Casey) Baldwin demolished the "Silver Dart" while conducting demonstration flights for the Department of the Militia "under most unfavourable conditions of terrain and wind" (9). Military air display activity advanced to a peak level in the late 1950s and 1960s. Most Canadians have had the opportunity to see one or more of the three official aerobatic teams which performed for a total of nine years between 1959 and 1974. In addition to this, a solo aerobatic performance known as the Red Knight Programme was conducted from 1960 to 1969 inclusive.

In this paper the 20 fatal military air display accidents occurring in the 18 year period between 1 March, 1956 and 1 March, 1974, have been analyzed to identify epidemiological factors. The information is presented as a contribution to the continuance of effective and safer air displays.

## MATERIALS AND METHODS

The proceedings of Boards of Inquiry into the 20 fatal accidents involving aircraft performing in an air display or conducting authorized training for an air display were reviewed. The 20 pilots sustaining fatal injuries were compared with a control group consisting of the 36 survivor pilots who flew for 55 man years with official Canadian military aerobatic teams during the period 1 January, 1959 to 31 December, 1974. Available data have been reviewed and subjected to statistical analysis (7). Characteristics of fatally injured and control pilots were compared using the Chi Square test.

The underlying premise throughout the study has been that accidents are caused by human beings and not machines. Human failure in aircraft accidents can usually be assigned to one or more of the operations, maintenance or design phases (11). This is an important distinction for it is only by the modification of human behaviour in whichever phase it occurs that future accidents can be prevented. The fatally injured pilots have been divided into "Designated" and "Non-Designated" aerobatic pilots where a "Designated" aerobatic pilot has been defined as:

> "A pilot who has been posted or attached to a unit for the primary and continuing purpose of conducting flying displays."

This differentiates designated pilots from those who were given special authorization to conduct one or more air displays or fly pasts in which the type and number of manoeuvers were normally specifically restricted.

### Time of Year

Figure 1 illustrates that May and June have the highest overall frequency of air display accidents. There are, however, important differences between the distribution of accidents involving designated and non-designated aerobatic pilots. Eighteen per cent of fatal accidents involving designated pilots occurred in each of February, March and May but only 9% occurred in each of June and July which are the two months in which most shows are scheduled. On the other hand, 66% of non-designated fatalities occurred in May and June with the remainder being distributed equally between March, July and September. There was never an air display accident in November, December, January or April in the years of 1956 to 1974.

Only one designated aerobatic pilot has been killed in a properly authorized prebriefed air display during the 18 years from 1 March, 1956 to 1 March, 1974. All other air display fatalities have occurred during training, during an unauthorized or spontaneous air display, or have involved non-designated aerobatic pilots.

### Time of Day

Nine out of twelve (or 75%) of actual air display accidents occurred between 1500 and 1700 hours local. Two occurred between 1000 and 1200 hours and the remaining accident

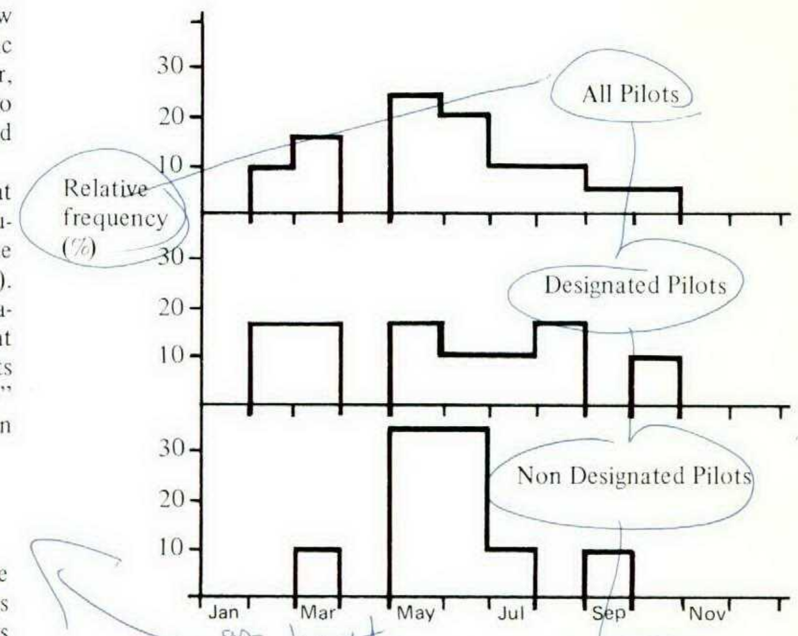


Fig 1 — Relative frequency of air display accidents per calendar month for period 1956-74 inclusive.

**TABLE I. COMPARISON OF THE AGE CHARACTERISTICS OF CONTROL PILOTS AND FATALITIES**

| | Mean Age | Standard Deviation | Range |
|---|---|---|---|
| Control Pilots | 28.29 years | 3.18 | 14 |
| Fatalities | 27.16 Years | 3.58 | 14 |

$P > 0.10$

**TABLE II. MARITAL STATUS OF CONTROL PILOTS AND FATALITIES**

| | Married | | Single | | Separated | |
|---|---|---|---|---|---|---|
| | No. | % | No. | % | No. | % |
| Control Pilots | 48 | 87.3 | 7 | 12.7 | Nil | |
| *Fatalities | 9 | 47.3 | 8 | 42.2 | 2 | 10.5 |

$P < 0.001$

* In the case of one fatality there is no record of the marital status of the pilot concerned.

occurred at 2100 hours. This time pattern is consistent with the routine scheduling of air displays which usually start in the early afternoon and terminate between 1500 and 1700 hours. Six of the nine aircraft which crashed between 1500 and 1700 hours were flown by non-designated pilots and two of the three designated pilots were involved in deviations from authorized plans. The eight remaining accidents occurred in training and were distributed without any apparent pattern throughout the normal flying day. The pilots' flying time on the day of the accident was recorded in only 12 cases; however, of these, eight (or 75%) occurred on second flight of the day.

### Pilot Age

The age in both fatal and control pilots ranged from 23 to 37 years. The age distribution of the killed pilots was unimodal with 47% being 25 years of age. The control pilots had a bimodal distribution with peaks at ages 25 and 29 years. Statistical analysis showed that the two groups could not be differentiated on the basis of age at the 90% of confidence.

### Marital Status

Table II shows a significant difference between the control and killed pilot groups. Eighty-seven per cent of the surviving pilots were married whereas 52% of the killed pilots were separated or single. The two pilots who were separated had lived separately for more than one year and had in effect resumed single status. The factor was shown to be significant with $P < 0.001$.

### Total Flying Time

Control pilots total flying time ranged from a minimum of 961 hours to a maximum of 4,726 hours. Killed pilots had a range from 641 hours to 5,495 hours. Only two of the killed pilots had a total time in excess of 2,500 hours. One of the two had 11.7 hours on type and the other was the most experienced aerobatic pilot in Canada at the time. Statistical analysis of the data revealed that there was a significant difference ($p < 0.01$) between the total flying times of the control and killed pilots.

### Time on Type

Control pilots' time on type ranged from 30 to 2,217 hours whereas killed pilots ranged from 11.7 to 1,812 hours. Statistical analysis showed a singificant difference between the two groups ($p < 0.05$).

**TABLE III. TOTAL FLIGHT TIME OF CONTROL PILOTS AND FATALITIES**

| | Mean | Standard Deviation |
|---|---|---|
| Control Pilots | 2,738 hours | 766.3 |
| Fatalities | 2,014 | 1,069.6 |

$P < 0.01$

**TABLE IV. TIME ON TYPE FOR CONTROL PILOTS AND FATALITIES**

| | Mean | Standard Deviation |
|---|---|---|
| Control Pilots | 1,074 | 529.3 |
| Fatalities | 717 | 503.7 |

$P < 0.05$

**TABLE V. AVERAGE FLIGHT TIME PRIOR TO DEATH FOR FATALLY INJURED PILOTS**

| | 90 Days | 30 Days | 48 Hours |
|---|---|---|---|
| Fatalities | 107 hours | 37.7 hours | 4.1 hours |



### Time on Team

The 10 fatally injured designated team members were killed at times ranging from nine days to seven months after joining the unit; however, seven of the 10 were killed within 90 days of commencing training. The three pilots killed after the initial 90 day period were all involved in accidents which were caused by factors predominantly beyond their control.

### Flight Time in Preceeding 90 Days

The figures shown in Table V indicate that the fatally injured pilots had been flying fairly intensively prior to their accidents. Thirty-eight hours per month is a substantial but not an excessive workload for a fighter pilot.

### Deviation From Plan

The three non-training accidents which occurred outside the 1500 to 1700 hours time frame share a common factor of deviation from pre-arranged plans. One pilot was flying contrary to specific orders to remain on the ground. Very little is known about the flight of the second aircraft except that the pilot had deviated from the original flight plan and had attempted a landing while considerably in excess of the maximum safe landing weight. The flight on the third aircraft had been authorized at the local level; however, it was an unscheduled hastily arranged and an ill-advised trip which terminated in a fatal crash after sunset. Three of the nine pilots killed in actual air display between 1500 and 1700 hours were designated aerobatic pilots but two of three were involved in deviations from authorized plans. The first aircraft was, together with the rest of the team, recovering from a spontaneous aerobatic display. The second aircraft was performing improperly authorized co-ordinated aerobatics under marginal weather conditions.

### Human Failure

Each accident has been completely reassessed in an attempt to isolate more definitively the human failure that caused the accident. The logical breakdown of human failure is into the operations, maintenance, and design phases. For the purpose of this study failure in operations phase was subdivided into human failure in the cockpit (HFC) and human failure in supervision (HFS). This latter category includes both immediate supervision and supervision at higher levels. Human failure maintenance (HFM) and human failure design (HFD) are self-explanatory. A fourth category, human failure – other (HFO) has been added to include factors such as the responsibility of Air Traffic Control and the second pilot involved in a crash which occurred in 1959. In only four of the 20 accidents has cause been assigned totally to one area of human failure in that three were assessed 100% HFC and one was assessed 100% HFM.

Table VI shows the assessed cause factors for the period 1956 to 1974 and compares them with the experience of the past five years. There has been a small decrease in accidents caused by HFC and HFS with an increase in those caused by HFD. These changes are not significant at the 95% level of confidence.

**TABLE VI. CAUSE FACTOR OF CANADIAN MILITARY AIR DISPLAY ACCIDENTS FOR THE PERIOD 1956-1974 INCLUSIVE**

| | 1956-74 | 1967-74 |
|---|---|---|
| Human Failure Cockpit | 49.5% | 47.5% |
| Human Failure Supervision | 32.5% | 29.3% |
| Human Failure Maintenance | 7.5% | 6.7% |
| Human Failure Design | 8.5% | 13.3% |
| Human Failure Other | 2.0% | 3.2% |

## DISCUSSION

Half of all air display fatalities involved non-designated pilots. There is not sufficient information available to calculate exposure rates; however, designated pilots normally perform 150 or more training and display shows per annum whereas non-designated pilots have often performed without any special work-up and have seldom had more than 10 hours of training. This information makes it very clear that properly trained designated pilots have a vastly higher probability of completing a particular air display safely than a non-designated pilot.

Official aerobatic teams operated in 1956, 1959-63 inclusive, 1967 and 1972-74 inclusive and it is noted that six out of 10 of the fatal accidents involving designated pilots occurred in the first year of operation of a team. The four remaining designated fatalities involved pilots who were in their first year with a team or the Red Night Programme. There has been only one fatally injured designated pilot with more than one year's aerobatic experience. Even in this case the individual was flying on a new team in an aircraft which had substantially different design and flight characteristics from those in which he had previous aerobatic experience and the accident resulted from factors which were beyond his control.

The information presented indicates that non-designated pilots who are tasked to conduct an air display or flypast are at a relatively high risk of becoming involved in a fatal accident. Designated pilots are at a much lesser but still appreciable risk during the first year of operation of an aerobatic team and it is presumed that this is caused by a break in the continuity of techniques and procedures used by a permanent team. Individuals joining an established team have a low risk of being killed and pilots flying for a second or third year with a permanent team appear to be at negligible risk.

Consideration of Fig 1 and the data concerning time on team prior to death shows that designated pilots who have been killed usually died in training and 70% of the designated death occurred during the first 90 days with the team. None of the non-designated pilots died in training and the fact that these 10 fatalities *all* occurred in front of an audience is probably indicative of inadequate training.

Analysis of the personal information data on killed and control pilots has revealed significant and unexpected information. Contrary to widely held belief, pilot age in itself does not provide any significant protection against involvement in a fatal accident (12). In the past, team selectors have on occasion been chastized for selecting individuals in their early twenties as designated pilots. The data presented shows that young pilots are at no greater risk than their older counterparts if their flying experience is equivalent.

Aerobatic pilots who are married have a vastly reduced chance of being killed. Analysis shows this factor to be highly significant with $p < 0.001$. This variable is independent of flying experience. A factor significant at this level of confidence cannot be overlooked and when aerobatic pilots are being selected married personnel should be given preference over others when other factors are approximately equal.

Flight experience is also a significant factor. Survivor pilots had more total time than their killed counterparts. The difference was significant with $p < 0.01$. Time on type appeared to be less important but was significant with $p < 0.05$. Using the mean time and standard deviation of control pilots it can be calculated that 1,236 hours is the minimum safe total flight time a pilot should have before being considered for selection to a team. A similar but less reliable calculation shows that no pilot with less than 36 hours on type should be considered for team selection. If these absolute minima had been observed, four (or 20%) of the accidents described would not have occurred. If the minimum figures had been increased to 2,000 and 100 hours respectively, only three of the pilots killed would have been eligible for team membership. Using the same criteria would have eliminated only six (or 16.6%) of the 36 survivors from eligibility.

Flight time prior to death indicates that all the pilots involved had been flying at a substantial but not grossly excessive level. In this type of work each hour of flying time involves about another two hours of pre-flight preparation and post flight debriefing and administration. From this it may be seen that the killed pilots were averaging 26.75 hours of work per week directly related to flying. In addition to this, designated pilots were expected to make frequent radio and television appearances and otherwise make themselves available for public relations purposes whenever possible. The assigned workload does not seem to have been inappropriate; however, there is a possibility that accumulated fatigue contributed to the increased accident rate observed in designated pilots in the month of August.

Deviation from pre-arranged and briefed plans was observed in eight (or 40%) of the accidents. The magnitude of the deviation varied from the flight of one aircraft in which the pilot was strictly and specifically forbidden to fly to another in which aerobatics were conducted in accordance with "Authorized Arrival Procedures". This resulted in a professional aerobatic team doing aerobatics in a circuit with other aircraft in the vicinity. The aerobatics were quite normal for a team but provided a sudden and unexpected hazard for other aircraft with the result that a fatal collision occurred. The fact that 40% of air display accidents involved deviations from plan indicates that spontaneity is highly undesirable in the precise and unforgiving world of the aerobatic pilot.

The statistics regarding human failure are a cause for sombre reflection. It must be recognized that these are based soley on the authors' thorough re-evaluation of each Board of Inquiry in an attempt to locate specifically the area of human failure causative in each accident. The evaluation undoubtedly contains bias and must be suspect because an attempt has been made to quantify intangible factors. However, the same bias is applicable to each accident and, therefore, the figures have some merit. Human failure in the cockpit accounted for slightly less than 50% of all accidents as opposed to the 65% to 70% assigned to this factor in accidents occurring in routine operations. This may reflect hte superior standard of pilots usually selected for aerobatic duties. However, it is extremely disturbing to consider that inadequate supervision accounted for approximately 30% of the cause factors attribued to fatal air display accidents and it is unacceptable that this factor has been reduced by only an incremental amount over the past five years.

It is disturbing to recognize that we have not learned enough from 25 years of jet fighter operations to permit a reduction in the percentage of air display accidents caused by human failure in the cockpit and in supervision. So long as aircraft are flown by humans there will be occasional split second errors in judgment which result in accidents. However, some of the accidents which have occurred in the past five years are like their predecessors in that they reflect major defects in judgment on the part of either the pilot concerned or one or more of his supervisors. It is clear that there is a requirement for increased vigilance in preventing the two primary causes of air display accidents – human failure in the cockpit and human failure in supervision.

## SUMMARY

It has been demonstrated that certain characteristics tend to differentiate fatally injured aerobatic pilots from their counterparts who were not involved in fatal accidents. Single and separated pilots are at very high risk compared with their married counterparts. Most survivor pilots had more than 2,000 hours total flying when they joined a team and most of the killed pilots had less time than this. A similar but less pronounced trend was observed in relation to time on type. Age in itself was unrelated to the incidence of fatal accidents. Non-designated aerobatic pilots without special air display training are at high risk of being killed as are all aerobatic pilots who permit themselves to deviate spontaneously from carefully prepared pre-arranged plans. Human failure in the cockpit is less frequent in air display fatalities than in fatal accidents occurring in routine operations but still accounts for 50% of the accidents. Human failure in supervision accounts for 30% of the cause factors, a figure much higher than in non-aerobatic fatal accidents. Finally, the disbandment and subsequent reformation of a new aerobatic team places the members of the new team at increased risk. Members of permanent fulltime professional teams on which part of the team rotates annually have a low risk of being involved in a fatal accident.

## CONCLUSIONS

The safety of military air display performances can be enhanced by following the criteria in Table VII.

**TABLE VII. CHARACTERISTICS FOR MAXIMUM SAFETY OF AIR DISPLAY AEROBATIC TEAM PERFORMANCE**

- Pilots should be "designated" to air display duty.
- Team should remain in continuous operation.
- Only part of the team should rotate annually.
- Team should be closely supervised.
- Deviation from prebriefed plan should NEVER take place.
- Pilot – should be married.
  - have over 2,000 total flying hours.
  - have over 100 hours on type.
  - be any age.



# "COMMUNICATION" of Flight Control Messages

Have you ever played the party game where you sit in a circle and a short message is passed on until it returns to the one who started it. The returning message is usually very different to what was started off!

What could a party game have to do with flight control messages? Quite a bit we think. Similar principles are involved. Let us return for a moment to the game. There are three main reasons for the message being corrupted:

1. inattention on the part of the listener caused by some distraction or excitement (stress);
2. poor, or inarticulate transmission by the sender; and
3. the listener hearing only what he wanted to hear or expected to hear.

Any of the above can cause the player to repeat what he or she, "thought" they heard.

When losses of separation between aircraft occur in Canada, the circumstances are always analyzed. Analysis usually indicates that several factors contributed. Whereas, some of these factors can be overcome by a change in procedures or requirements, others involving communications are more difficult to resolve. Air traffic controllers and pilots are each involved in the communication loop.

In one case a controller was anxious to know what altitude an arriving aircraft was passing through, in order that a departing aircraft could be released. The pilot's response gave this information first, followed by something else! So intent was the controller on receiving the altitude information, that the "something else" **failed to register with him**.

The pilot has followed the passing altitude with the information that he was descending to an altitude **below** that given to him in a previous descent clearance. Result–some minutes later a loss of separation between the arriving and departing aircraft. Ironically, the pilot's response to the controller, contained all the information necessary to prevent what happened. But apparently, the controller only heard what he wanted to hear–the passing altitude. Fortunately it was VFR weather and both pilots saw each other in time to avoid a more serious state of affairs.

In another, the captain was handling the R/T and the 1st officer was flying. ATS gave a descent clearance which the captain read back correctly. The altitude they were cleared to, was 2,000 feet higher than that normally given. The captain set the altitude alert to the altitude they **normally** received. Meanwhile, the 1st officer was sorting out his approach plates. Subsequently, when during the "in range checks" he saw the altitude alert set for the lower altitude, he assumed there had been a further clearance that he had missed, did not question it and carried on in the descent. Once again the weather was VFR and they saw the other aircraft in time to take avoiding action as they were levelling out at their incorrect altitude.

In both cases, when the ATS tape transcripts were read back to them, the ATS controller and the aircraft captain were very frank and helpful. The controller said that the lower altitude which the captain mentioned during descent hadn't registered with him; the captain said that although he had read back the right altitude initially, he was convinced he was cleared to the normal lower altitude.

Sound impossible? Perhaps, but these are not unusual examples of human traits.

Another example of the peculiar capabilities our senses have, is illustrated as follows: You're at a party in a group of people. Near you another group is talking. You hear a name mentioned that you recognize. Your attention switches and the conversation of the group you're in drops down to a low mumble in your ears, while you strain to follow the other groups' conversation. Nevertheless from your own group a few phrases or words filter through–enough to allow you to keep up a polite semblance of listening and to pick up the thread of conversation again, when you voluntarily rejoin your own group. However, if your attention is forcibly brought back by way of a direct question to you, it is rarely that you are able to give an adequate answer. In other words, your attention has wandered.

At the party, our responses or reactions might be considered odd or rude, but in the air, the same pattern of behaviour can have serious consequences. In the air we like to feel that there is someone around who will pick up human "lapses". Usually there is. For the pilot there is his crew; the controller has his co-workers and supervisor and in some cases, another crew might detect a potential traffic confliction. While the first case was the individual's responsibility we also must look at the back-up system. In the case of the 1st officer sorting out his approach plates one aspect of the backup system was not effective and did not resolve the lapse in personal alertness.

We are often unaware of our own communication lapses. On the other hand, for some of us the moment of realization may be somewhat shattering. After all, there are very few of us who can accept with equanimity an apparent flaw in our professional ability. To bring things into perspective, however, we should not necessarily regard this as a unique, personal failing. Rather it is one of the sometimes insidious characteristics of the complex human machine. While some of us may be more prone to it than others, nobody can say for certain when it may occur in an individual. So many things can trigger it off–health, worry, distraction, etc.

However, "forewarned, is forearmed". A realization that the problem can occur, coupled with constant alertness, can go a long way towards preventing the problem. This personal involvement, dovetailed with proper use of back-up monitoring should ensure a decreasing likelihood of problems in communication of flight control messages.

*courtesy Aviation Safety Bulletin*

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# HELO IN THE WATER

DURING my 8 years of flying the SH-3 helicopter, I have always benefited from the experiences of other pilots and their response to emergency situations. Accordingly, I pass this information on to others so that they may learn from my experience when I was confronted with a sudden single-engine water landing from a 40-foot sonar hover.

I was in company with two other squadron aircraft, assigned to a screening station 6-8 miles from the carrier. My copilot was at the controls. We had been airborne about an hour. The wind line was 290 degrees at 20 knots with gusts to 25, sea state 4 with ground swells of 10-12 feet.

The crewman had just reported ths sonar dome was at a depth of 200 feet and the cable visually centered. I had checked the gages and was preparing to take control of the helicopter. Suddenly, without warning, the afternoon calm was shattered by a loud, now increasingly familiar rumble and banging sound – my second compressor stall in 4 months. I took control and shouted over the ICS, "Compressor stall!", as my copilot applied full power.

I glanced at the $N_f/N_r$ tachometer and noticed the No. 1 $N_f$ decreasing to 60 percent and the $N_r$ passing below 94 percent. The aircraft simultaneously yawed slightly right and began backing down. I recall stiff-arming the cyclic full forward to get the nose down as the aircraft descended into the water. We landed on the crest of a swell with no forward speed, oriented about 345 degrees. During the 4 or 5 seconds prior to water entry, I put out three Maydays: "736 in the water." No one acknowledged the call. We discovered later that no one heard the transmission.

Once we had stabilized on the water and had a chance to collect our wits, the tempo of cockpit activity increased remarkably. Due to the high sea state, my first concern was the stability and seaworthiness of the H-3. I ordered my copilot to lower the landing gear and blow the emergency flotation bags while my first crewman jettisoned his starboard window to facilitate egress should the helicopter capsize.

We verified that the No. 1 engine was the malfunctioning engine. My copilot secured the engine, switched to the upper UHF antenna, and turned the IFF to emergency. Several times we attempted to broadcast on UHF without success. The aircraft was now heading 360 degrees, quartering the swells at an angle of 40-60 degrees. As I sat on the water, I could look up through the overhead and port side of the aircraft and see a threatening wall of water approaching every 10-15 seconds.

The thought of being engulfed by the next breaker as it rolled in on my crippled bird was foremost in my mind. Fortunately, only the tops of the swells would break (whitecaps only), and the helicopter would rise above the swells like a small boat. At no time did I let the collective touch bottom. I maintained $N_r$ at 100 percent. We rapidly progressed through the single-engine water takeoff checklist. I alerted the crew to an ominous looking wave which was bearing down on us and appeared as if it would turn us over or flame out the good engine. Fortunately, the helo rode it well. But let me leave no doubt, it was one "heckava" ride.

Prior to starting the takeoff checklist, I doublechecked the RMI against the wet compass and saw a 30-degree error. I reminded my copilot that I wanted to take off into the wind line. Due to the swells, water taxiing could not be attempted. I elected to jump takeoff. As manual throttle was brought on the line, I adjusted the collective to build the $N_r$ to 113 percent. At that time we were on the crest of a swell, so I decided to take off without delay. Our gross weight on entry was 17,500 pounds.

The takeoff went smoothly with $N_r$ decreasing to about 95 percent where it stabilized. Prior to the liftoff, we had dumped 400 pounds of fuel, jettisoned the sonar hydrophone, marine markers, MAD and MAD reeling machine to lighten the helo. Once off the water, I let the $N_r$ build back up to 100 percent while the airspeed slowly increased. Before we knew it, we were clear.

My copilot put out several more "Maydays," and this was the first time anyone knew about our predicament. Total time on the water was about 3 minutes. Enroute to the ship, we secured our fuel dump and manual throttle. Proceeding through the landing checklist, I saw my copilot switch the hover indicator from D-mode to A-mode. Then I saw the ASE OFF flag and realized I had been flying without the ASE engaged. I reengaged the ASE and made an uneventful landing aboard the carrier.

Based on this experience, I consider the following items most relevant:

- When a water landing is inevitable, get the nost over– don't land tail-first.
- Droop the rotor RPM as necessary to soften the impact while still trying to maintain directional control.
- Continue to fly the aircraft in the water.
- The helo will ride swells very well at a 40-60-degree angle to the swells.
- Don't let the sponson dig in on landing or liftoff and when floating.
- Check your ASE; ensure it's ON for takeoff.

During our debrief, other pertinent thoughts came to light.

- Our second ASW crewman didn't know we were going to ditch. The first time he became aware of it was when he felt the helo impact the water. He had been busy monitoring sonar and didn't hear the call over the ICS.
- We didn't switch to guard frequency, but remained on tactical UHF. There was a possibility that overhead aircraft may have heard us on guard.
- The landing gear was down and bags inflated on takeoff. However, by executing a jump takeoff, the bird's configuration didn't affect our ability to get airborne in a fairly high sea state.

Perhaps there was a certain amount of luck involved in that no injury occurred and the aircraft sustained no damage. Nevertheless, the aircrew's prompt, accurate response and compliance with EO procedures were the framework for this successful recovery. Crew coordination was the cohesive element that led to a happy conclusion to a hairy afternoon.

*courtesy USN Approach*

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# too many hands

An experienced pilot was on his first ride in the right seat of a C-47. The instructor pilot demonstrated the takeoff and briefed the new copilot on his duties during a closed traffic pattern. The crew completed their before-landing checks on downwind and were cleared for a touch-and-go landing.

On short final, at about 400 feet AGL, the IP asked for a final gear check. The copilot complied with a visual thumbs-down signal. Unfortunately, the signal was somewhat over-enthusiastic; the copilot's swinging left hand struck the right feathering button and the prop, as advertised, came to attention.

The instructor, feeling the yaw and power loss, slightly advanced both throttles. Assuming they were making a missed approach, the copilot asked, "Going around?" Then, presumably overcome by zeal and initiative, he snatched up the landing gear before the startled instructor could say a word!

The IP, realizing he was now committed to a missed approach, applied full power to the left engine and asked the flight engineer to unfeather the right. But by this time, the malady afflicting the copilot had begun to spread, and the engineer smartly reached up and feathered the left.

The IP, now beginning to accumulate glider time, was still unwilling to give up. "Landing gear down," he called – but the copilot, not about to be outdone by the engineer, lowered full flaps instead. Frantically, the IP managed to get the gear down himself just in time to flare the silent Gooney Bird smoothly onto the runway. But the right main had not locked completely down, and the aeronautical Keystone Kops routine finally ended with a folded main gear and damage to the right wingtip and propeller.

# GOOD SHOW

### SGT R. NICHOLAS

Sgt Nicholas was the senior NCO in charge of helicopter maintenance for the HMCS IROQUOIS detachment when Sea King 12414 was assigned as the detachment aircraft. During the first week of detachment flying the aircraft was put unserviceable for fluctuating transmission oil pressure. The fault was diagnosed as a faulty pressure indicating system and, after a new system had been installed, the aircraft was checked serviceable. However, after six hours of flying the same symptoms re-appeared. Investigation revealed that since the aircraft had returned from the contractor six months previously, it had twice been put unserviceable for low or fluctuating transmission oil pressure. In light of this history the fault was now determined to be within the transmission itself and it appeared that a main transmission change could be required.

Sgt Nicholas was not convinced of the requirement to change the transmission and proceeded to research the problem further. On his own initiative he retraced the complete transmission oil pressure system and after many hours discovered that the check valve in the number two transmission oil pump had been installed backwards. This incorrect installation rendered the pump virtually useless and therefore placed the total transmission oil pressure requirement on the number one pump.

The check valve was re-installed correctly and the aircraft test flown serviceable and returned to operational flying with no further problems in this area.

Had the aircraft continued to fly with the valve incorrectly installed, as it had for six months, a failure of the number one transmission oil pump could have caused a catastrophic failure of the main transmission. Sgt Nicholas's initiative and perseverance in researching and finally identifying this faulty installation, not only prevented a main transmission change but also removed the potential for an in-flight emergency.

### CPL C.H. AUBIN

Prior to replacing an unserviceable CSR 123 Otter engine oil cooler and temperature regulator valve, Cpl Aubin carried out an extensive visual inspection of the overhauled replacement component. He observed that a foreign object, a nut, was jammed in the cavity of the assembly near the by-pass valve. Should the nut have become dislodged during flight, a series of events could have occurred leading to engine overheating and possible failure.

Cpl Aubin's superior knowledge, diligent efforts and concern for flight safety are indeed commendable attributes of an outstanding technician.

### MCPL J.R. CHARTRAND
### CPL J.J. B. OUELLET

While performing a CSR 123 Otter engine inspection at 1 RSU, Cpl Ouellet found an oil leak on number 4 cylinder rocker box and reported it to his supervisor, MCpl Chartrand. The MCpl was very concerned with this oil leak since it had occurred previously and the standard procedure of changing "O" ring seals had not rectified the snag. He ordered Cpl Ouellet to remove the cowlings and to perform a close inspection of the rocker box. The Cpl meticulously cleaned the area and found a 2½ inch crack.

Prior to this incident, oil leaks were apparently treated as normal occurrences on the Otter engine. Since it was the first time that a rocker box crack was found prior to aircraft flight, all engines were inspected using NDT methods. Out of the first 10 engines inspected six were found to have the same type of crack.

As the above problem was the cause of an engine failure and subsequent emergency landing a few months before, the initiative, thoroughness, and team effort of these NCOs did not only result in the development of an effective inspection technique but also has doubtlessly averted other air incidents and possibly a serious accident.

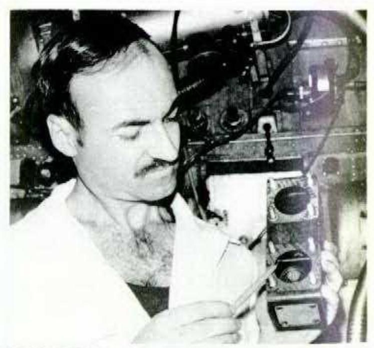
### CPL W.D. GOSSE

While carrying out a routine "A" Check on the horizontal stabilizer of an Argus 10731, Cpl Gosse noticed something unusual in the vicinity of the starboard elevator inner hinge assembly. An in-depth investigation by Cpl Gosse and his supervisors revealed two of the four retaining bolts in the hinge assembly sheared and protruding in such a manner that fouling of the elevator control surface was a distinct possibility.

The two remaining bolts were carrying the full stress of the inner hinge assembly and complete failure of the mounting point was imminent. The result of such a failure could have been catastrophic to both aircraft and aircrew.

As a result of this discovery a vital special inspection was initiated on a fleet-wide basis in order to check for and rectify any potentially dangerous situation.

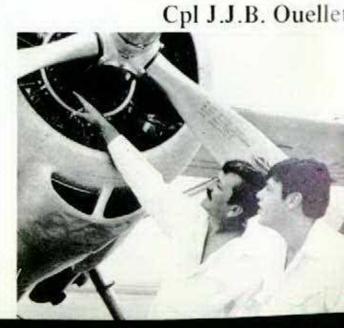
Cpl W.D. Gosse



Cpl C.H. Aubin

Sgt R. Nicholas

Mcpl J.R. Chartrand
Cpl J.J.B. Ouellet

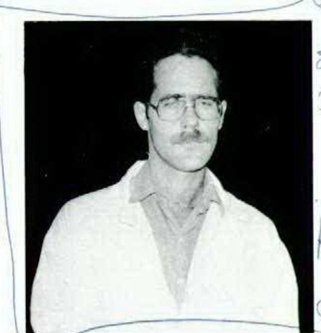




Cpl N.S. McCallum

Cpl G.A. Wright

Cpl K.E. Wentzell
Cpl G.G. Lowther



Cpl R.L. Nickerson

### CPL R.L. NICKERSON

On 20 August 1975, while preparing a CH 125 helicopter rotor blade for painting, Cpl Nickerson noticed a small crack at blade station 111. Further investigation revealed that an indentation .093 inches deep had been filled in with an unknown substance, and radiating from it fore and aft, was a crack that was eventually determined to be nine inches in length. UCR B2573/5080 submitted by 2 AFMS and dated 5 September 1975 details the seriousness of this fault and recommends to NDHQ that the rotor blade be considered for disposal.

Maintenance records at this Unit do not indicate where or by whom this blade was repaired, or that such a repair was ever authorized. It should be emphasized here that the inherent danger in this instance is that had the paint on this particular area of the blade not been removed, the fault would have gone undiscovered as it was not visible to the naked eye.

Cpl Nickerson's alertness and interest in an area nominally outside the perimeters of his trade may well have prevented the occurrence of a serious flight incident and as such his performance in this instance was exemplary and deserves to be duly recognized.

### CPL N.S. McCALLUM

On October 12, while carrying out aircraft starts, Cpl McCallum, an Airframe Technician, noticed a piece of FOD on the tarmac that looked like it could be a piece from an aircraft. When unable to identify the origin of the FOD, he immediately brought it to the attention of his supervisor. Through further investigation it was revealed to be a piece of backing from the 2nd stage turbine Honey Comb Seal. An immediate Special Inspection was carried out on all Tutor aircraft, thereby locating the unserviceable engine.

This was the second occasion that due to Cpl McCallum's devotion to duty and positive attitude towards FOD control, he found a piece of an aircraft engine and a potential Flight Safety Hazard was averted.

### CPL K.E. WENTZELL
### CPL G.G. LOWTHER

Tasked with rectifying an engine problem on a CC137 Boeing aircraft, Cpls Wentzell and Lowther completed their work and conducted a quick visual inspection of the engine compartment before closing the cowlings. They discovered what appeared to be a hairline crack on the right rear engine mount attachment point. A check of the remaining mounts showed the left side was also cracked. A Non Destructive Testing (NDT) eddy current check confirmed the defects and the turbine exhaust case assembly was removed for repair.

By using the opportunity of checking the remainder of the engine while the cowlings were open these techs discovered a serious defect and prevented the possible in-flight separation of an engine. Their professional approach exemplifies accident prevention at its best and deserves service-wide recognition.

### CPL G.A. WRIGHT

Cpl Wright is employed as a Flight Engineer Flying CH135 Twin Hueys with 408 Tactical Helicopter Squadron at CFB Edmonton. He was assigned to assist a servicing crew perform a supplementary inspection on aircraft 135102 on 9 Mar 76.

While performing the routine chore of cleaning and waxing the main rotor blade, Cpl Wright noticed an overlap in the paint which aroused his suspicion. Although he realized that the blade had been recently repaired in this area and certified serviceable, he persisted in rechecking the condition. Cpl Wright requested the servicing supervisor to investigate what he believed to be a possible delamination of the blade skin. Upon completion of a detailed inspection, which included removal of the paint in this area, a 3½" crack was revealed in the blade skin running cordwise from the previously repaired area. The blade has subsequently been condemned.

Through commendable thoroughness and alert professional interest while on an apparently routine job, Cpl Wright prevented further deterioration which could have resulted in severe main rotor vibration and a hazardous flight condition.

### MAJ J.G. WESTPHAL

Major Westphal was performing an acceptance flight test of a Tutor aircraft when the airframe overheat, fire warning, master caution and warning lights illuminated. While he was checking for confirmation of a fire, the hydraulic pressure failed. Through his detailed knowledge of the Tutor aircraft, Major Westphal promptly and accurately assessed the cause of the fire warning as a small hydraulic fire confined to the engine section aft of the firewall. With the field in sight, Major Westphal set his aircraft up to intercept final key for a forced landing, all the while allowing himself the option of a safe ejection should the fire spread or damage the rudder and elevator control rods. With a landing assured, Major Westphal flamed out the engine, executed a flawless landing and rolled to a stop beside the crash trucks. The firefighters quickly extinguished the hydraulic fire, caused by a ruptured speed brake hydraulic line in the engine compartment.

Major Westphal's detailed knowledge of the Tutor aircraft, coolness in the face of a critical in-flight fire and superior airmanship enabled him to save a valuable aircraft. Major Westphal deserves service wide recognition for his outstanding performance.

### MR. R.C. OVERWATER

On the afternoon of May 2, 1976 Mr. Overwater was working near the field where CF5 116760 crashed and exploded. Mr. Overwater saw the pilot, Major G. Kennedy land. Unable to get free of his parachute the pilot was dragged by the 30 knot wind, some 1,000 feet before being tackled and brought to a stop by Mr. Overwater. This was accomplished with great difficulty, since the field was freshly cultivated and the pilot was moving quite rapidly. Spurred on by shouts for help by the pilot Mr. Overwater, nearly at the end of his endurance was able to make a dive and pin the pilot to the ground. Mr. Overwaters' father arrived shortly after and collapsed the parachute. The field where Maj Kennedy landed was over a mile long, as it was the pilot suffered some abrasions during his dragging. Being dragged the full length of the field would most likely have resulted in serious injury.

For his willingness to get involved and for his quick action in aiding the pilot Mr. Overwater is awarded a Good Show.

### CAPT R.E.K. HARDER

While on a low level navigation trip over the Black Forest, West Germany, at approximately 75 feet above ground level, Capt Harder experienced a sudden decrease in engine torque with accompanied loss of rotor RPM. Autorotation was entered and the necessary checks were carried out in an attempt to determine the cause of power loss, to no avail.

The area of the Black Forest over which Capt Harder was flying afforded very little in the way of suitable landing areas; a problem which was further compounded by a recent snowfall accumulation of one and one half feet.

Because of the low flight altitude at which the emergency occurred Capt Harder's quick reaction in correctly assessing this critical in flight situation, immediately selecting a landing area and then executing a successful autorotation landing to 12 degrees sloping ground attests to his professional flying ability thus avoiding the possible loss of life and resources. Capt Harder is to be commended for his all round professionalism.

### CAPT R. FERGUSON SGT C. PAQUET

The pilot of a CF5 in Cold Lake reported that the ejection seat handles partially raised when he tried to install the safety pins after flight. The potential for a serious accident (unintentional ejection) under these conditions is very real, however, no one could explain how this condition could have developped.

Capt Ferguson, aided by Sgt Paquet, discovered that even with the seat safety pins installed, it is possible for the ejection seat handles on some CF5 aircraft to be raised sufficiently to disengage the latching mechanism and leave the handles in a floating condition. Once the safety pins were removed, a very slight pressure (negative G) could raise the handles fully and fire the seat.

Apart from the fact that this situation may explain the Cold Lake incident, these two individuals pin pointed an area where serious accident potential existed and by doing so, may have saved both human life and valuable aircraft.

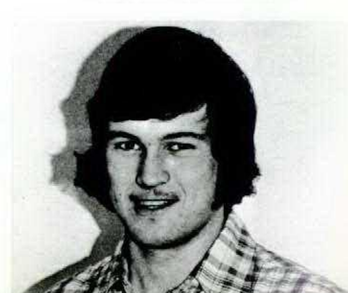
The attitude displayed by Capt Ferguson and Sgt Paquet towards solving an incident from another base clearly demonstrates the high calibre of individuals we have in our system today.

Capt R. Ferguson
Sgt C. Paquet

Cpl J.J.A. Jarret

Capt R.E.K. Harder

Mr. R.C. Overwater





### CPL J.J.A. JARRET

While replacing the pack and harness assembly on a B5 parachute, Cpl Jarret discovered that the dual housing clamp received with the new assembly, could not securely retain the power cable housing of the automatic release mechanism.

Further investigation revealed that the clamp received with the new pack and harness assembly was slightly different from the original clamp normally used.

Cpl Jarret immediately reported the incident which originated a "Special Inspection". He proceeded to check all B5 personal parachutes at this unit and found 14 installed with the wrong type of clamp.

The professional approach and attention to detail in discovering this problem, prevented a possible automatic opening failure of the parachute, following an ejection.

Cpl Jarret is an outstanding example of the calibre of individual required in the safety systems tech trade today.

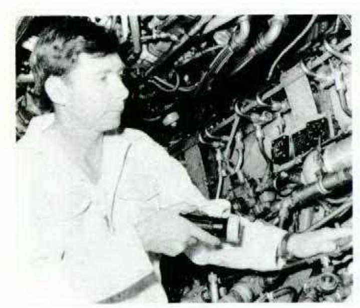
### CPL K.G. MORLEY

On 10 Nov 76, Cpl Morley, employed in AETE Servicing, was carrying out a Daily Inspection (DI) on aircraft CF104652 in preparation for a Remembrance Day fly-past. During the DI he found a bolt lodged in a corner of the hydraulic service door. Upon further investigation, he discovered that a bolt was missing from the port side of the combustion chamber split outer casing on the engine.

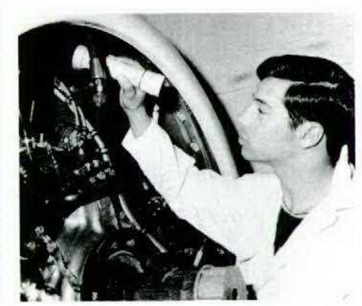
In the event that the bolt had not been discovered any one of the following incidents could have occurred:

FOD damage to the engine by the bolt gaining access to the engine intake through the actuating secondary air intake by-pass flaps; bolt jamming the throttle controls in the engine compartment; or flight line FOD had the bolt fallen out when closing the hydraulic service door.

In recognition of Cpl Morley's professional attitude, personal initiative and devotion to duty, he is awarded this Good Show.



Cpl K.G. Morley



Pte G.F. Put

Maj A.J. Field

WO G.L. Skanes

### PTE G.F. PUT

Pte Put, as part of a tow crew, was tasked to move a CP 121 Tracker aircraft from a hangar to the flight line in preparation for a fisheries patrol. The close proximity of the Tracker to other aircraft and maintenance equipment, within the hangar, necessitated that Pte Put reposition the propeller blades to ensure sufficient clearance was available prior to commencing towing. Upon moving the starboard propeller, Pte Put noted a faint hiss coming from the engine area. After the aircraft had been towed to the flight line, Pte Put immediately informed his supervisor of the hissing noise. Further investigation by the line crew revealed a cracked cylinder head on number one cylinder. Pte Put's awareness and his initiative exemplifies the contributions made to flight safety by conscientious technicians.

### WO G.L. SKANES MAJ A.J. FIELD

Major Field and Warrant Officer Skanes were the VP404 Pilot and Flight Engineer Instructors respectively on a local student training mission on 23 Feb 77 that became involved in a serious in-flight emergency. While carrying out a required practice manual undercarriage lowering, the right main landing gear would not extend fully and lock down using either main or emergency hydraulics.

As systems pressure indicated zero PSI, the hydraulics were unloaded. A visual check confirmed an hydraulic leak in the right main gear area. Inspection by a chase aircraft gave no further clues.

Maj Field initiated a series of dives, sharp pull-ups, semi wing-overs, yaws and combinations thereof in an attempt to force the gear to lock down. The chase aircraft was able to deduce that yaws gave the best results. Maj Field then combined a maximum left yaw with a sharp pull-up and right roll, followed by full right rudder. The resultant sharp swing forces the gear down and forward into the locked position.

The landing was carried out safely with the hydraulics unloaded using maximum propeller reverse and brakes on accumulator pressure to reduce the landing roll and shorten the period of potential hazard.

This emergency lasted three hours and sixteen minutes and was characterized throughout by professionalism on the ground and in the air but especially so by Maj Field and WO Skanes, the only qualified Argus aircrew on board the stricken aircraft.

Major Field and Warrant Officer Skanes are to be commended for the extremely competent and persistent manner in which they analysed the situation and then, through sheer dogged determination, succeeded in bringing the gear down to a locked position. In so doing, they saved an Argus aircraft from serious damage.

# DON'T BE SURPRISED

**by CDR C. H. Zilch CinClantFlt
Ass't Director for Meteorology
and Oceanography**

**THERE** you are, tooling along in your J80 afterburner equipped *FlugenJet* at FL380, fat, dumb and happy. Nothing can touch you. The king of all you survey, right?

Then suddenly dead ahead you see a squall line and then a line of thunderstorms dreamed up by Zeus himself. Real granddaddies! No sweat, you think. I'll just climb over them. A quick change of altitude with Center, a power increase and climb. As they say in the movies, "Then there occurs an awful thought" — that those bloody storms are growing faster than you can climb! A solid wall of rain, super turbulence, engine chugs and then out goes the fire and you are one jet jockey who is in for a helluva ride.

Don't chortle too loudly, Phan Pushers. How 'bout the jerk who knew his *Phan Pilver* could NEVER top those thunderstorms and decided to go under? Remember that old saying about being VFR when you're not? Here it comes again.

Fast Fred decides to go under the storm since he has heard that's the least turbulent area. VFR is the only answer. So Fred drops down to 1000 feet and starts under. Then he finds he must go lower and lower until finally there ain't no lower to go. Yipes! — there it is looming out of the gloom one each Mk-1 Mod O Cumulo Granite. Zlunk! No more Fast Fred.

Friends, there will probably come a day in every "Birdman's" life when he *must* fly through a thunderstorm. When and if that day comes to you, there is only one answer to your dilemma — be prepared. Here are a few general tips to assist in your preparation. They are not to be taken as a *panacea* — and certainly not to be construed as any recommendation to go out and penetrate a thunderstorm. We do hope, however, that these tips will prod you to study or review the thunderstorm and turbulence characteristics of the flying machine you are now driving.

There can be no hard fast rules laid down to govern all flights in and around thunderstorms. Heretofore, we have stated that thunderstorms should be avoided when feasible, due to obvious reasons. However, this advice does not mean avoid thunderstorm at *all cost*. Far too many pilots have attempted to overfly thunderstorms only to find the tops higher than the service ceiling of their aircraft or have experienced flameouts caused by excessive angle-or-attack and altitude. One sure bet is that it is no picnic to come down through the middle of a thunderstorm with no power!

Most **NATOPS** manuals contain a section which outlines speeds, configurations and recommended techniques which are best for flying through thunderstorms in a particular model aircraft. Tips and suggestions are generalized in this discussion and if they vary from a particular **NATOPS** manual, should not be construed as superseding that pub. No thunderstorm should be regarded as "light" and any decision to go or not-go must be based on the following: pilot experience, pre-planning, knowledge, aircraft type and performance, radar available, vertical extent and physical appearance of the thunderstorm. (In this respect it is best to avoid, if possible, any storm which has radar echo tops of 35,000 feet or higher. Tops of thunderstorms as indicated by radar are often in error by several thousand feet.) However, if you must penetrate a storm, the following general flight procedures are recommended and give the highest probability for safe passage:

- Get your aircraft ready for thunderstorm penetration prior to entry by checking instrument and cockpit lights full bright; pilot heat on; safety belts and shoulder harnesses locked and tight; set recommended power settings and slow to the recommended severe turbulence speed for your aircraft, and mentally prepare for *attitude* flying and thunderstorm hazards.
- If there is a choice, establish a penetration altitude to avoid the area from the freezing level upward to -10C (about 5000 feet above the freezing level). Many successful penetrations have been made between 4000 and 6000 feet above the highest terrain. This area has been termed the "softest" altitude. Four thousand feet above the highest terrain in the area should be the minimum penetration altitude.
- Fly the recommended airspeed range for turbulent air penetration in your aircraft. This airspeed will reduce the hazard of exceeding stress limitations and improve the probability of maintaining control. Trim the aircraft for penetration airspeed *before* thunderstorm entry.
- Change power settings to establish the recommended airspeed *prior* to storm penetration. There will be enough to do once in the storm, so keep power settings as constant as possible. Airspeed indicators often give false readings — in vertical drafts and heavy rain.
- Avoid unnecessary maneuvering while in a thunderstorm by flying in as straight and level an attitude as possible.
- Choose a heading prior to entry, if possible, that will take you through the storm in minimum time and then *maintain* it. Use all available information such as radar, lightning flashes and storm appearance to determine the best heading. Once committed, don't turn around.

There is no intent to imply that the foregoing procedures are complete but they do provide some information to guide your further study. To quote an old, old pamphlet on naval aviation, remember:

"If you keep your head, your aircraft will (probably) outfly the storm.

"Don't change your course

"Don't change your mind."

If you must go through a thunderstorm, the only way to do it is go directly through. Attempting to turn around *after* thunderstorm entry can frequently lead to more hazardous flight conditions than you have already encountered. Such hazards include flying into more turbulent conditions, remaining in the storm longer and increasing the possibility of stall by increasing angle-of-attack and angle-of-bank. Finally, remember it is better to arrive at your destination late and safe than not at all. Don't be ashamed of a 180-degree turn *prior* to penetration and while still well clear of the storm. This deft maneuver has saved many lives and aircraft and could have saved many more.

Preparation and forethought will be of invaluable assistance when you do come face to face with a thunderstorm. Think about what you are going to do in advance — don't get caught napping!

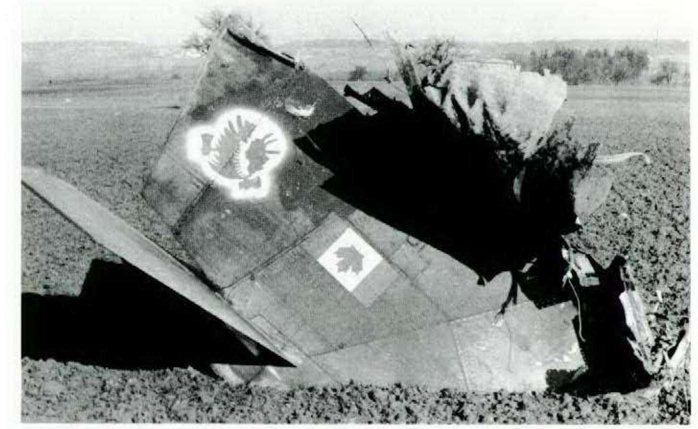


# accident – CF104 656

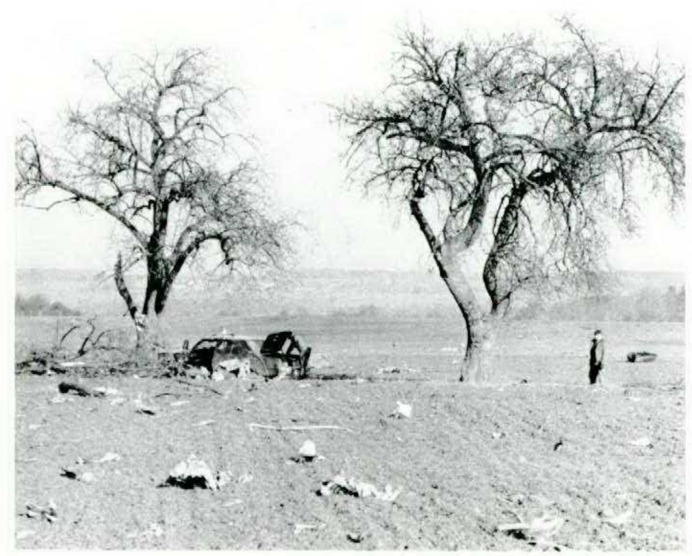
The two pilots concerned were authorized for a low level navigation mission in Southern Germany. The aircraft departed Baden and twelve minutes later was observed emerging from the base of low cloud in a gradual descent. The aircraft crashed seconds later in a cultivated field ½ nautical mile from a small village. The aircraft struck the ground in a slight nose up attitude with a few degrees of right bank at an airspeed of approximately 400 knots. Witnesses stated that the aircraft exploded on impact resulting in a flash fire. The wreckage was spread over a distance of approximately 2,000 feet with the engine compressor and turbine being the furthest component from the point of impact. Neither crew member attempted to eject and both sustained fatal injuries.

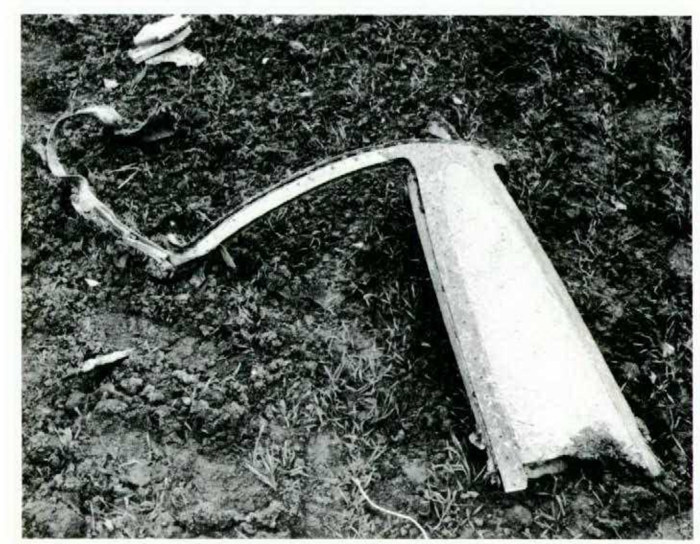
Investigation determined that the engine was operating at high RPM at the time of impact. The control servos were examined and found correctly connected and safetied. Both hydraulic pumps, although damaged, did not show any evidence of overheating. A review of the maintenance records failed to identify any significant aircraft history which could be related to this accident.

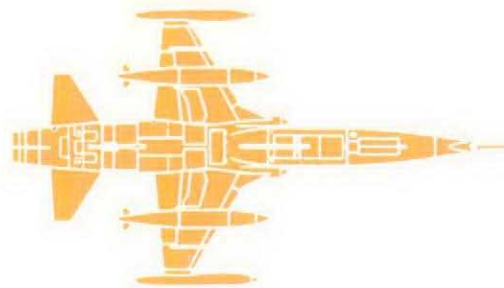
Weather reports in the area varied from 900 to 1,500 feet overcast with visibilities anywhere from 3 to 4.3 miles in rain showers. It is significant that five minutes before the accident, two helicopter pilots flying approximately 8 to 10 miles south of the crash sight reported ceilings 400 to 500 above ground level with 3 miles visibility in rain showers.



At this time it would appear that this accident occurred as the result of the aircraft striking the ground while the pilot was attempting to maintain visual contact in marginal weather conditions.







# Evolution of CF Air Weapons Ranges Strafe Scoring Systems

By Capt W.G. Walton NDHQ/CADO

There are still a few around who can remember those "good ol' days" when, in 1951, we flew those Screaming Yellow Harvards out of Stn MacDonald, Man. to carry out air weapons exercises on the Langruth Air-to-Ground Range.

Each aircraft carried 100 rounds of .303" ammunition which, the night before, had their bullet tips dipped in melted coloured wax so that, when fired at a 12' by 12' canvas target strung up between two poles, "hits" would leave a distinctive colour marking on the canvas. Individual scores were then determined by closing the range down, lowering the canvas targets (by pulleys), and counting the number of "reds" or "blues", etc. found on the canvas. Holes in the canvas were then "cancelled" (or patched over), the target raised into position and the range re-opened for further business. It was arduous work carried out by our armourers, usually under extreme working conditions. The amount of range down-time to count scores resulted in a very inefficient operation and, worse still, the pilot never really knew when he made his good or bad pass as, odds are, he never received his total score until either that evening or the next day.

Bad business all around. The only diversion at all was eating those 16 ounce T-bone steaks three times a day at the range, while the pilots found their way back to base about 40 feet off the deck (to check on the duck population, so they said).

A very short time later, the T-birds arrived, and at other ranges, such as Tracadie Range in N.B., that beautiful Sabre was making its first appearance. In later years, the CF5 came of age and then, finally, our aging Starfighter was provided with a conventional weapons capability.

The point to be made by these reminiscences is that, until the early 1970s, in spite of improved high-speed tactical aircraft and sophisticated weapons and weapons delivery systems, weapons scoring methods remained unchanged.

As often is the case, economics imposed change upon us. Conventional weapons were once again in vogue thus resulting in an ever-increasing need for range time. Faced with the choice of operating our ranges more efficiently or building more ranges with money we didn't have, the decision wasn't all that difficult.

A study was conducted to see whether our NATO friends were experiencing similar problems, and if so, what solutions had been found. Most European NATO countries were using an automatic strafe scoring system manufactured by Saab Electronics, whereas States-Side, two other systems were in an advanced state of development: one based on radar technology, the other acoustic. The system finally selected was "Acousti-score", a modern strafing scoring system manufactured by Del Mar Engineering Laboratories, Log Angeles, California.

The first system was installed on the Jimmy Lake Range at Cold Lake, Alta, in 1970 and AETE was tasked to conduct evaluation trials.

Technically, it was an instant success and remains so to this date. Problems were experienced, however, with some aircrew, especially when the cost of the drinks at the bar were on the line for Low Gun. After all, who's to believe a machine which tells Hot Shot he can't hit the broad side of a barn? Time and results finally won the trust of the aircrew in the reliability of the scoring system, and it wasn't long before the Eastern Squadron was clamouring for such a system of their own.

The remote scoring system at Cold Lake is made up of electronic devices that employ acoustic principles, for detection of passing projectiles, and telemetry for the transmission of hit counts to a remote display for the benefit of the Range Safety Officer and the attack pilot who is forwarded the same information in flight for corrective action prior to this next pass.

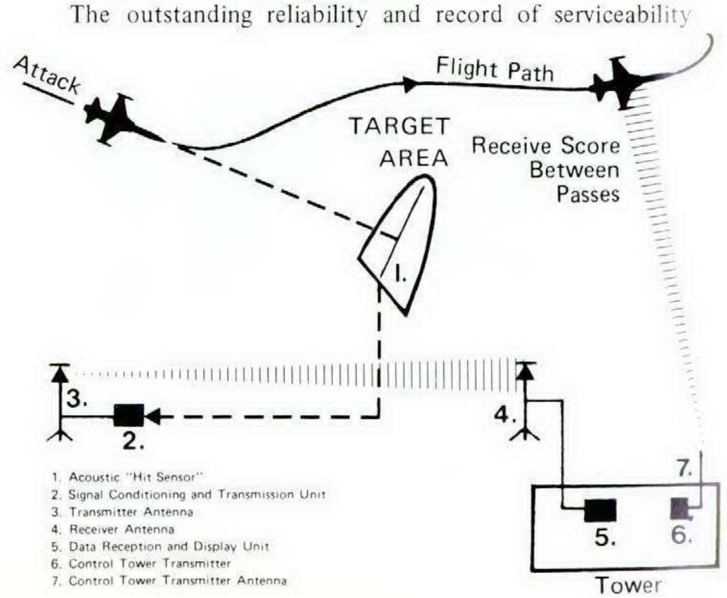
Here are just some of the benefits this system offers the pilot and range personnel:

- High accuracy and uniformity in counting hits.
- Better range utilization with no down-time for hit counting.
- Elimination of human error in hit counting.
- Scoring the right pilot.

But the real benefit gained is in vastly improved training. Have a look:

- Delays are eliminated from scoring firing runs thus making available real-time evaluation and offering the option of corrective in-flight instruction.
- Training methods and equipment are placed on a par with advanced weapon systems now is use.

The outstanding reliability and record of serviceability of this system is due primarily to its relative simplicity.




On a firing pass, all projectiles passing through or near the target area produce shock waves that are "felt" by the sensor (transducer). These are conducted to the signal conditioning and transmission unit as electrical impulses. Therefore, those signals from projectiles that did not pass through the pre-set target area are rejected. Those signals that were generated by projectiles that did pass through the target area are conditioned, coded, and telemetered via the transmitter antenna to the receiver antenna and then to the data reception and display unit. Each signal received lights up a numerical display counter which provides the RSO with a readout of the hits per pass.

The system later installed on the Tracadie Air Weapons Range was very similar except that direct link land lines were used in lieu of telemetry.

Well, there it is! A brief history on how we arrived where we are regarding strafe scoring systems. But what may seem to be the end, we hope, is really only the beginning. New weapon impact scoring systems (WISE) for bombs and rockets are under development and, if all goes well, our air ranges will be so equipped in the near future.

Now that the Horse and Buggy have been removed from our air weapons ranges, we're looking forward to the New Fighter Aircraft. Bring it on, we'll be ready!!

# Cessna "CHUTE DOWN"

Usually, when a parachutist leaps from an aircraft, he contacts terra firma somewhat earlier than the machine from which he departed. Usually—but not always.

Four sport parachutists, three students and one instructor, were to make a static line jump from a Cessna 182 cruising at 2,500 feet. The first student jumper got off safely, but as the second exited the aircraft, he slipped on the step and fell in front of the landing gear. Instinctively, he grabbed for the wing strut and hung momentarily; then he let go. But during the process, his chute had deployed and had wrapped itself around the landing gear.

Now the jumper was dangling below and behind the Cessna, which was struggling to stay airborne against the extra drag. A hairy situation, indeed, but not yet critical; the student jumper still had his reserve chute. The jump instructor in the aircraft began working to cut the tangled main chute loose, but before he could free the lines, the excited student popped his reserve chute, which deployed as designed.

This was too much for the 182, which promptly quit flying and flopped over on its back. Not being rigged for inverted flight, the engine stopped. The whole assemblage headed for the ground; first the aircraft, dangling by its landing gear from the shroud lines of the student jumper's main chute, then the student, and finally the seriously overworked reserve chute.

Incredibly, no one was killed. The occupants of the aircraft sustained some fractures, and the student jumper was uninjured. The reserve chute, designed to let down a 200-pound jumper at 20 feet per second, had managed to lower a 2,500-pound load to earth at 45 feet per second.

Now, for you navigators who have trouble hitting the DZ . . .

# accident
# Beware the Vortex Ring

Operational troop deployments by helicopter pose special operating problems for the pilots involved. To achieve tactical surprise, a low level approach to a landing zone is often essential; but this may result in late sighting and identification of the intended landing point, which in turn may require rapid revision of the flight path and lead to aircraft handling problems.

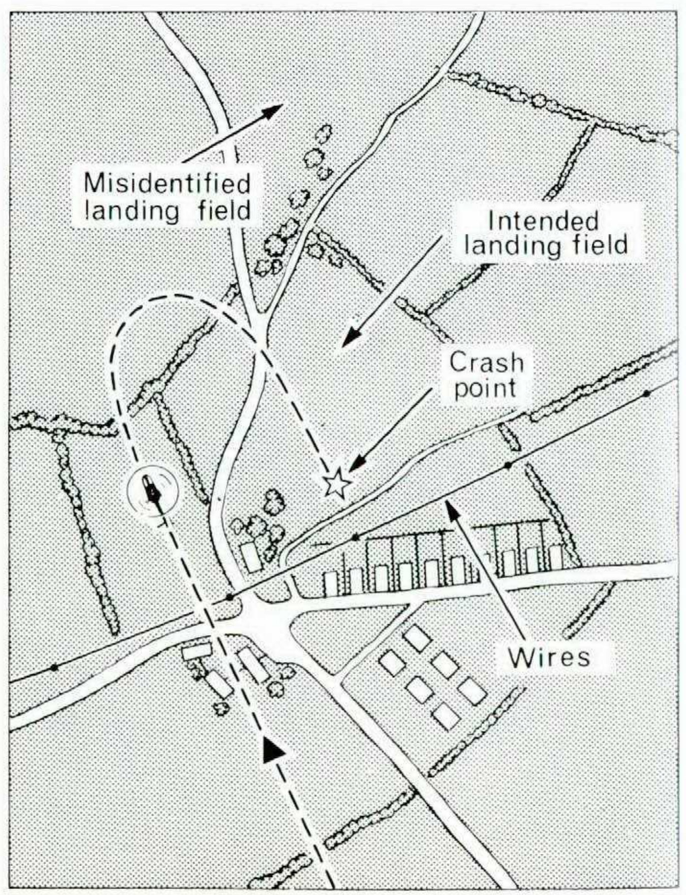
This accident occurred on an operational army support mission requiring a tactical low approach to a landing area. An initial mis-identification of the landing point necessitated a major change of flight path just before landing, which led to a loss of control due to a flying condition known as Vortex Ring state. (A Vortex Ring state is in some ways similar to a stalled condition in a fixed-wing aircraft. A Vortex Ring can develop when the rate of descent in a power-assisted approach with low or zero indicated airspeed is allowed to increase. An article on Vortex Ring is published on page 342).

In this accident, a Puma had been tasked with dropping two sticks of troops, each of eight men, at two tactical locations. The weather forecast was good, with no low cloud, excellent visibility, and a general Northerly surface wind of about 15 knots. But, when embarking the load of troops—at a point about 5 miles away from the two dropping points—the pilot noted that the wind was in fact light and variable; and later, when the first stick of troops was disembarked at the first dropping point, the pilot again assessed the surface wind as being relatively light.

The aircraft took off once more and approached the second landing point from the South. The success of the troops' mission relied heavily on surprise, consequently the route to the landing site was flown at 50/100 feet AGL. The pilot's plan was to carry out a concealed approach, and because of this he realised that he would be able to identify the landing point—a field to the North-West of a village crossroads—only at the last moment. In the event, he misidentified the landing point and continued Northwards until he was immediately West of the crossroads at about 100/150 ft AGL. However, he realised that he was approaching to land in the wrong field and that the correct one was some 200-300 yards closer by now to the right of and below the aircraft. There were some high wires along the South-West boundary of the correct field, so the pilot opted to make a right turn through 180° and to land, facing South, immediately to the North of the wires. *(The sketch map will help the reader with orientation.)*

Reaching a point about 100 yards North of the intended landing point, flying at about 30 knots, the pilot turned right and lowered the nose to maintain airspeed. He applied some power during the turn but, on rolling out, discovered that he had a high rate of descent. His crewman, kneeling in the open starboard doorway, also sensed a rapid and increasing rate of descent and, hearing a rising enging note, moved back onto the seat immediately forward of the door and braced himself for a heavy landing. The pilot now recognized that he was in a condition which could result in a Vortex Ring state. He continued to apply power, but could not increase speed straight ahead because of the 'upward' slope of the ground and the high wires and houses to his front. His only clear escape path was to his left in an Easterly direction, but this would have been downwind according to his interpretation of the wind in the area and may not have enabled him to regain full control. He was committed, therefore, to a heavy landing close to his selected landing point.

The aircraft struck the ground heavily on all three pairs of wheels. The impact was such to cause the tail cone to distort downwards, fracturing the tail rotor drive shaft. The aircraft bounced into the air before yawing violently and crashing to the ground, coming to rest on its port side. The crewman helped the troops out of the main cabin; the co-pilot, after initially having some difficulty in releasing himself from his seat because his torso armour was snagged by the window of the port cockpit door, left the aircraft by climbing over the captain and exiting by the starboard door; the captain strapped in until the co-pilot had escaped, since he did not want to fall down onto him; while waiting for him to get past, the captain, seeing an engine fire warning light come on, operated the fire extinguisher and switched off the emergency electrical cut-off bar, before following the co-pilot through the starboard door.




Shortly after the accident, while awaiting rescue, both pilots noticed that there was a stiff gusty breeze blowing from the North.

COMMENT

The pilot, perhaps conditioned by his experience at the embarkation and first disembarkation points, misread the wind velocity at the second location. Then, because of his initial misidentification of the landing point and late sighting of the correct field, he elected to make a slow-speed, small-radius turn close to the actual site and to approach it from the North. In the event, that approach was in a downwind direction. During the turn onto the approach, he applied power and lowered the nose to maintain airspeed; but this led to a high rate of descent which, when combined with the low forward airspeed, forms the classic conditions for Vortex Ring. By now the aircraft was well below 150 ft AGL and this, together with the sloping ground and obstructions ahead, precluded a successful recovery.

Of course, the pilot had many other things occupying his attention besides his approach and landing. He was in a hostile area and, to achieve surprise, had flown a concealed approach with the aim of landing the stick of troops as soon as possible. But, even allowing for the operational circumstances, he misjudged his approach to such an extent that he placed his aircraft in a situation from which he was unable to recover. Whether the aircraft entered a state of Vortex Ring or was overpitched is subjective opinion and will never be positively established. The accident serves as a sharp reminder of the dangers inherent in low speed/high rate of descent approaches and of the conditions which favour the onset of Vortex Ring. Involving as it did a relatively powerful aircraft, this unfortunate occurrence shows again that it is not only light helicopters that can suffer from Vortex Ring, and that power alone cannot effect a recovery from that state.

*courtesy Air Clues*

# A HOT COMPLAINT - BOEING 707

Approximately three hours after takeoff, a lady passenger approached the front steward complaining that her purse was getting very hot. It was discovered that a 9 volt battery in her purse was generating the heat; smoke was coming from the battery. An oven mitt was used to remove the hot battery from the purse so it could be placed on the front galley to cool. The lady then removed some coins, that were quite hot to touch, from the same section of her purse. Apparently the passenger dutifully followed our regulations and removed the battery from her portable radio, but then, she unwittingly dropped it into the section of her purse containing coins. The battery was shorted. The manufacturer of the particular battery stated that a fresh 9 volt battery shorted by a coin could easily produce sufficient heat to cause a fire or the battery itself could explode.

Consider for a moment, the possibility of that battery shorting in someone's luggage in the aircraft hold, where no one can get at it.

*Transport Tips*

some thoughts on

# CHOPPER DYNAMICS

This type of accident is unfortunately by no means unique; indeed, it is only one of a long series of similar accidents which at best have given pilots nasty shocks and resulted in heavy landing checks, and at worst have destroyed aircraft and killed crew members. The significant feature of these accidents is that they are typified by lack of response from the collective lever in the final stages of the approach. The most important point about them, however, is that they are almost always *avoidable!* Why then do they occur and how can they be avoided?

## VORTEX RING

Fixed wing aircraft create a down-wash as a by-product of lift. Helicopters also produce a down-wash, known as 'induced flow'. When a helicopter descends at rates equating to between 70 per cent and 150 per cent of this induced flow speed, a condition known as 'settling with power' or 'vortex ring' can be created. It is somewhat like flying in one's own wake.

The rotor blade tip, as does a fixed wing tip, creates a strong rotational vortex which influences the nature of the entire flow pattern. These tip vortices are shed down and behind a fixed wing aircraft. However, for a hovering helicopter a helical geometry is produced.

Surrounding air is induced into the vortex pattern and the wake moves downward and contracts. While the strongest vortex is located at the tip, there is a continuous shedding of weaker vortices all along the blade, which is called a vortex sheet. The picture is further complicated by the presence of more than one blade, each of which has its own vortex system. The interference of one vortex system with another produces further distortion of the wake.

The aerodynamic flow state through the rotor of a descending helicopter is not the same as in level flight at the same speed. This is particularly true in pure vertical descents when the rotor is thrusting in a direction opposite to the direction of flight. The diagram (right) shows two flow states for descending flight. It is an idealized representation of these states for a purely vertical descent.

**As can be seen in Fig 1(b)** the high rate of descent has overcome the normal downward induced flow on inner blade sections. The flow is thus upward relative to the disc in these areas and downward elsewhere. This produces a secondary vortex ring in addition to the normal tip vortex system. The result of this set of vortices is an unsteady turbulent flow over a larger area of the disc, with an accompanying loss of thrust and excessive thrust fluctuations even though power is still being supplied from the engine.

If we now look at descents at forward speed, similar flow states may exist as for vertical descents but the rates of descent at which they occur and the symptoms of their presence to the pilot are different. **Figure 2 summarizes the situation.**

In the figure showing horizontal speed versus vertical speed, straight lines emanating from the origin are lines of constant descent angle. Superimposed on the grid are flow state regions for a typical helicopter. It is interesting to note that the vortex ring state can be completely avoided by descending on a flight pattern shallower than about 30° (at any speed). Furthermore, for steeper approaches it can also be avoided at sufficiently slow or sufficiently fast speeds. What is happening in both cases is that the turbulent wake created by the vortex system is not remaining in the vicinity of the rotor and causing difficulty. At very shallow descent angles the wake is shed mostly behind the helicopter. At steep angles, it is below the helicopter at slow rates of descent, and above the helicopter at high rates of descent.

It should be noted however, that if the helicopter adopts a steeper flared attitude on any of the lines of constant descent angle, this angle should be added to the descent angle to ascertain the loss of rotor efficiency caused by the increase in tip vortices. **See Figure 3.**

So much for the theories—let us now look at the practicalities of vortex ring. We can summarize the conditions in which vortex ring can develop as follows:

a. When the indicated airspeed is low (below 20 Kts) and a rate of descent is building up (400 FPM+).

b. A downwind approach.

c. Re-application of power when recovering from a low airspeed autorotation without first increasing airspeed.

d. A misjudged and consequently fast approach which requires a flare to be maintained in the final stages of the descent.

Recovery, once in vortex ring, can best be effected by changing the relative positions of the disc and the upward air flow, either by pitching nose down and increasing airspeed or by banking the aircraft. However, in the fully developed vortex ring sloppy cyclic control could increase the time taken to effect a change of attitude, thus increasing an already considerable height loss—which could be as much as 6,000 feet.

Since a helicopter pilot spends most of his flying time below 1,000 feet there is little point in enumerating further the methods of curing vortex ring. It is the preventative measures that must be highlighted. Below are listed points which every helicopter pilot should know:

a. It is in the low airspeed condition that vortex ring will occur. Ensure, if power is required to arrest any descent or sink, it is applied before that low airspeed condition is reached.

b. Realise that the most likely time when the airspeed may be unexpectedly low is when turning or making an approach downwind. KNOW WHERE THE WIND IS and in any case monitor the ASI when manoeuvring at low speed. If you are unable to assess the wind, the advice in a. above is especially important.

c. What can aggravate that all-important 'sink'?

1) A late application of power when turning downwind at low airspeed.

2) Failure to realise that more power is required to maintain height, at all angles of bank at a constant and low airspeed.

3) Flight at 30 Kts parallel to ground which slopes downwards at 1:16 and will give a rate of descent of approx. 200 feet per minute.

4) The RCDI does not necessarily accurately register a sudden and temporary sink. It takes some time to show a rate of descent.

5) The RCDI may not be accurate in a turn. For example, in the Puma, if the RCDI is held at zero in a constant 30° bank/30 Kts turn, the aircraft will descend at approx. 150-200 feet per minute.

d. With any rate of descent, a flared attitude will put the airflow from below the disc nearer direct opposition to the induced flow and increase the chance of entering the vortex ring state.

e. It should be remembered that almost all the above mentioned conditions for the onset of the vortex ring state will be encountered earlier at high AUW and high density altitudes.

f. When descending at low speed, even when outside the vortex ring envelope there is a reduction in rotor efficiency and the amount of extra power required to arrest a rate of descent is greater than that normally required to overcome aircraft inertia.

In the operational environment and with many other factors to think about it is unlikely that all these points of pure flying would be at the forefront of one's mind. For that reason it is useful to know of them and to consider them from time to time on the ground, so as to retain one's 'instinct' for the vortex ring condition.

## OVERPITCHING

High collective pitch angles result in high rotor drag, and therefore more power/torque will be required to maintain rotor rpm (RRPM). If, in normal powered flight, pitch is increased without a corresponding increase in power, the RRPM will decrease and the rotor blades will cone upwards. This will result in a decrease in disc area, therefore more pitch will be required to maintain the rotor thrust and, consequently, RRPM will reduce further. This condition is known as overpitching, and the helicopter will sink.

Every helicopter has its optimum RRPM and it is this which is critical since, for example, a decay of only 10 per cent of rotor speed can result in a 19 per cent decrease lift capability.

In helicopters with manual throttles, overpitching is a fairly common occurrence. Pilots who are a little late with

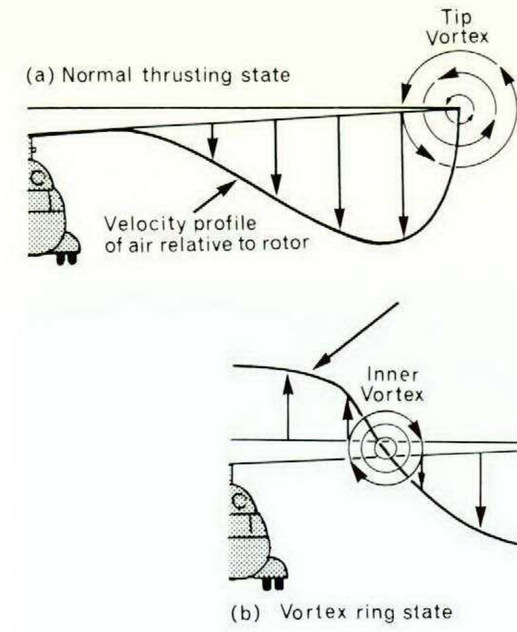



FIG.1 COMPARISON OF FLOW STATES

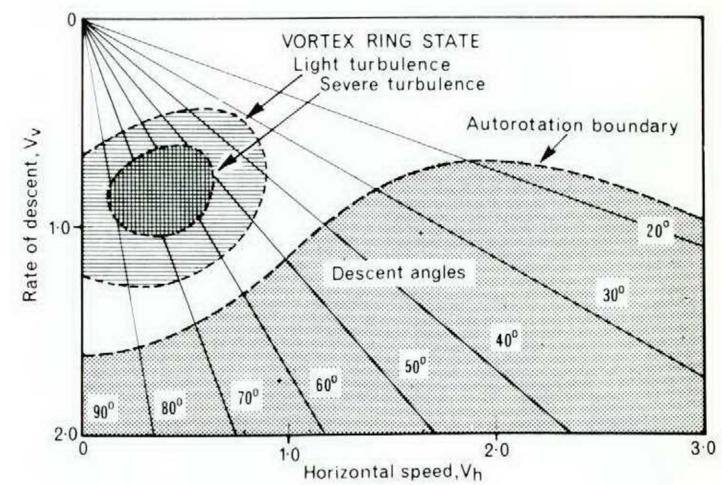



FIG.2 FLOW STATES IN DESCENDING FORWARD FLIGHT

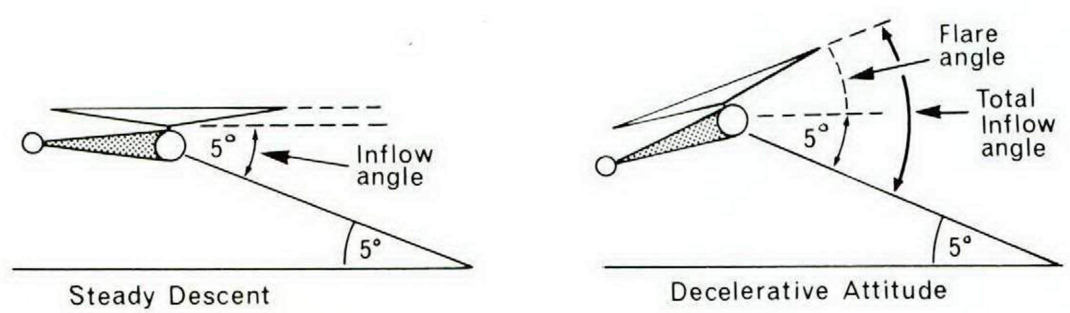



FIG.3

their power application find, to their misfortune, that the RRPM have dropped so low that the engine has insufficient torque to regain the normal rotor speed the result: the aircraft sinks rapidly. For modern helicopters, with automatic throttles, the problem of overpitching is very much reduced. However, there are still risks.

Currently, there are only two situations in which it can occur: first, a twin-engined helicopter which has suffered a single engine failure (a reasonably obvious one) and second, recovery from a nil or very low power state to a full, or near full power condition in less than three seconds. In this case the engines, via the governing system, which requires a little time to compute exactly how much power and how fast it is required, are being required to accelerate from the off-load condition to almost full power in order that the mass of aircraft, to which they are attached, may be decelerated before the aircraft reaches the ground. What happens, in fact, is that the collective lever is raised rapidly, thus reducing the RRPM well before the engines have had time to accelerate to prevent the decay. The power now required to regain the normal RRPM and to stop the inertia of the descent is far greater than that required to support the aircraft at MAUW in the hover. Moreover, there is a distinct possibility that with the rapid application of power the transmission system will be over-stressed/overtorqued. The solution is the same as that for vortex ring: prevention is better than cure; therefore, if in doubt, apply power early. (This problem is particularly applicable to the Puma; the Wessex has an anticipator system which provides an electrical rate of collective movement signal to the engine control computers, thereby reducing any transient rotor droop.)

As a final illustration, the Puma has a relatively small rotor disc, but is capable of lifting heavy loads; it has therefore a high disc loading. If a heavy Puma is allowed to descend rapidly the rotor thrust required to arrest the inertia will be quite considerable. If this is now allied to a low forward airspeed condition and the application of power is delayed, it can be seen that there is a very strong possibility of the Puma entering both the vortex ring and the overpitched states. The consequence of this to a low flying helicopter could obviously be disastrous.

In conclusion, there is one important point which cannot be overstressed. If inadvertent entry into either a vortex ring or overpitched state is to be avoided, a helicopter pilot must always make effort to determine the local wind velocity and ensure that he has at least a head-wind component on his final approach. If this is done, and the correct handling techniques are employed, then the problem of vortex ring will remain theoretical.

Remember, anyone can make a mistake. If you find that you have misjudged your approach, don't be proud, go round again, otherwise you too could get that nasty sinking feeling, and it could be your last.

*courtesy Air Clues*

# Who's on Final

The attention of the controllers at a large Air Force base was focused on the final approach to runway 36. In minutes, a C-141 with an emergency gear condition and some highly explosive cargo was to land, and preparations for its arrival were underway. The Starlifter crew reported on final and received landing clearance.

Meanwhile, at a major civilian airport several miles to the south, a civilian student pilot on a solo cross-country flight contacted the tower for landing information. He was informed that the active runway was 18 and that the tower did not have him in sight. But the student reported that he saw the runway and was cleared to land.

Minutes passed, and the controller at the civil field still hadn't spotted the little trainer. Becoming suspicious, he asked for the student pilot's position.

"I'm on short final," he answered.

Now the tower controller was almost certain that the student was attempting to land at the Air Force base to the north. He questioned the pilot about the color of the runway and the tower, and confirmed his suspicions. But it was too late, as the pilot reported that he was already on the ground and that a large aircraft was rolling down the runway at him!

The alert controller instructed the student to pull off the side of the runway and to contact the Air Force tower. The student complied, leaving the startled MAC crew plenty of room to taxi around his aircraft. Meanwhile, the civilian controller notified the Air Force tower of the incident. The blue-suiters, who had not noticed the presence of the civilian airplane until he was already on the ground, then provided an appropriate welcoming committee.



# accident – KIOWA

The flight departed Venzone Italy on a reconnaissance mission in the earthquake area of Northern Italy to familiarize the aircrew with the area while looking for further damage.

The crew observed some problems with the dam in the area just north of Avasinis and proceeded up the valley towards the dam. The crew noted a cable on the south slope and some power lines in the area of the dam but not the cable on the north slope. After a short look at the dam area they flew out of the valley along the north slope and flew into an unmarked cable which they had not detected previously.

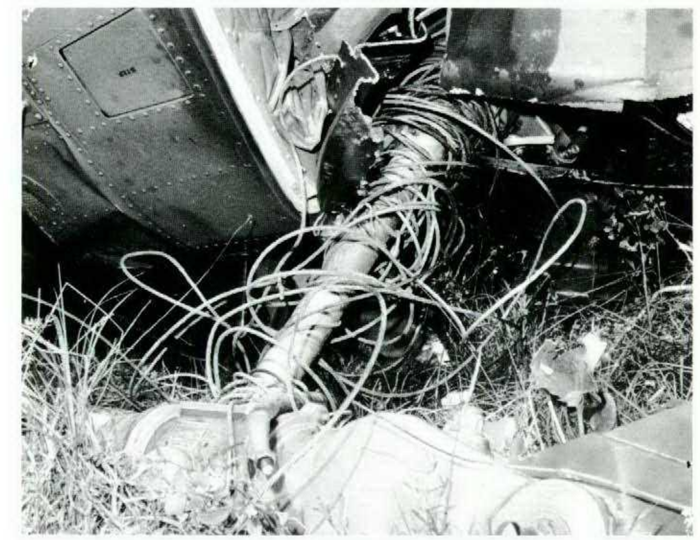
The helicopter was flying at approximately 200 feet above ground level at 60 knots airspeed and contacted a single steel cable on the front windshield. The cable slid up the windshield, cut through the upper cowling then contacted the mast and control rods. The cable snapped and one end fell free while the other became entangled in the mast assembly. The pilot initiated a descent, but at approximately 50 feet above ground level with the cable wrapped around the mast about 70 times and control rods severed the main rotor decelerated and almost stopped. The pilot lost control and the aircraft yawed left, hit the ground right nose low and rolled inverted.

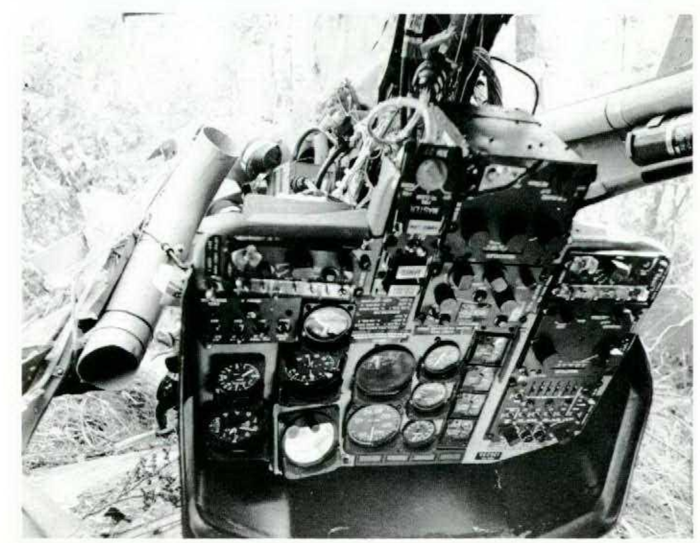
Italian military personnel witnessed the crash and were on the scene within a minute. They released the crew and passenger, applied first aid, and called for an ambulance. The casualties were driven to an Italian aid station, examined and within minutes evacuated by helicopter to a large civilian hospital at Udine.

This accident involved an experienced crew flying an authorized mission in an unfamiliar area. They were flying at a normal operating altitude of 200 feet above ground level at a reasonable speed and were employing normal wire avoidance techniques. Caution was being exercised while in the valley, and an unmarked cable on the south slope was detected with difficulty, but the cable on the north slope was not seen.

The wire that the aircraft struck was a cable that ran from the top of the hill to the base of the valley on the far side. This area of Northern Italy is covered with similar cables which are used to transfer supplies up and down the slopes. The investigating team flew in the same area under similar light conditions around known similar cables and concluded that even with the location being known it was practically impossible to see the cables unless they were skylined. It was concluded that it was improbable that the crew, flying at their altitude and position would have been able to detect the cable prior to impact.

The pilot of the Kiowa died of injuries sustained in the accident. The other occupants of the aircraft survived.





# *Reaching the Unreachable Star*

**by LCDR Carl McCullough**
**Naval Air Systems Command**

CASE I. "As safety observer for low-level navigation flight, chase pilot established position well below lead aircraft and impacted ground."

CASE II. "Returning from weekend cross-country flight, crew performed unauthorized aerobatic maneuvers until impacting the ground in a nearly vertical attitude."

CASE III. "During join-up phase of rendez-vous, pilot dissipated excess airspeed by performing canopy roll over lead aircraft, resulting in midair collision."

UNDERLYING these summaries of recent accidents are a number of factors too closely related to ignore. Most significant of these is the fact that all three pilots involved had been previously observed demonstrating qualities of questionable airmanship and/or judgment. That these three pilots were allowed to fly is not being questioned here. The key issue is derived from another important fact — that the information available to commanding officers regarding the tendencies of unusually brash pilots is often incomplete.

Over the years, naval aviation has made significant progress in reducing the major accident rate. This reduction is due in part to increasing awareness among pilots and flight officers that tomfoolery in naval aircraft is no longer tolerable. Behavior that once resulted in a slap on the wrist now frequently results in a pilot disposition board. Despite this effort, it appears from these and other recent accidents that we are still being plagued by the "unreachable stars."

The star in the first case was an aviator with 875 total flight hours. He was described by the accident board as "a very action oriented individual whose appearance in the eyes of others seemed very important to him." Not unlike a lot of us — right? Except that a projection of this drive was apparently to fly dangerously low. He had expressed his enjoyment of low flying to his roommate on numerous occasions and had been recently criticized for his dangerous tendencies. During his final flight briefing, he prophetically proclaimed, "You'll probably see me below you."

The second star had 835 hours and was regarded as "a highly talented individual with a great deal of potential who occasionally showed a marked degree of immaturity, poor judgment, and poor impulse control." The flight surgeon further described him as having had "A narcissistic personality with grandiose ideas about his glamorous self-image." His flight leaders and navigators had found him difficult to control. Tragically, that lack of control cost one of them his life.

The star of Case III had 1,100 flight hours and was a qualified section leader. He had previously done rolling maneuvers over other aircraft with "Close enough lateral separation to leave very little margin for error," a fact unknown to his CO. Less than 3 weeks prior to his accident, he had been reported (by a source outside his command) to have violated flying orders by performing three consecutive aileron rolls over a ship while dumping wing fuel.

Comments by the accident board and subsequent endorsers in these accidents reflect a serious bottleneck in the flow of information to the command level. In Case I, the CO concluded that "the tragic loss of a pilot and aircraft might well have been prevented if communications concerning the mission competency of the pilot was either known or brought immediately to command attention." Concerning the pilot in Case II, an endorser commented that "after the accident actually took place, his marginal substandard performance was totally substantiated as peers and others came forth with specific instances of undisciplined airmanship." Finally, in Case III, it was concluded by the board that those who had observed previous showboating by the pilot had "failed to report these actions to any supervisory personnel."

The questions arising from such a series of accidents demand consideration. Why is it not until after an accident that such critical information is made available to commanding officers? Has there been enough emphasis on what constitutes unacceptable airmanship? How do we reach these unreachable stars? How do we curtail such activity without stifling the highly desirable "tiger spirit" in all our aircrews? Can it be done without sacrificing morale?

The fact that accidents of this nature continue to occur despite tighter enforcement indicates the need for a shift in some commands' emphasis. Rather than channeling the entire effort into reaching the unreachable, it is time to convince the "reachable" (a vast majority) of their essential responsibility to keep the command level informed. Aviators, inescapably, are their brothers' keepers. In no other vocation can be found the need for such critical reliance on one another. Nor does any environment offer so convenient a communications forum as the squadron readyroom. In this setting we must pursue a dedicated program of reaching the peers of the "unreachable."

The foundation of this program has already been laid. Everyone knows the rights and wrongs of airmanship. No increased effort in this area is viewed as necessary or desirable. Continued training, however, should contain the clear assertion that a maneuver unfit for a flight with the CO is unsuitable for a flight with anyone else — or alone, for that matter. In determining the targets of such training, it should be noted that all three pilots discussed previously were curiously close to the famed 1,000-hour mark. Furthermore, all experienced their mishaps while flying with relative contemporaries.

Producing an upward flow of information from junior officers must be done with heed to its inherent risks. High morale and aggressive airmanship are essential for safe, effective operations. Both, however, are subject to decay in an atmosphere of charges and countercharges. That result is far removed from the object of this discussion. One well known (but not world famous) attack squadron achieved a beneficial level of competition and peer pressure by instituting a prestigious award, presented annually, with selection based on bombing scores, combat readiness exam grades, flight time, and an anonymous peer ranking. While only the top five scores were revealed, the result was an increased awareness of the need to perform professionally, despite the rank of one's leader or wingman. Multipiloted aircraft squadrons have achieved success through several forms of aircraft commander boards, most notably those which encourage all those who have flown with the pilot in question to comment on his abilities and tendencies. The key squadron personnel in a program of this sort are, of course, the safety and operations officers. They are indispensable in keeping communication lines open. Not only must they ensure that command policies are implemented and understood by junior officers, but they are also responsible for informing the CO of potential problem areas. Commanding officers will continue to confront the unreachable star — an accident waiting to happen. Only when all the facts are known about these people can the proper decisions be made regarding aircrew scheduling and utilization. In the words of one endorser, "Peacetime is the time to be highly selective, and there are many young professionals just waiting to take the vacant cockpit seats."

*courtesy USN Approach*

# ARRESTER CABLES

Ever since arrester cables were placed across runways it has been known that aircraft would be damaged if the cable was not rigged and tensioned properly. Recently, a formation of four F-106s proved how serious the damage can be.

The cable was being straightened for pretensioning when the flight requested takeoff clearance. After being advised that the cable was still loose, the flight lead requested takeoff anyway. The arrester cable maintenance crew cleared the runway and the formation took off. Lead had no problems, number two damaged his right gear door, number three had no problem and number four caught his left main gear door on the cable. The cable contacted number four's door four inches above its lowest extension, causing loss of the door and a large hole in the left wing number three fuel cell. An immediate and massive fuel leak was ignited by the afterburner, causing a rooster tail of flame behind the aircraft. Fortunately the flame went out when afterburner was terminated and the aircraft recovered safely.

If aircrews are not already aware of the hazards of taking off over loose arrester cables then they should be briefed on the subject immediately. Pilots must not allow special conditions such as the pressures of an ORI to cloud their good judgment and persuade them to do things that they would not normally do.

In case aircrews are not familiar with arrester cable hazards, here are a few.

a. A nose gear will often bounce the cable enough to cause it to contact main gear doors on some aircraft.

b. Main gear will cause the cable to bounce and hit the underside of the aircraft.

c. A formation takeoff is very likely to cause cable bounce that will damage the wingman's aircraft.

d. The faster you hit the cable, the higher it will bounce. However, the chance of hitting the cable depends on how well the bounce is synchronized with the position of the main gear as it passes the cable.

e. Loose cables bounce higher that tight cables.

f. Improper spacing of the cable pendant support donuts contributes to cable bounce.

g. Wide style donuts (2"), such as are used on some high crown runways, are believed to have caused damage to T-33 main gear doors.

h. Cable bounce is likely to be more pronounced on flat runways than on crowned runways.

So that nobody is left with the idea that this recent incident is an isolated case, we point out that less than 2 years ago an F-102 wingman couldn't raise his gear after what he thought was a normal formation takeoff. It wasn't so normal — the cable had snagged the gear door. On landing the left main gear folded, the aircraft left the runway and the remaining gear collapsed. Result — a minor accident.

**EDITOR'S NOTE:** This is not just a fighter problem! One base discovered three transport-type UHF antennas

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# MURPHY CONNECTION

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**by Maj D. A. Hacker, DAEM 3-2**

10 pt. Press Rom Med 21 picas

There may be those who think that in this age of sophistication, the "Murphy" has been laid to rest forever. Not so kiddies! Murphy is alive and well, ready to strike anywhere, from right where the work is done to the dusty crannies of our highest HQ.

Consider the trusted, reliable C130 HERCULES. A proven performer, like a lady in her prime, no great surprises but steady and consistent. Images of baseball, hot dogs, apple pie and (insert your favourite) come to mind. But wait: here comes Murphy.

At the aft (stern ?) end of the Herc fuselage underside, in the area of the horizontal stabilizer, there is an access panel. "Ha!" you say, "the old panel improperly installed story." Not so this time: read on. In *this* panel the designers cunningly provide a drain mast to get rid of any accumulated moisture which might enter through small gaps in the vertical fin/rudder area. They knew that water would play havoc with the elevator trim motor or other essential flight control mechanisms in that area. In later production they improved the design of this little tube to provide even better drainage and possibly to try and avoid Murphy causing it to be put on backwards. This all worked very well and ended up looking something like this. (See Fig. 1.)

Knowing that this little tube would occasionally need replacing as a result of collisions with cargo loads, maintenance platforms and so forth, the manufacturer went further and provided drawings so that a replacement could be made up locally at little cost. Thoughtful and simple. You take a flat piece and a round piece, weld them together and get the later version, which is the preferred spare. Enter Murphy. The drawings are quite clear, if they can be found, but the Tech Order is far from clear. Anyway, it is apparent that someone put the right pieces together wrong like this. (See Fig. 2)

Now we have a problem. Instead of the drain creating a slight vacuum, we now have a sort of collector which grabs water flowing back in the slipstream and forces it up into the elevator control area, thoroughly soaking everything including wiring and trim motor. The result: a potential flight safety hazard, particularly in a situation of wet weather at ground level with below freezing temperatures at higher altitude. There is no record of how often it was overlooked on all of the external visual inspections we do but it may have been quite a few times.

Incidentally, the whole panel is symmetrical so that it *could* be installed backwards on the aircraft but no one would do *that* – would they?

In any case, we have again proved Murphy's first law: "If a thing can go wrong, it will." Common sense, applied all along the line, from the drawing board to the technician who does the "simple" job, will beat Murphy every time but you have to work at it. Think about it.

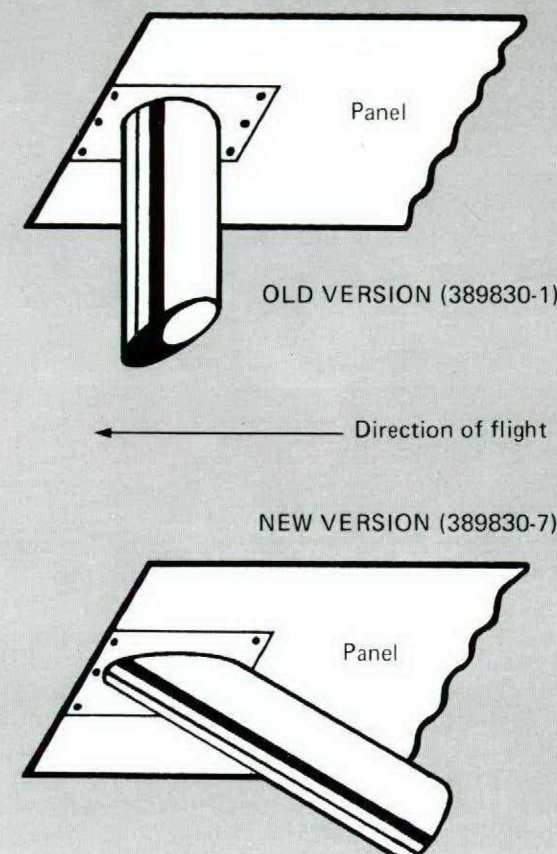



FIG. 1

"MURPHIED" VERSION

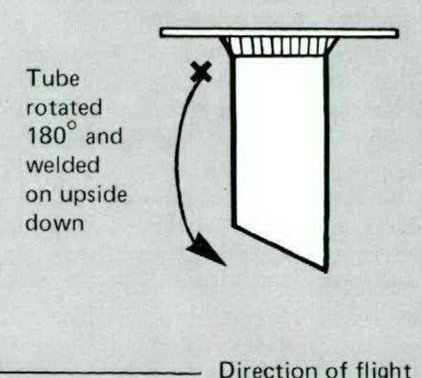



FIG. 2



48 pt Futura Med l.c.

# accident – CH136 265

42 pt Cent Extrabold Rom u.c.

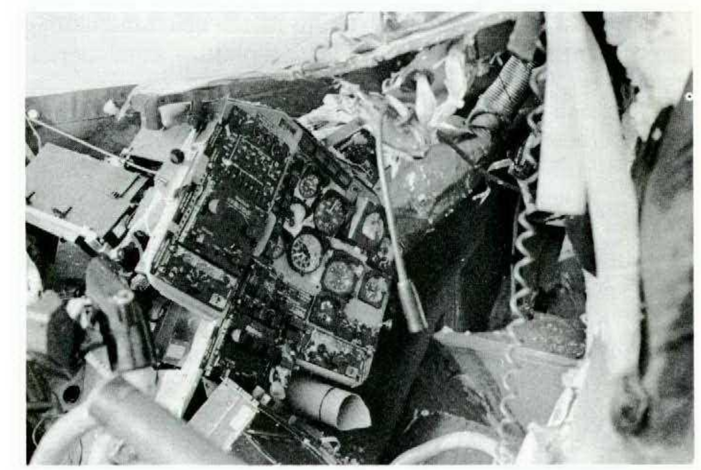
10 pt Press Rom Med 21 picas

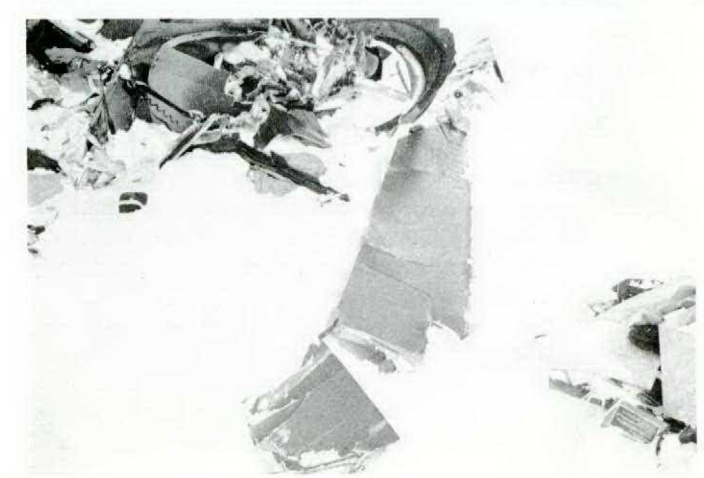
The accident occurred during the outbound leg of an authorized liaison flight from Botwood to Cornerbrook, Newfoundland and return in support of Exercise NORTHERN RANGER. The aircraft departed the Squadron Base Camp and proceeded to a tactical location some 10 nautical miles distant for a passenger pick-up. The aircraft departed from the pick-up point and proceeded on course to Cornerbrook, crashing on Dawes Pond on track at approximately 1600 hours on 17 Feb 77.

A flight plan was not filed since the mission was outside controlled airspace, but an itinerary was left with Squadron Operations. The estimated time for completion of the task was 1900 hours. A telephone search was commenced at 2145 hours with negative results. A CC115 Buffalo was launched from Summerside to conduct an airborne electronic search but went unserviceable enroute and was unable to complete the task. Weather in the local area prohibited a night search by helicopter and Rescue Coordination Centre ordered a first light search by 424 Squadron and 422 Squadron helicopters. The crash site was located by a 422 Squadron helicopter at approximately 0810 hours on 18 Feb 77 and the pilot and passenger were found dead. The observer was missing and was located by the SAR helicopter at 0945 hours on the same day. He was critically injured and was pronounced dead on arrival at Gander hospital.

Investigation revealed that the aircraft struck the ground initially in a right nose low attitude with a high rate of descent. The aircraft then bounced twice before coming to rest on its left side. During this time the aircraft fuselage separated and the engine flamed out due to overspeed. It has been determined that all of the aircraft systems were serviceable prior to the accident. It became obvious in the course of the investigation that actual weather conditions encountered during the flight were much worse than forecast.

The investigation concluded that the pilot was flying in an area of snow showers and encountered "white-out" conditions over the lake. He attempted to turn back and experienced disorientation during the turn. Since he was likely flying at a very low altitude in an attempt to remain visual with the ground, he must have unknowingly lost height in his turn and flown into the surface of the lake.





# Jeanette's, some of Canada's fighting aircraft

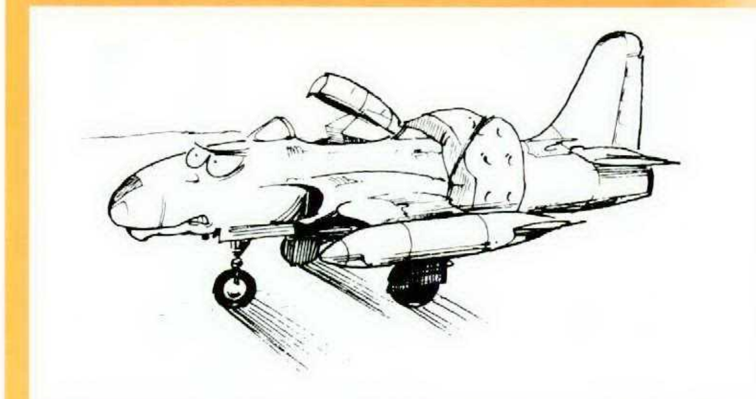
by Hans Dietrich and Gordon Trevor

### The T-33

The design for this bird originated during the Second World War, when a nearsighted Kamikaze attempted to destroy a dud torpedo. The resultant changing took wing and was last seen heading out to the open sea at fifty-two feet.

In 1948, Look'n'heed made the idea reality with its converted F-80C, then known as the TF-80, and now known worldwide as the T-33, or 'Teabag', to Canadian enthusiasts. Takeadair built 656 of the jaunty jets for the RCAF, delivery beginning 1953 and continuing through till 1959. Those still remaining will serve until 1990, or until all become extinct, which ever comes sooner.

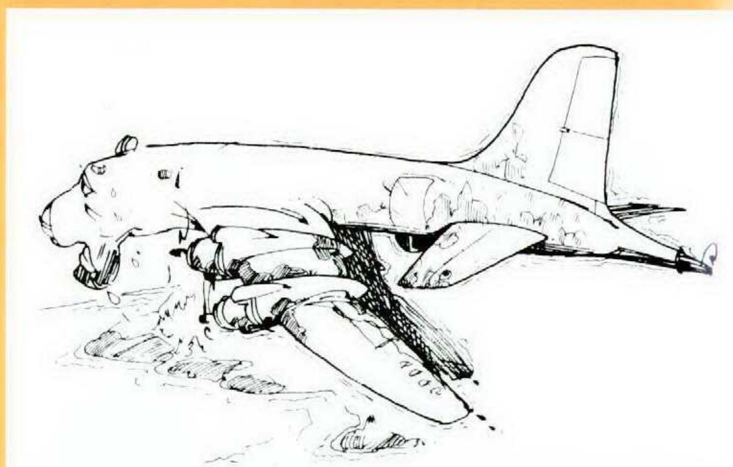
A docile, single-engined steed, the T-33 retains the memory of its origin in its flattened-torpedo shape and casually attached wings. It is widely used, for general and support purposes, and to fly Turbo Tarling around the country.



### The Argus

The CL-28 Argus first flew in March 1957 and was accepted by the RCAF six months later, to fill the dual roles of long range maritime patrol aircraft and mobile, mental convalescence for hyper jet jocks.

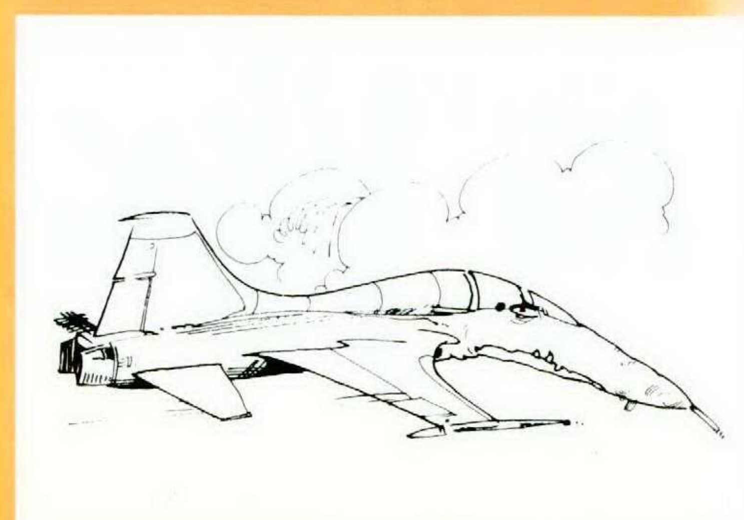
It is one of the most awesome of our aircraft, reminiscent of the cruder medium bombers of the last World War, and sworn by many to be partially built of their dredged remains as well. A jutting chin radar and trailing MAD broom lend it an air of grave distinction and a ready recognition as the plane with the proverbial 'stick. . . '. Its endurance in the air is legendary. Alas, this favourable characteristic is not perpetuated on the ground, and the entire breed will be mercifully euthanized in the early 1980's and replaced by an upper atmospheric phenomena.



### The CF-5

A potential monetary disaster gave birth to this little brat. In 1964, a company in the business of manufacturing childrens warfare toys, and which shall remain nameless, blundered in the placing of several decimal points and was delivered some eighty models of a small, well-designed jet, whose only flaw was that it had been built to a 72/72, instead of a 1/72 scale. Despair was deep and jobs were in jeopardy until the RCAF received wind of the error and offered to take the shipment. The deal was swiftly made. Nohope and Takeadair proclaimed the design as their own, supplied guts and power, and dubbed the result the N-156F or CF-5.

The 'Freedom All-Mouth-And-No-Action' is today known as a lightweight rabble-rouser, whose dubious speciality is ground support. It is a nervous little airplane with a nasty expression. It can be got in single and dual seat versions. Despite its uncommon background, or perhaps because of it, it has proved prolific.





### The CF-104

The missile with the man in it really is a missile.

In 1952, a benevolent ex-Nazi, whilst under the influence of considerable good-will, confessed knowledge of a secret cache of potential V-rockets under Lake Constance to his drinking chum, a Look'n'heed employee, who immediately plied him to reveal this astounding info to a paying source. After much thought (and several threats) the happy hum relented. Look'n'heed investigated, found and claimed the hidden hoard of aerodynamic delights a year later, and set out at once to make something of the dozens of advanced and hitherto unknown type rocke bodies uncovered. One of the best known conversions, created by minor alterations and cheap additions to an already superb missile-fuselage, was the F-104.

The 'Starfighter' or 'Falling Star' (as it was known to the well-initiated) proved a very popular strike and reconnaissance fighter once the design was perfected in '56. Takeadair joined the bandwagon and built several hundred of the sleek birds for the RCAF alone. This flock was delivered in 1961. Most are still capable of winging it whereever asked, though some have shown an annoying tendency to moult at unpredictable times, especially during flight. But, aside from this, and an unfortunately irresistable desire to return to earth when its feathers are shorn, the Canadian CF-104 is still considered a pretty good'un, by most if not all.

# Boots and Parachutes

by WO P.J. Vanderburg DAES 4-3-3

In the thoughts of many the idea of parachuting brings to mind the hardy commando-paratrooper equipped with all the trappings of his rough and tough existence, or the neat sports parachutist similarly adorned with the finest paraphenelia. This article is intended to address one item of equipment used by these exciting heroes. The lowly boot, or better the intent of footwear when parachuting and specifically how it applies to a jet jockey.

The paratrooper or combat boot is a piece of equipment designed and built to ensconce the foot of a para-landing trained, combat ready, physically primed individual, who requires sturdy protective footwear to see him through highly varied and undefined battle field conditions to fight a war, once landed.

The sports jumpers boot, again is a piece of equipment designed for a specific group of people, involved in although a highly specialized form of entertainment, but who are least trained, practiced and aware of what they are facing.

Jet aircraft crews faced with an ejection are likely to blackout temporarily during the ejection sequence. Because of this eventuality all efforts in design and procurement of their life support equipment are directed toward automatic operation and maximum personnel protection.

If not unconscious, the traumatic shock of a high speed ejection often has the ejectee too dazed to help himself during the critical parachute landing. Even wide awake, he is still untrained, unpracticed and certainly, from the standpoint of muscle and bone, unprepared for the shock of landing.

The ejectee decked out in any type of supportive boot higher than the ankle is therefore a cripple in the making. Why a cripple? Medical records and statistics indicate a well supported ankle is very likely to withstand the shock of a para-landing without injury, but if the body is so aligned with the ground that it is likely to twist or break a bone, the shock is then transferred to the knee joint.

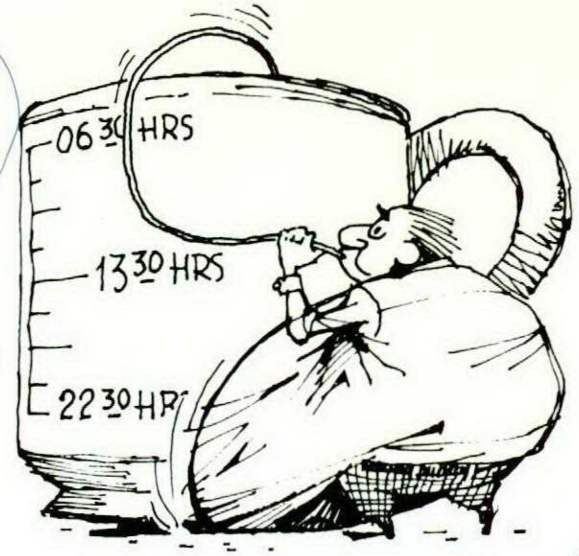
Medical opinion holds that a broken ankle is generally a simple break and is readily repairable, whereas a broken knee generally means the loss of a pilot to the CF and a permanent knee problem to the individual.

If the ankle is broken during the para-landing the ejectee can crawl on all fours and walk with a crutch (stick) during the critical seek and pickup time, he therefore has some mobility. With a broken knee he is likely to have to drag himself along the ground, possible in summer but likely to be doomed to failure in the winter.

There is also no justification for wearing jump/combat boots for the following reasons:

a. Survival instructions are to stay with your aircraft, therefore rough terrain travel boots are not necessary.
b. Mukluks give cold weather protection whereas combat boots are not very good in this area.
c. The support provided by the jump/combat boot is only effective in the summer months, as that type of support is not given by the mukluks. If support is needed, surely it is needed year round.

# Cafeine Comments




**by John Bardsley, M.D., Ph.D.**
**Flight Surgeon Directorate of Preventive Medicine**

Caffeine is a common drug found in a variety of plants, most notably coffee beans, tea leaves, cocoa seeds and cola nuts. It is closely related to a variety of chemicals, including uric acid (the causative agent of gout), purines (a major constituent of DNA), theophylline and aminophylline (for treatment of asthma) and theobromine (the major stimulant in cocoa). Of all the chemicals of this family, caffeine has the greatest stimulant effect on the central nervous system (CNS), especially the cerebral cortex. It also causes the kidneys to increase fluid output, stimulates the heart to beat faster and relaxes smooth muscle (e.g. the bronchi).

Of all these effects, we drink coffee for its stimulating effect on the CNS. Caffeine, through the CNS, does a variety of "good things": It allays fatigue and drowsiness, allows sustained mental effort, gives a keener appreciation of sensory stimuli, decreases reaction time, enables a clear flow of thought, increases motor activity and enables greater association of ideas. Through other avenues it also increases the muscular capacity for work, increases secretion by the stomach and increases respiratory rate, among others. Although tolerance to these effects does develop, the stimulant effects seem least affected.

Since a variety of food products are made from the plants that contain caffeine, many commonly consumed beverages and snacks have fairly high levels of this drug. Also, since caffeine does have the psychological effects referred to above, it appears in a host of commonly-prescribed and proprietary medicines. Following is a list of the commonest sources of caffeine on the market today, with approximate contents of caffeine:

| 1. Beverages | Caffeine Content |
|---|---|
| brewed coffee | 90 – 150 mg / 6 oz cups |
| instant coffee | 80 – 90 mg / 6 oz cups |
| tea | 70 – 80 mg / 6 oz cups |
| hot chocolate* | 20 – 50 mg / 6 oz cups |
| colas | 35 – 55 mg / 12 oz bottle |

* certain types do not have any
* (e.g. Ovaltine®)

| 2. Medications | |
|---|---|
| Frosst Pain-Killers (e.g. 222, 292, etc.) | 30 mg / tablet |
| AC & C (Ayerst) | 15 mg / tablet |
| Anacin® | 32.5 mg / tablet |
| Coricidin Cold Tablets® | 30 mg / tablet |
| Sinarest® | 30 mg / tablet |
| Bromo Seltzer® | 32.5 mg / packet |
| Excedrin® | 60 mg / tablet |

In addition, certain chocolate preparations and Dristan® also contain significant amounts of caffeine.

Although caffeine has many good side effects, too much of the proverbial "good thing" has undesired, adverse, and often deleterious effects. When one consumes enough caffeine to get side effects, the condition becomes known as caffeinism, and most of us have probably had this entity on occasion. The symptoms of caffeinism are legion, and include the following: irritability, shakiness, muscle twitching, inability to sleep, nervousness, rapid breathing, flushing, rapid heart rate, irregular heart beats and palpitations, frequent urination, abdominal cramps, diarrhoea, and acidy stomach with heart burn. Most of these effects are due to the stimulant properties of caffeine, again the reason we drink coffee or tea in the first place.

The development of these symptoms and the dose of caffeine required to produce them depends on the individual. On the average, however, 50-200 mg of caffeine is usually enough; therefore, two cups of coffee or tea could produce unwanted effects, and so could the drinking of several colas indeed, caffeinism has been documented in youngsters from colas. In part, this is because young people are most susceptible to caffeine – the younger, the more susceptible. So, be cautious in the amount of caffeine-containing substances you allow your children to have. Others who should be cautious are those with heart disease, fast heart rates, high blood pressure, and ulcers, acidy stomachs or bad nerves.

Another trait of caffeine that is interesting is its purported effect of depleting the body's Thiamine (Vitamine B-1) supply. This has prompted people sold on vitamins to push vitamin supplements on coffee drinkers. Whether this is necessary or not needs verification, but it is a distinct possibility and deserves attention.

To avoid the adverse side effects alluded to above, a lot of people are switching to decaffeinated coffee. However, there is evidence that caffeine is not the only offending constituent in coffee, albeit the principal one. Thus, people who switch to decaffeinated coffee may still witness some, or all, of the unwanted side effects. Moreover, other heavy caffeine consumers, alarmed by articles such as this have ceased their intake abruptly. This has resulted in a physical withdrawal with such symptoms as irritability, headaches, shakiness and a variety of others. So, if you decide to break the caffeine habit – let's call it what it often is, a caffeine addiction – let yourself down slowly, or stop under the care of your physician. Although we often don't take cafeeine seriously, we should!

As a final comment, it is interesting that many fever remedies contain aspirin and caffeine together. Evidence exists which shows that the fever-lowering effect of aspirin can be negated by the presence of caffeine which tends to elevate body temperature. And speaking of cold remedies, this raises the topic of the evils of aspirin . . . .

To stop drinking coffee would be extreme, and probably not warranted. However, to be aware of what one is consuming, and to practice moderation, seems to make sense no matter what we are doing. And this is especially so if the results of immoderation adversely affect performance – indeed be downright incapacitating – as they can be in the case of caffeine.

# Delegation

What do you understand by delegation? Many people at all levels of management argue that responsibility can be delegated, the manager in some curious way granting his responsibility to a subordinate, but still retaining it himself. This is surely a fallacy, but one which is so widely held, that it is worth some examination.

When jobs are initially specified a decision is made in theory, explicitly, but often, only implicitly, as to the responsibilities proper to it. These depend on many factors, such as skill level required by the job, the experience and background of the person likely to fill it, and as often as not, service custom. If the job is not clearly defined, there may be many misunderstandings as to where responsibility properly lies and this is an argument for the establishment of Expanded Terms of Reference (ETOR's) for all managers. How many times do we hear the argument: "The job covers so many different areas that it is impossible to write an ETOR".

The answer to that is surely that if the job cannot be properly defined, it cannot be properly done!!

In an ideal world, therefore, managers at all levels would be in no doubt as to their exact responsibilities. Where misunderstandings occur is usually with the principle of how far a superior is responsible for his juniors' responsibilities, and it is over this principle that people stumble when they claim that responsibility can be delegated. To take a simple example: a squadron AEO is responsible, amongst many other things, for the maintenance of correct standards and practices, in his squadron. A maintainer who works for him is responsible for employing correct standards and practices. The maintainer's responsibility is properly granted to him by reason of his training and skill: it is not delegated to him by anybody. Thus if he makes a technical error only, only he is to blame, unless of course it can be shown that his superiors had failed in **their** responsibilities, such as ensuring that the task was properly detailed, the man was properly qualified and had not been overworked, and so on.

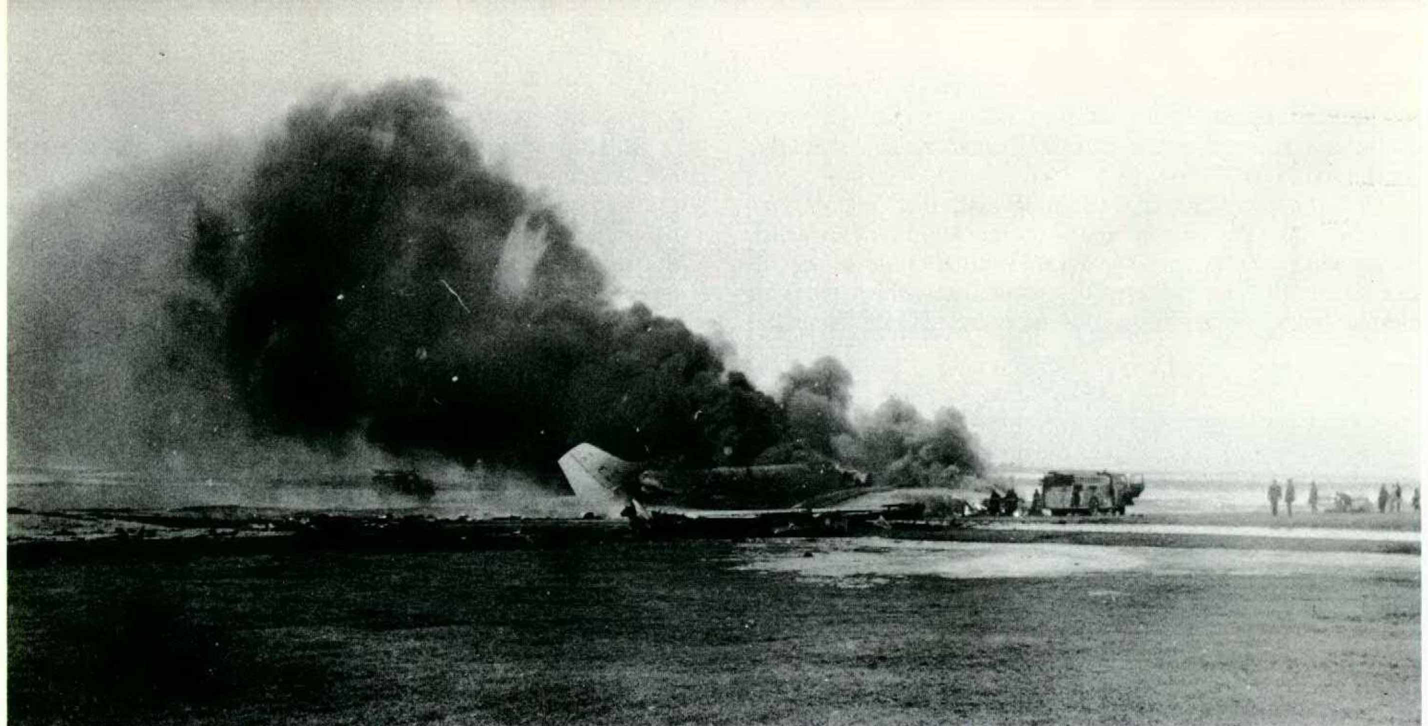
A straightforward and simple example you may say, but it illustrates a principle which is often lost sight of when Management is discussed.

Coincident with responsibility must go authority, and the scope of a manager's authority should also be defined in ETOR's. It is sometimes necessary for a subordinate to carry out tasks for which a manager is responsible, perhaps to ease the manager's workload or to improve the subordinate's experience of decision-making. In order to do so, he needs some part of the manager's authority, so we arrive at the principle of delegation of authority, which really only means that some of the manager's task is carried out by a subordinate in the name of the manager. The manager remains responsible, and to put it bluntly, if the task is done badly, in his name, he ought to get it in the neck!

The foregoing may seem just playing with words, but those who argue that responsibility can be delegated have not grasped an important point. This is, that in every situation where a subordinate needs to be made fully responsible for something, he should be granted full responsibility. Thus the importance of writing ETOR's for managers becomes apparent – it involves the consideration of how far down the management tree various responsibilities should be placed, and if done properly, usually ensures the placing of responsibility at a lower level than before, (not delegating it!). This in no way interferes with the principle that the boss is responsible for the end product, but it does mean that when a man is trained and experienced enough to hold down a specific job, he should be trusted to get on with it, because he is responsible for it. Trust is the key word and here we come to the connection between a lot of management jargon and Flight Safety.

Nelson got it half right: every man is still expected to do his duty. What the manager must ask himself is if he trusts each man to do his duty. It involves an effort of will sometimes, but the end product is very rewarding, it pays off in the meticulous workmanship and performance which everybody is trained, but not always encouraged, to produce. When responsibility is set at the right level, and the freedom given to exercise it fully, Flight Safety is bound to benefit.

*Courtesy of Royal Navy "Cockpit"*

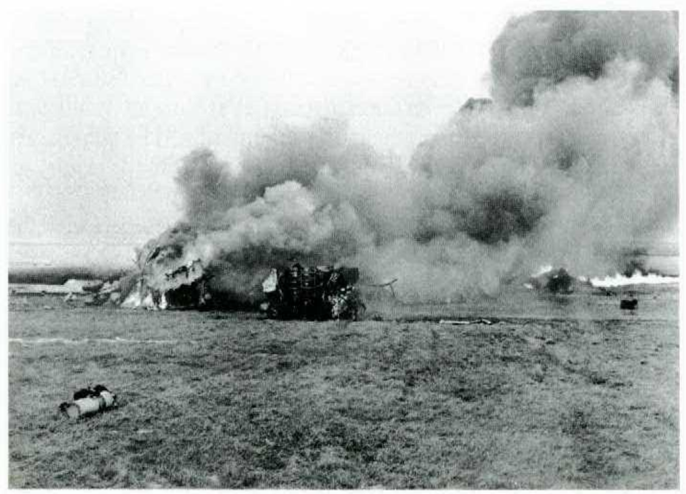


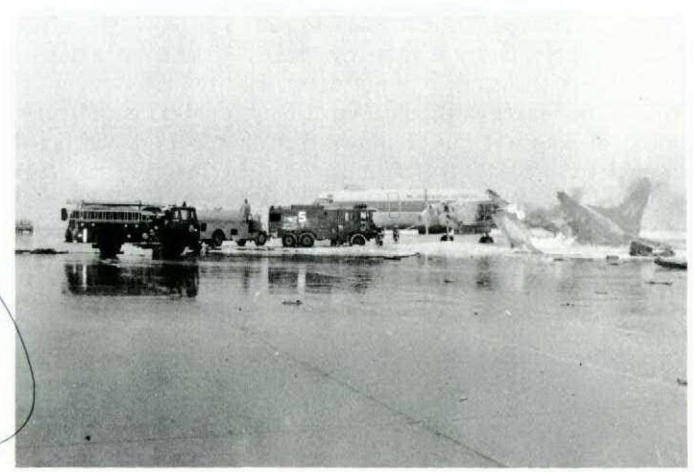
# accident – ARGUS 10737

Argus 737 had initially been assigned to a ship search and rescue mission which was cancelled, and then was reassigned to a routine operational patrol. Number 1 engine malfunctioned in flight and was shut down. Fuel was dumped to reduce the aircraft to landing weight and a surveillance radar approach was completed to runway 18 at CFB Summerside. At approximately 1½ miles from touchdown on course, the crew reported visual and were cleared to land. Witnesses reported that the aircraft then nosed over rapidly followed by an abrupt roundout. Power was applied and the aircraft began banking to the left while still descending. The aircraft touched down on the left main landing gear in a nose high attitude in the infield 100 feet to the left of the bottom of the runway. After two touchdowns the aircraft became airborne again. The left wing continued to drop and the Argus flew in a curved path and crossed the ramp in front of the control tower where it struck an unoccupied Nordair Electra. The left wing of the Argus severed the aft fuselage and ripped open the left wing of the Electra. The Argus crashed on the ramp, slid into the infield and burst into flames. Fifteen of the crew managed to escape from the wreckage. An observer was fatally injured in the crash. Subsequently the supervisory pilot and one flight engineer died from their injuries.

The weather at CFB Summerside at the time of the crash consisted of a ceiling of 800 feet with a visibility of two miles in thunderstorms and fog.

During the approach and subsequent crash the aircraft captain was in the co-pilots seat with the first officer in the pilots position. The aircraft captain had control of the aircraft during the latter stages of the final approach phase and the overshoot. The supervisory pilot and the fatally injured flight engineer had been standing on the flight deck behind the pilots.







## JANE'S ALL THE WORLD'S AIRCRAFT 1976-77

With far more changes visible than in any previous edition, the new "Jane's" is not only new in content but rearranged. The main text has grown to 820 pages and contains some 1½ million words and 1,500 photos and drawings.

Sail-planes, RPVs, target drones, airlaunched missiles, research rockets and aero-engines are among the aerospace products dealt with in sub sections. On the subject of conventional aircraft, apart from those of the "Big Three" (U.K., U.S.A., U.S.S.R.), one cannot help but note that there is a noticeable expansion in aerospace activity in Brazil and also in China (Shenyangs F-6 to F-9 are documented).

Much of John Taylor's foreword is devoted to defence. In it he points out that the U.S.A. owing to a preoccupation with nuclear missiles, has slipped behind Russia in conventional weapons. To match Russia's growing force of "Back-fire" swing-wing bombers – "each faster than Concorde and with a much longer range" – America has only subsonic 1955 – vintage B-52s, if the shorter range FB IIIs are discounted. For home defence Russia has 2,600 manned interceptors, many of them of the latest types, and 12,000 SAMs: against the U.S.A.'s 315 obsolescent F-106s and no SAMs at all in the 48 home States. No mention is made however of the possible augmentation of NORAD forces by TAC F-4's and F-15s in case of emergency. Taylor, a commentator of international standing considers it essential that the U.S.A. should go ahead with the B-1 and order replacements for the F-106s of the manned interceptor force. Perhaps another area worthy of consideration is that of on upgraded Nike Hercules or Hawk defensive SAM network.

"Biggest and best" accurately describes this latest edition of a work which still has no rival in all the world's countries. Aviation enthusiasts and professional men involved in any area of the aerospace industry or military aviation need look no further for a definitive reference work. Surely the Janes intelligence network rivals or exceeds in efficiency the networks of many nations.

I cannot believe that this actually happened – but it did – and I'm sorry. In our Tribal Destroyer article in the last edition, a photo caption was inserted without my knowledge on the opening page. It said "The new HMCS Huron" – while in fact the ship pictured was the new HMCS Athabaskan. We had used this photo on the front cover since we lacked a good colour shot of Huron with a Sea King. It was our intention to use a black and white of DDH 281 on the inside – but apparently this footwork dazzled both our artist and our printer – and hence the problem. The editor however accepts full responsibility – because he (I?) authorized printing without proofing due to time difficulties. My object apologies to all who were offended by my oversight – and my congratulations to the many eagle-eyed ship recognition types who wrote to point out the error.

MEA CULPA, MEA MAXIMA CULPA

NATIONAL DEFENCE HEADQUARTERS
DIRECTORATE OF FLIGHT SAFETY

COL R.D. SCHULTZ
DIRECTOR OF FLIGHT SAFETY

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# SATISFACTION IS???

A lot of people feel that the old saying "You can't satisfy all of the people all of the time" is more appropriately expressed as "You can't satisfy most of them most of the time" where pilots are concerned. Whether you agree with this simplistic categorization or not I think that pilots will admit that as a group we are prone to display strong likes, dislikes and plain prejudices. To a degree this stems from the nature of our work and the consequences of taking things for granted or of accepting change(s) without questioning the reasons or the motives involved. On balance this inquistorial approach is healthy because it often prevents hasty decisions by identifying the areas that haven't been given due consideration.

There is however an undesirable side effect from an accident prevention viewpoint when this individualistic approach is taken to an extreme. This is most obvious when an issue appears to infringe on the pilot's decision making authority or freedom of action. Anyone who has been involved in a discussion on life support equipment, operating procedures or the relative merits of an aircraft modification knows just how difficult it is to achieve a concerted and consistent approach to solving problems. When everyone has his own view and is reluctant to concede that others may have something to add there is a loss of objectivity. This in turn too often results in compromises that fall well short of what could have been achieved with more open-mindedness.

I am convinced that we can have the best of both worlds if we do our homework carefully and stop worrying about the few who refuse to be satisfied most of the time. Once we reach a consensus we must take a stand and stick to it.

COL. R. D. SCHULTZ
DIRECTOR OF FLIGHT SAFETY



# Être satisfait, c'est quoi??

Pour ce qui concerne les pilotes, plusieurs personnes pensent qu'au lieu du vieux dicton "Vous ne pouvez plaire à tout le monde, tout le temps", il serait plus approprié de dire: "Vous ne pouvez plaire à la plupart d'entre eux, la plupart du temps".

Même si vous n'approuvez pas cette idée simpliste, je crois que les pilotes, dans l'ensemble, sont enclins à démontrer une forte aversion pour certaines choses, ou une grande synpathie pour d'autres, et quelquefois même ils font preuve de simples préjudices.

Jusqu'à un certain point, celà est dû à la nature de notre travail qui fait que nous constestons tout changements sans d'abord chercher à connaître toutes les raisons ou les motifs en cause.

Cette méthode arbitraire est parfois bonne car elle empêche des décisions hâtives en reconnaissant certains faits qui n'ont pas recus assez de considération.

Par contre, elle a aussi son mauvais côté lorsqu'il s'agit de la prévention d'un accident, quand cet individualiste est poussé à l'extrême, et surtout quand des décisions semblent vouloir enfreindre l'autorité du pilote ou sa liberté d'action.

Toute personne qui a participé à une discussion sur un système de sécurité ou de survie ou encore à une modification sur un aéronef connaît les nombreuses difficultés que l'on rencontre pour arriver à un consensus. Quand chacun a sa propre opinion et est peu disposé à concevoir que d'autres peuvent aussi ajouter des idées concrètes aux problèmes, ceci devient une perte d'objectivité.

Trop souvent, il faut aboutir à un compromis qui est plus ou moins acceptable, faute d'un esprit plus ouvert qui aurait pu accomplir de meilleurs résultats.

Je suis convaincu que nous pouvons avoir "le meilleur des deux mondes" si nous accomplissons non tâches avec soin et que nous cessons de nous inquiéter de la minorité qui refuse d'être satisfaite la plupart du temps. Une fois un consensus atteint, restons en là.

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