FLIGHT COMMENT

NOVEMBER · DECEMBER · 1967

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Comments

Late last winter the captain of a large multi-engine aircraft experienced throttle jamming when applying power on an overshoot. The GCA approach had been flown in cloud in conditions conducive to carb icing. Later, on shutdown the throttles still could not be closed. Perhaps the EO had made insufficient reference to this problem but apparently no one in the crew had associated the throttle jamming with ice formation in the carburettor. With winter upon us, now's the time to run through some of the winter effects on your aircraft.

AETE, the Aerospace Engineering Test Establishment (formally CEPE) has been instructed to devise strap-in procedures for all our jets. The increasing complexity of escape systems necessitates proper strapping in; this directive is timely evidence of the importance of proper procedures. The instructions are slated for inclusion in AOIs.

A misconception common among aircrew is that all circuit breakers give a visual indication when popped. This can most readily arise in an aircraft with more than one type of circuit breaker, particularly if one of the types gives a visual indication when popped. The Expeditor, for example, contains the pull-to-open and the toggle-switch, both of which give a visual indication – but in the same cockpit is push-to-reset type which gives no visual indication of a popped or open condition. Here, the pilot would receive the indication only through the failure of that particular circuit.

One of our larger aircraft had a very dicey brush with disaster recently. The flight engineer on his pre-flight inspection discovered that a nut had almost backed off the bolt that holds the outer end of the aileron control torque tube. The bolt was installed backwards and a split pin had not been inserted. Both technician and inspector failed to spot this deadly mistake. Keep vigilant – people's lives are at stake.

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SUPERVISION'S NOT SNOOPERVISION

If ever there was a need for two-way understanding in the relationship between technician and supervisor it's in a man's attitude toward follow-up inspections after the work's been done. These double-check inspections may induce in a technician the notion that he is not to be trusted. With this in mind, a supervisor may be tempted to ease up on the close scrutiny required in the -2J inspection to demonstrate a confidence in his men. At the other extreme, is the supervisor whose lack of tact arouses resentment. Few individuals are born leaders; most of us Win Friends and Influence People by working at it – and the already-burdened supervisor may not make the effort on every occasion.

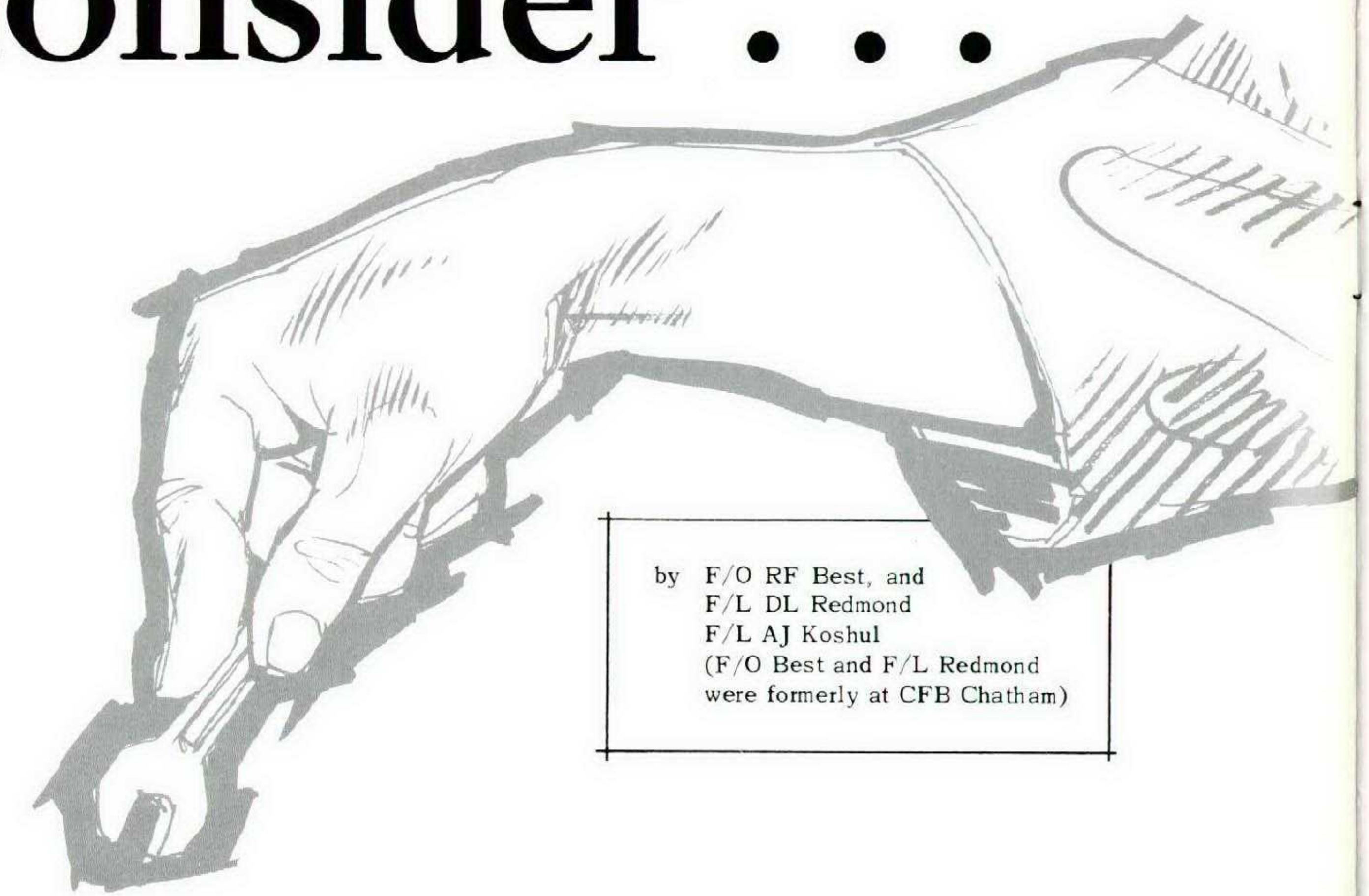
Inspectors in commercial companies have similar problems – so much so, that corporations spend considerable effort and money "selling" the image of quality control to their employees. The selling point is that quality control achieves and preserves the company's reputation; a reputation assures continued sales; continued sales assure continued employment. In the Forces quality control saves lives and preserves valuable equipment.

Today's supervisors are from the ranks of the technicians of previous years; they also worked under the scrutiny of their supervisors. Today's technician will, in turn, be tomorrow's supervisor – and making the system work will then be his challenge.

The no-nonsense approach to post-maintenance inspections is at the foundation of safe flight. And the longer the technician is around airplanes the more surely he will see the truth of that statement.

G/C RD SCHULTZ
DIRECTOR OF FLIGHT SAFETY

Consider . . .



by F/O RF Best, and
F/L DL Redmond
F/L AJ Koshul
(F/O Best and F/L Redmond were formerly at CFB Chatham)

Say what you want – but the backbone of the maintenance business is the technician with the tool in his hand. Upon him the responsibility for safe operation of aircraft is placed; it is he who works the hardest and receives the least reward. He often receives the greatest recognition – when it is unfavourable. Each time there is an inflight emergency or accident the technician faces a number of self-aimed questions. He tries to recall when and if he worked on that particular aircraft, what the job was and whether it could be a contributing factor. A cause factor of "pilot error" or "materiel failure" surely brings a sigh of relief...

If the safety of flight depends upon the actions of each technician, the factors which influence his performance demand attention. Let's consider the personal and technical qualifications of the man. Viewing his trade qualifications first, there are at least four areas to consider:

- knowledge of trade,
- use of equipment and/or tools,
- ability to get the job done,
- potential.

Quality of workmanship is affected by personal qualifications such as: co-operation, purpose, initiative, motivation, loyalty, maturity, mental alertness, integrity, and dress deportment. But let's consider that we do have the right man.

How about his tool box – that tin can containing items which are supposed to save someone's life? Here, one may mumble that the proper use of tools is so elementary that it's hardly worth mentioning. Really? It's safe to assume that we haven't heard the last of someone missing a tool and the Forces missing an aircraft. Sound judgement, pride of workmanship and personal integrity will mean:

- every tool kept in top shape
- tools cleaned regularly
- keeping an inventory of tools on every job
- allocating a space for each tool in the kit.

An organized toolbox can mean the difference between a happy family and an empty chair at the head of the table.

Consider we have the right man with the right tools. There's more, if we want safe maintenance. Our *Technician X* must also have:

- current EOs at his disposal for authority and guidance. Both Command and Unit Instructions are to be complete and current, as must any other references used in maintenance. Their accuracy is essential as full confidence and faith are placed in them.
- correctly identified parts supplied promptly; hardware and data must always match.
- good working environment and proper equipment to produce an uncluttered, functional, and professional appearance.
- dependable measuring equipment, precisely calibrated, certified, and kept that way.

Now, consider something intangible like supervision – providing authoritative direction to others. Careful supervision plus careful work on the part of the technician is a necessary combination for safe maintenance. Therefore, a supervisor has his work cut out for him. He has to be parent, chaplain and psychologist. A good supervisor keeps well informed, stays on the job, close to the men and their work. Supervision involves communication, talking to people about their jobs, and showing them how to prevent accidents. Often a tradesman who fluffs the job is not indifferent, negligent, or lacking skill, but simply does not appreciate the danger. Why? Because someone didn't tell him explicitly, and hang around long enough to see if he did a good job.

Giving of one's knowledge is often difficult and involves a lot of common sense, common courtesy, and tact. It's a skill that requires consideration for the other guy's feelings. To motivate any man the supervisor has to show a definite interest in both the man and the job. Generally, when the technician is aware that the supervisor cares, he too will care. Each technician has to be given responsibility, equal to his knowledge and ability, and on accepting such responsibility he should know that others are depending on him. The product of the technician's efforts must be acknowledged by the supervisor, and recognition given for a job well done.

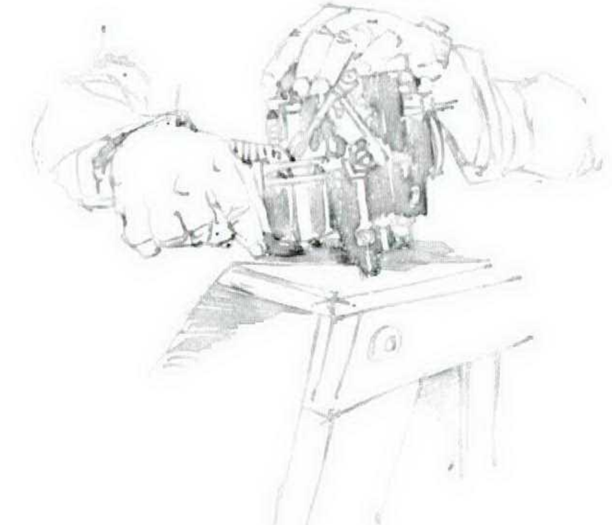
What does one do with a bungler? Perhaps there's one in your shop. He's not hard to find. You can't merely feel sorry for him because he may be a likeable type; that may be the reason he has been carried so long – nobody has had the heart to write him off. But if he can't take care of a Buck-Fifty screwdriver, can he maintain a high-priced aircraft?

We said that the performance of a technician determines the quality of maintenance and in turn his performance is affected by competence. Training precedes competence, and although graduation from a basic course accomplishes something, it does not end there. Only when he has demonstrated his ability is he suitable for safe maintenance. The technician who doesn't bother to keep abreast of the latest info isn't thinking as much about the aircrew's safety as he would his own – that is, if it were *his* turn to fly in the aircraft he just finished.

Let's consider *Technician X* – the dedicated professional. He has good supervision, is properly equipped, and often required to work long hours. Consequently, he undergoes personal sacrifices from day to day; for lunch he brings along a few victuals in a brown paper bag, or he may have to grab a quick sandwich at the snackbar. Sometimes he ends up eating a cold late supper on arriving home when the kids are in bed. He sometimes cancels an evening out because he's too tired. Yes, fatigue must be considered. We commend determination to get the job done but not at the expense of common sense, sound judgement, and safety. An overtired technician can be as dangerous as a fatigued pilot, and the outcome may be just as spectacular.

FOD. Beyond the normal police-the-area routine, how about a close watch on work methods to cut the introduction of foreign objects to zero? Sometimes, a FOD campaign is based on the theme that foreign objects will be recovered after the job is finished. How many "cause undetermined" accidents were caused by poor housekeeping? A lively campaign against FOD will produce worthwhile results.

Contamination. Work benches, test stands, and fuels and lubricants all contaminate aircraft. Cleanliness and quality at unit level involve familiarity with instructions. Are all persons (particularly the temporary fill-ins for absent technicians) adequately informed? The supervisor carries the can if they aren't.



Inadequate troubleshooting. Combined efforts by both aircrew and technician obtain a precise and timely identification of trouble spots before they develop into something more serious. Not too much can be done until the problem is understood and all the significant information is made known. Don't get in the habit of "living with" something you know will require rectifying sooner or later.

Non-compliance with EOs. Keep in mind that aircraft parts represent much design, research, and testing. Don't substitute or improvise. Ingenuity is commendable, but not with aircraft. How about the technician working on a trim system which requires a simple solder connection? Is he going to be the cause of a few moments of suspense about to enter a pilot's life? It would be hard to justify the loss of an expensive aircraft and crew all through the misuse of a couple of cents worth of lead alloy. Don't take short cuts. It takes only a few minutes longer to do the job by the book.

Lack of Attention to Detail. How many "undetermined" fatal accidents were caused by a malfunction because of inattention to detail during inspection, rectification and reporting? It should make some people wonder if their work ever contributed to an accident. Also, there have been too many instances where more careful records might have provided better information to investigation boards. How many times have you checked an L14 and seen "Ground Checked Serviceable"?

An effective safety program profits from experience gained from an analysis of our failures. There should be continual maintenance evaluation; only those ideas that result in improvements should be adopted. How about decreasing the technician's volume of paperwork so that he can get on with the job at hand? And methods to improve management policies, procedures, and reports? How well-written are UCR submissions?

Let's have co-ordination in all areas – especially between the maintenance people and flight safety officers. A safety officer, working alone, may make recommendations which are not in line with the thinking of the technical people. How about co-operation between aircrew and technicians? Is there room for improvement at your unit? Occasionally, aircrew are apt to overlook the fact that it is through the technician's effort that the aircraft is able to get off the ground for an uneventful flight.

The key to any accident prevention program is to identify potential hazards and then take action. Repeated write-ups in L14s could be a glaring signpost to danger.

We've heard that the more an aircraft flies, the easier it is to maintain – that's only part of the story. If there is excessive flying we may have the makings of a snowball. First, the staggerboard's off-balance, the flow of aircraft disrupted, and a backlog awaits inspection. When the backlog gets so great that a normal workday is not enough, overtime results. If flying continues without a break the repair people are going to find themselves coming back to work an increasing number of nights per week. By then, you may notice the increased robbing of aircraft, the accumulation of snags, and more AOGs. Of course, the number of manhours spent on a periodic increases. The overtime degrades the quality of maintenance. It's too late when you notice a rising number of aborts and inflight emergencies and/or accidents.

When we are asked to supply names for a forthcoming course, do we merely send bodies or are the most suitable candidates selected? How about those good ideas we have sometimes? Do we keep them to ourselves or do we take action?

We've pointed out the sliver in the aircrew's eye, but how about the plank in our own? Let's cease trying to shift the responsibility for maintenance error, ignorance, apathy and lack of common sense. After all, there are three sides to every story – yours, mine, and the truth.

Are You Cheating on Safety?

You're driving on a four-lane divided highway several miles from the nearest town. The speed limit is 60 mph. You're doing 70 and have been for some time. Topping a slight rise, you spot a police cruiser parked on a side road. There's some equipment set up near the highway. RADAR! Immediately you ease off the gas and your car coasts by the unit at a legal 58 mph. Once the "speed trap" is well behind, you ease her back up to 70 and roll on. Cool.

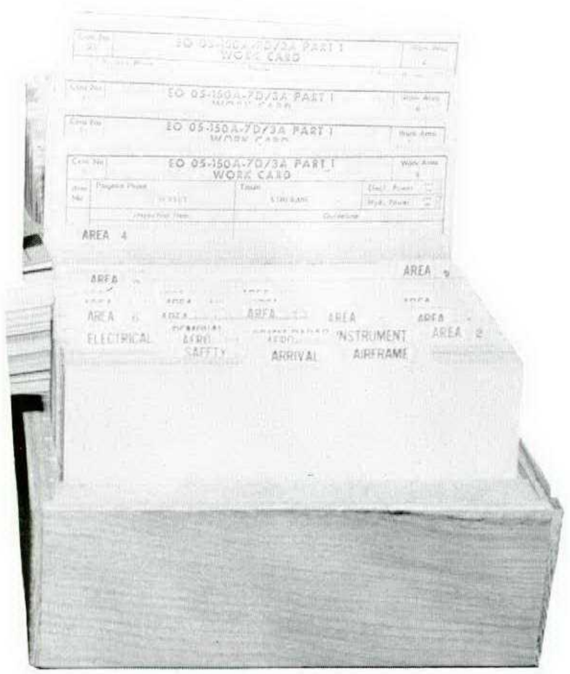
If you read that little passage and grinned smugly, "Ya, that's about how I done it", you're only kidding yourself. There's an old Transylvanian saying: "If you cheat long enough, you're bound to get caught". That's true whether we're talking about cars, airplanes, or women.

The flying safety business is a little like that police cruiser. We can park along the side of the road and stop the obvious offenders. We can train and re-educate them. We can cruise alertly down the highway putting up signs and marking potential trouble spots with flares. We can investigate accidents and tell you what happened. We could even yell and shout and pound on desks, but the ultimate responsibility still rests with you – the individual.

It boils down to this: Whether you work on airplanes or fly them, if you cheat on safety you're going to get caught – sooner or later. The choice is yours. Make it the right one.

– MAC Flyer

WORK CARDS – do they work?



The early detracters are now our staunchest supporters . . .

The Canadian forces Aircraft Planned Inspection Card systems, which evolved along with similar developments in the USAF, RAF, and commercial maintenance companies, were introduced on trial with the Hercules and Yukon in 1961. Since then they have become commonplace in our maintenance operations.

The first change from the original -7A maintenance schedule was the introduction in 1959 of the Planned Periodic Inspection Schedule. This system which embraced the F86, CF100, T33, and later the Argus and Chipmunk, was abandoned; the preplanned Flow Control Charts proved to be unworkable. These aircraft have been returned to the standard -7A EO maintenance schedules.

The first trial card system (the Yukon) was developed with Canadair assistance and later developed into a sophisticated all-embracing card system. Next, the card system on the Hercules was created – this time somewhat more simply – by transcribing all the inspection data from the maintenance schedules onto cards. It became, in fact, the maintenance schedule on a card format. In 1963 the Cosmopolitan and Tutor were assigned card systems. By this time the disparity between each aircraft card system necessitated an attempt at standardization. An investigation team was formed to develop a standard card system based on the Yukon techniques.

The team visited all Canadian forces units employing card systems. The USAF and RAF systems were also reviewed. The team noted that systems developed by the user unit varied greatly but at least had one thing in

(cont'd on page 17)

GOOD SHOW

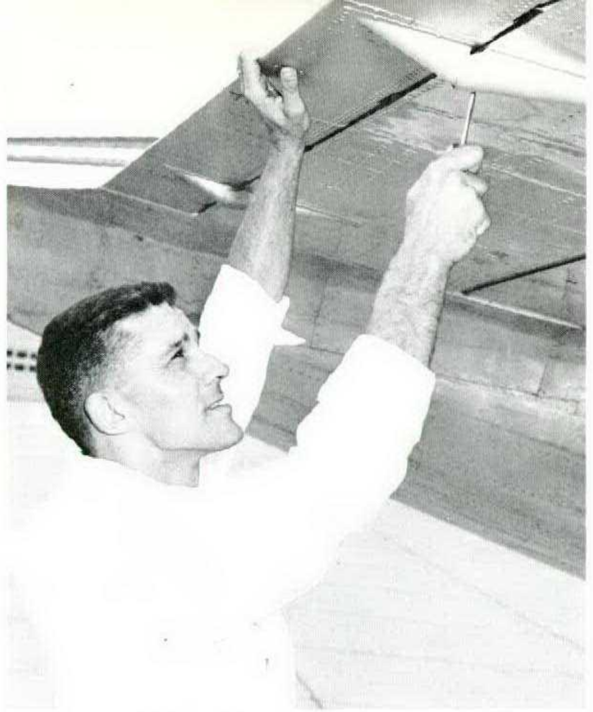
F/L RH DAHL

Thirty minutes after takeoff on a low-level training mission in a CF104D the accessory gear generator drive mechanism failed causing cockpit indications of an extreme emergency. F/L Dahl first experienced a series of thumps and the stability augmentation damper began cutting in and out. Then both generators failed. The EGT appeared high and the engine rpm began unwinding rapidly. Suspecting a severe compressor stall F/L Dahl commenced climbing and performed a relight procedure. The relight produced an EGT rise to normal but the rpm remained indicating zero. Fuel flow, oil pressure and the EGT were stabilized; a generator re-set was unsuccessful. This time the nozzles slowly drifted open and had to be closed by manual override.

F/L Dahl was able to return his aircraft safely to base but only after correctly assessing the symptoms which seemed to warrant a bailout. Being at low level he had very little time to make his assessment. In returning his valuable aircraft to base after this serious inflight emergency, F/L Dahl displayed a professional knowledge of his aircraft and fine airmanship indeed.

CPL AXL BELAND

Unsatisfied after performing a tension check on a Cosmopolitan elevator control cable in response to a snag report, Cpl Beland decided to extend his check in the hope of finding a better explanation for the malfunction. While carefully examining all possible problem



areas he discovered that the elevator cable spacers by the autopilot motor cable housing were severely chafed. Had this condition gone undetected it would have eventually caused the seizure of the elevator control cable by the jamming of the damaged spacers. A special inspection based on Cpl Beland's discovery showed another Cosmopolitan to be in the same condition.

Cpl Beland's voluntarily extending his check to include other components, was an act of integrity and competence. His discovery led to the elimination of a malfunction which could have caused a serious accident.

CPL A MARTYNIUK

Cpl Martyniuk was assigned to check a T33 undercarriage microswitch after the pilot reported getting a mainwheel unsafe indication when pulling G on two previous flights. These flights were post-inspection test flights; on the first flight, the pilot heard a loud bang at 5G and noted a port mainwheel unsafe indication. The second flight produced an unsafe indication at 2G.

While checking the port main undercarriage microswitch Cpl Martyniuk noticed a small piece of aluminum in the channel between the mainwheel wells and advised the airframe technician on his crew who found a piece of metal had broken off a reinforcing plate on the forward face of the wing spar web. Further investigation showed

the spar cap and web to have failed; this probably caused the loud bang the pilot heard on the first test flight.

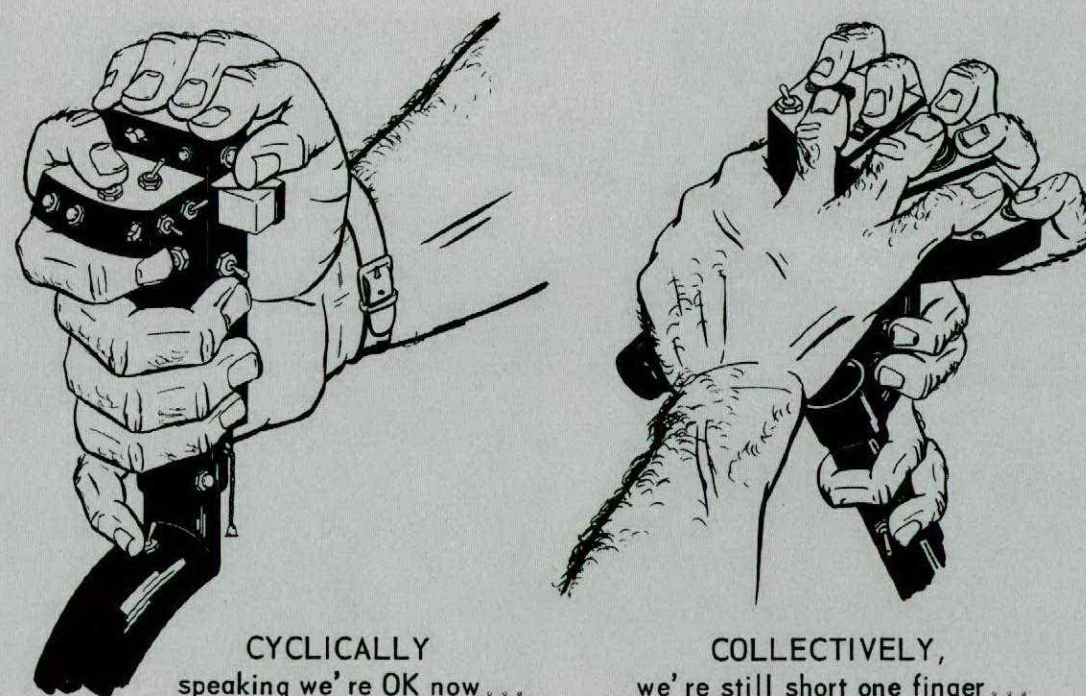
Required only to test the microswitch, Cpl Martyniuk carefully inspected all the wheel-well area and in doing so, discovered a dangerous structural deficiency. Further inflight G loading could likely have resulted in total wing failure. Cpl Martyniuk's initiative and alertness averted a possible tragedy – a very commendable contribution to flight safety.

CPL AJ UNRAU

Cpl AJ Unrau, during a before-flight inspection on a Tutor discovered a crack 1-5/8 inches long in the exhaust cone casing assembly. This is the first time a crack has been detected in this manner – by inspection through the fire extinguisher panel. The crack was barely discernible in the daylight after the casing was removed.

Detection of this crack prior to the flight probably prevented a serious incident, if not loss of the aircraft. Cpl Unrau's thorough inspection is a fine example of competence and integrity.

EVOLUTION OF HELICOPTER PILOTS



CYCLICALLY
speaking we're OK now . . .

COLLECTIVELY,
we're still short one finger . . .

When additional thumbs and fingers are grown, pilots will no longer require gloves or sleeves. They will come equipped with fire-retardant, cut-resistant, rhinoceros skin. Not shown are extra hands for tuning radios, holding charts, computing ETAs, and saluting VIPs.

– USABAAR Weekly Summary

ABORTS/ACCIDENTS

. . . is there a relationship?

—Aerospace Safety Alumni Review

"The hypothesis, that a strong positive correlation exists between abort and accident rates, was supported with a high level of confidence."

"High abort rates indicate high accident rates."

"Accidents generally occur when unit abort rates are highest."

During the 1950s, the safety specialist was introduced into the Air Force safety program and this new emphasis on safety was attended by a sharp reduction in the aircraft major accident rate.

During the past few years, however, the dramatic reductions have leveled off.

This new trend could be accepted as the result of a normal learning curve process. Or it could herald the need for new approaches to the art of aircraft accident prevention – or both.

A review of current accident prevention programs will enlighten the observer to some of the present-day safety limitations. The evaluation of any flight safety program is related historically to the aircraft major accident rate. With this in mind, a comparison of the total US Air Force (USAF) rate and the Air Defense Command (ADC) rate from 1955 to 1967 will show relative trends and provide comparative effectiveness. As the USAF rate decreases, comparable reductions occur in the ADC rate. The leveling trend, along with a slight increase in the 1966 rate, is reflected in both curves.

This reduction in progress toward the lowest possible rate, consistent with effective operations, is best demonstrated by an examination of the 1965 and 1966 ADC accident history. ADC realized its ninth consecutive reduction in the major accident rate in 1965. In fact, the 4.6 rate was the lowest ever achieved by any Fighter command. The significant reason for the success of the 1965 accident prevention program was the effectiveness of the identification and correction of materiel deficiencies. The excellence of the support and maintenance of the command's weapon systems was recognized by the presentation of the Daedalian Flying Safety Trophy for 1965 to the Air Defense Command.

The improvement programs to correct long-standing deficiencies in the landing gear, engines and flight controls of various aircraft should have made 1966 a banner year. But it didn't. In 1966, ADC's rate climbed to 5.7.

Momentum Lost

The number of major accidents decreased from 31 to 30. However, a sharp reduction in the flying hour program in 1966 accounted for the rate increase. Not one of the 1966 materiel failures could be charged to previously identified deficiencies. The modification programs were successful, but the accident prevention program lost its momentum. Why?

During 1966, ADC was involved in a major realignment of the command structure. Concomitant with this re-organization were heavy withdrawals of skilled personnel in operations, maintenance and safety. This combination produced a serious down-grading in the supervision of flight operations. The result was an increased major accident rate during the first quarter of 1966. After re-organization, one of the first command-directed activities was a safety survey of the supervision of maintenance and operations. This management review identified methods to resolve the problems of supervision substantially. A continuous reduction of the major accident rate from 8.4 on 31 March to a final 5.7 on 31 December 1966 demonstrated the value of the safety survey in highlighting problems for command attention.

When considered in the light of overall accident exposure, ADC's safety program was an effective deterrent to aircraft accidents. It was geared to cope with problems heretofore not experienced. The difficulty was in the time required to identify the trend and isolate the cause in order that preventive action could be taken. Safety program managers needed a more responsive indicator of accident exposure.

With this need in mind, the command's maintenance officers were asked how they recognized that their maintenance effectiveness had dropped. Almost without exception, the answer was – "an increase in the aborts".

Responsive Tool?

Could the abort rate trend be the responsive tool to keep safety dynamic and ahead of the accident?

Because Air Defence Command is equipped primarily with jet fighter aircraft, the investigation concerned data about the command's fighters. Arbitrarily, a period of 20 months was selected for examination. It was determined that current maintenance data collection systems were reporting the necessary information. The use of information already in a data bank would expedite the analysis. The following definitions were selected as being most representative of potential accident exposure:

Ground abort An incident in which an aircraft, assigned or scheduled for an aerial mission or sortie, fails to take off.

Emergency recovery The declaration of an inflight emergency by the aircrew or an occurrence which necessitates an immediate landing.

The data collected was converted into an abort rate for jet fighters in ADC. The rate was an accumulative by monthly percentage of scheduled sorties. Because of the large numbers involved, the abort rate is statistically accurate. Accidents are, by comparison, few in number and inferences drawn from a small sample or population are subject to dispersion. To reduce this chance, the abort rate and the major/minor accident rates were included. The addition of minor accidents increased the accuracy of the analysis.

Even casual comparison of abort and accident rates identifies a significant relationship. When the abort rate was the highest, so was the accident rate. This continued correlation warranted an in-depth investigation of one of the command's weapon systems. Aircraft "A" was selected for this evaluation, because of its comparative stability throughout the 20-month test period.

During this period, the abort rate for ADC's "A" aircraft was 4.2%. Monthly abort rates were subject to rather wide variations. The range was from a low of 2.7% in May 1965 to a high of 6.5% in January 1966. Evidence was not sufficient to determine whether the variations were seasonally significant or the result of modification programs or maintenance procedure changes.

A Closer Look

Up to this point, the investigation limited considerations to command-wide observations. The next step required a closer look at units involved in reporting. The eleven major/minor aircraft "A" accidents were checked against the involved units' abort rates at the time of the accidents. The correlation of high abort rate with accident exposure was again apparent.

Next, the accumulative abort rate for each of the 14 reporting units was computed. These rates were then compared to the command rate of 4.2%. Units were then categorized as being above average, average or below average by their abort rate. The accidents for the units in each grouping were collected and a group accident rate computed. The results of this grouping are shown in the following table:

AIRCRAFT "A" ABORT/ACCIDENT RATE

Abort Rate Group	No. of Units	No. of Accidents	Accident Rate
Above Average	4	5	16.3
Average	6	5	11.6
Below Average	4	1	3.3

The above table demonstrates the high abort rate – high accident rate relationship.

A similar analysis of aircraft "B" was completed. The average abort rate for aircraft "B" was 4.9%. The major/minor accident rate for aircraft "B" for the test period was 14.8.

The range of the abort rates was from a low of 3.6 in May 1965 to a high of 7.1% in February 1966. As noted in the aircraft "A" investigation, an apparent seasonal influence could be observed. The 13 "B" units were categorized by their abort rate average and accident rates were determined as follows:

AIRCRAFT "B" ABORT/ACCIDENT RATE

Abort Rate Group	No. of Units	No. of Accidents	Accident Rate
Above Average	5	8	24.2
Average	4	3	10.8
Below Average	4	2	6.8

(cont'd on next page)

Limited numbers of units possessing other types of aircraft prevented a similar treatment for all the mission aircraft in ADC. Available data did provide the following information of significance to this investigation:

- Aircraft "C": The unit with the highest abort rate had all four of the "C" accidents.
- Aircraft "D": The wing with the highest abort rate had both of the "D" accidents.
- Aircraft "E": Transfer of this aircraft to the Air National Guard during the test period made comparisons invalid. However, it was noted that those units, which did have accidents, had abort rates well above their average at the time of the accident.

Unaware of Purpose

It must be stated that the abort rate data was submitted by units unaware of this intended purpose. It is doubtful that unadjusted data would have been submitted, if it were known that management score-keeping was intended. An eminent psychologist and management expert says, "When measurements are used primarily for self-guidance, rather than policing, the motivation to distort data is removed." For this reason, if safety can be served by abort rate data, then it must be a function of safety management at the reporting level. Additionally, action to curtail abort rate increases must be prompt to be effective. The time required for the reporting system to record must be short. The analysis and response by higher headquarters must be quick.

The implication of this investigation is obvious: Reduce the abort rate and the accident rate will fall. Not so obvious is how one sets about reducing abort rates.

A cursory examination of the causes of the aborts reviewed in this investigation identified more than maintenance problems. Aborts, as defined in this report, resulted from the full spectrum of cause factors identified in accident reports. In effect, an abort could be defined as an accident that didn't happen.

Presently, after an abort, the cause is determined and corrective action taken to return the aircraft to flight status. But preventive action against recurrence demands real thought and positive action. In what ways? . . . By eliminating the causes through education, improved supervision, better maintenance procedures, revised schedules, and by maintaining an aggressive reporting system to keep higher headquarters advised of materiel and management problems. The effort required is significant, but the rewards can be a harvest of aircraft and lives that were not lost.

Conclusions

- The hypothesis, that a strong positive correlation exists between abort and accident rates, was supported with a high level of confidence.
- High abort rates indicate high accident rates. Positive action to reduce abort rates will reduce accident rates.
- Accidents generally occur when unit abort rates are highest.
- Seasonal trends in abort rates are apparent, but cannot be substantiated.
- Programs designed to reduce abort rates must be a function of safety management at the reporting unit level.
- Investigation of aborts for prevention will reduce abort rates.

Trailing Vortices

In a recent paper released by the Royal Aircraft Establishment on the effects of trailing vortices relating to safe capacities of air routes and airports the author modestly admits ". . . these vortices are so imperfectly understood, and their effects upon an aircraft flying into them so inadequately quantified, that the degree of uncertainty as to their possible influence on safety and capacity is unsatisfactorily large." Nevertheless the report does testify to the severity of these vortices. Here's a sampling of some interesting facts:

- Vortex circulation depends on aircraft weight, wingstand, and airspeed of the aircraft generating the vortex. Of today's aircraft the 707 and DC8 at takeoff, generate the strongest vortices.
- Vortices are most violent in the unstick phase of takeoff. A landing aircraft will not be in the area of the most severe disturbance but overshooting could expose an aircraft to vortices.
- The Concord SST will probably generate vortices half again as strong as the 707 and DC8.
- Vortices may take four minutes to decay to half strength. Atmospheric turbulence will assist the dissipation of vortices.
- At altitude, significant vortices persist for two minutes; at 300 knots this means about ten miles.

Hard of Hearing?

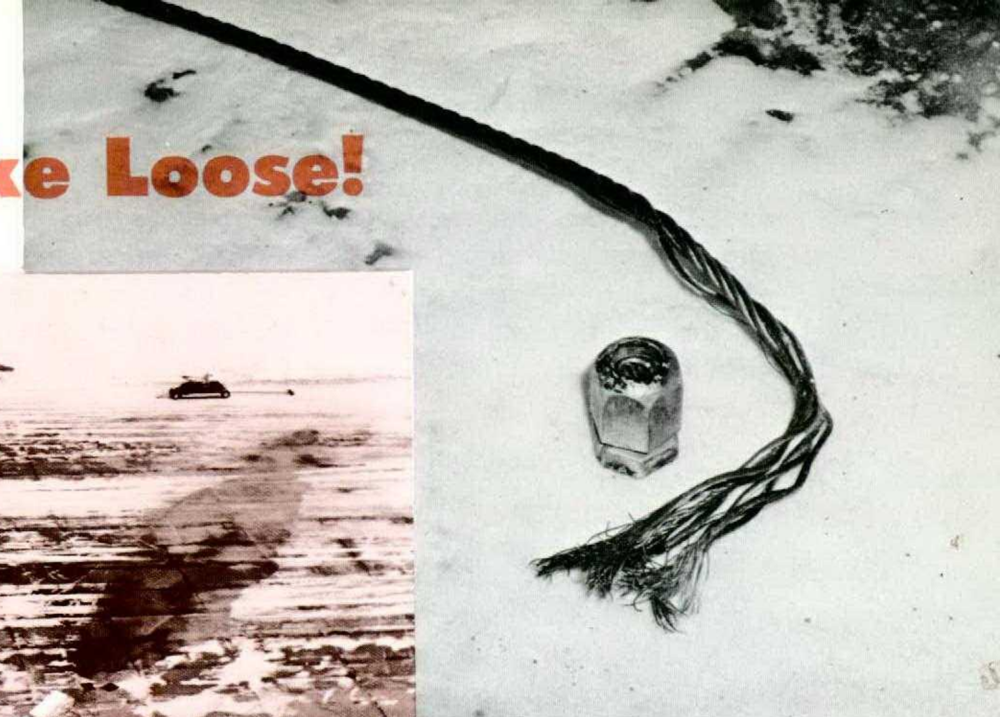
The base commander noted that some groundcrew occasionally work on the flight line without ear protectors.

– Flight Safety Committee minutes

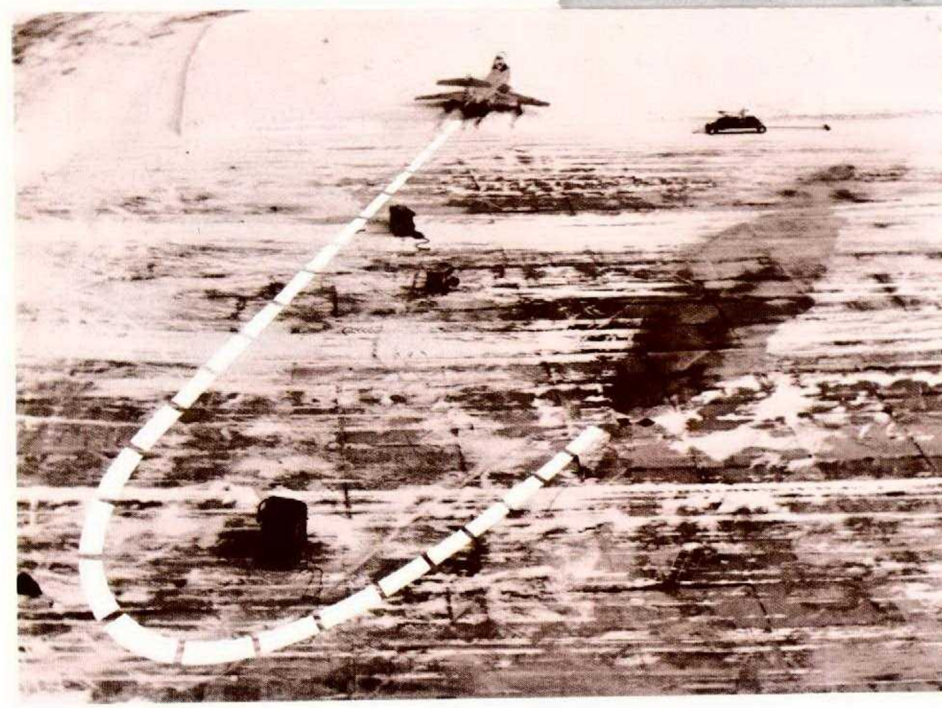
Properly Dressed?

. . . flight line crews are to be properly dressed so a job is not rushed because of discomfort caused by improper clothing.

– Flight Safety Committee minutes



All Hell Broke Loose!



"I had both feet on the brakes but the aircraft would not stop . . ."

The man at the controls eased the throttle past military and into afterburner. The burner lit. At that moment the tiedown cables broke, first one – then the other. This one-two failure of the cables imparted a tight 180 (see photo); before power could be shut off, the aircraft proceeded across the tarmac and into a snowbank. On his way to the boondocks the hapless "pilot" saw his runaway 101 first strike a truck knocking off the aircraft nose, and then two power units, badly damaging all three. The Voodoo was crunched-in at several spots.

What had started as a routine engine runup for trimming had near-disastrous consequences. The tiedown cables (about which the USAF had previously complained) were not up to the job having been tested to 20,000 lbs – this, for an aircraft engine which develops 19,000 lbs. The safety margin has now been increased to 35,000 lbs, necessitated by the considerable difference between static and dynamic thrust – once that heavy aircraft is rolling its energy accumulates rapidly.

The whole procedure had been done as published; each man performed his job properly.

This close call sparked the purchase of stronger cables, and more comprehensive instructions on tieing-down the 101.

Prepared for the worst this winter? Here's a few examples to ponder. Most of those involved in the snapshots were victims of an indifference to winter hazards. The table shows that last year's greatest winter menace was the airport infield, converting a summer incident into a winter accident. The cold facts are here... and don't be misled by the incidents; they're actually accidents that didn't quite happen!

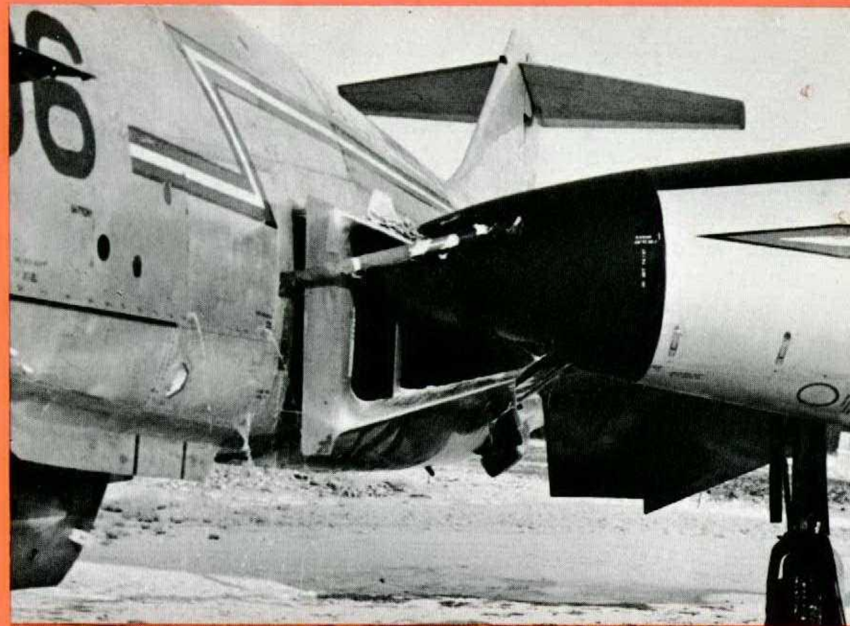
WINTER WOES

Whiteout – sunlight and the unbroken snow-covered lake defeated this pilot.

A snow-covered infield nosed over this Cessna.

This Otter landed on thin ice.

	INCIDENTS – ACCIDENTS 1965	INCIDENTS – ACCIDENTS 1966
SNOW ON INFIELD	0 - 1	0 - 5
RESTRICTED VISIBILITY – HEAVY SNOW AND WHITEOUT	1 - 4	2 - 2
SNOW – UNDER- AND OVERSHOOT AREAS	0 - 2	0 - 1
SNOW/ICE/SLUSH – RUNWAYS, TAXIWAYS AND RAMPS	7 - 3	10 - 0
ICING – AIRFRAME, ENGINE, FUEL, UNDERCARRIAGE, FLIGHT CONTROLS, AND INSTRUMENTS	14 - 1	22 - 0



Inadequate clearing of run-up area resulted in out-of-control slide into nearby aircraft (fuel is gushing from fuselage from lanced tank.)

Did you know?

- Icing continues as the greatest potential hazard: thirty-six incidents in two years. Let's face it; we were lucky to have gotten away with only one accident.
- The snow-covered undershoot area is a major winter hazard. Though few in number undershoot accidents usually cause major damage.
- The snow-covered infield is the greatest single winter hazard. These snow-covered boondocks claimed five aircraft last year alone – writing off three of them!
- Jet and helicopter pilots are most vulnerable to whiteout.
- In one occurrence an incident became an accident when the pilot was confronted with a featureless blanket of snow.
- An increase in air incidents due to runway conditions may have contributed to last year's record of zero accidents from this cause.
- Snow and ice-covered ramps and taxiways caused seven towing accidents and one during a run-up.

An infield covered with 8 inches of hard crusted snow did this to Expeditor.

Crusty, chunky snowbanks proved as durable as aircraft.

Swirling snow obliterated pilot's vision on landing.

F86 sits off the end of 10,000 foot ice-covered runway.

For the Sake of Argument . . .

When is a FIRE not a fire ?

If aircraft fire-warning systems were as reliable as – say, our oxygen regulators, there'd be no problem. The sad fact is after years of mods and mods-on-mods, our fire warning systems – or overheat warning systems – are simply not reliable, do not tell the pilot what he wants to know, and are unacceptably prone to malfunction and damage.

Such criticism is not wholly true and may unfairly point to the man on the drawing board. The designer, of course, operates within the limitations of something called "the state of the art". Regrettably, no *real* breakthrough has yet occurred in heat detection devices. We, in our turn, have compounded the problem by misemploying these delicate and sensitive devices by:

- failing to establish scientifically the course of an in-flight fire in a given aircraft and reflect this knowledge in the AOIs.
- routing cables, etc, into damage-prone locations in the airframe.
- labelling what is essentially a heat detector with the emotional word FIRE.
- permitting these anomolies to remain unexamined and unexplained.

The latter point has exposed aircrew to unnecessary hazard, and has caused preventable losses of valuable aircraft.

Recently, a pilot of a jet aircraft saw a warning light labelled OVERHEAT flash on, followed by another marked FIRE (this one in red). Both he and the student promptly abandoned the aircraft. The sequence in this case, presented false information to the pilot who, with understandable haste made a quick decision which in retrospect turned out to have been incorrect. This pilot's training, in which dire warnings about fire were bandied about (was it 8, or 11 seconds to oblivion?), and the "immediate-response" training in the simulator conditioned him to react in this way. If a fire in a jet was as hazardous as published, the pilot had a choice between the Quick and the Dead. What we're saying here has nothing to do with the pros and cons of this pilot's decision but the occurrence did spark considerable discussion at all levels – a discussion characterized by blunt questions and honest answers.

At DFS we're not in the position to execute changes in either techniques or equipment; we do strongly propose a long hard look at the so-called fire warning system philosophy.

Some topics for discussion:

- Can we develop and install economically a true fire detection device? If not, should our equipment be re-appraised and our philosophy restated?
- Should we continue to label the warning light FIRE, with all the panic reactions this evokes in humans?
- How energetically should we campaign to eradicate the impression created in the minds of aircrew over the years that fires in jet aircraft will result in catastrophic explosions?

And just watch the sparks fly!

Here's a few starting-off points for the discussion:

- All airforces we have contacted express dissatisfaction with fire warning devices.
- During one ten-year period ending in 1965 the RCAF alone had 926 false fire warning lights.
- In many of our aircraft, fire warning systems were added after the aircraft were built; only recently has a systems engineering approach been employed at the design phase.
- Continuous-wire systems are especially prone to maintenance and installation damage.
- Fire warning systems have not, in the past, been designed to give quantitative information, ie, how hot is the hot spot?
- Until recently most systems had no pilot verification capability; today, redundancy is the most popular technique to achieve verification.
- A system malfunction such as short circuit or mechanical damage manifests itself as a false fire warning; in other words, the system has no discrimination between heat and mechanical damage.
- RAF Pilots' Notes for training and fighter aircraft have now been amended to include the advice that if a fire warning light comes on and does not go out when the appropriate action is taken the crew should look for other signs of fire such as trailing smoke, engine indications, etc, before abandoning aircraft. The report goes on to state "although far from satisfactory, we consider that by adopting this procedure the crew will have time to eject if fire is present and we will also avoid losing aircraft unnecessarily if the warning is serious".
- A USAF report says in part "until approximately 1954 there were an excessive number of questionable ejections, particularly in single-engine jet fighters and trainers. Directives were subsequently issued and flight handbooks were revised to bring about additional action when a fire/overheat light illuminated in order to confirm the warning. This brought about an appreciable decrease in the number of aircraft losses as a result of false fire warnings".
- Of all the data we were able to obtain from other airforces only one – a Royal Navy Buccaneer – blew up in flight following a fire.
- No Canadian Forces aircraft has exploded in the air as a result of fire.
- The F86 AOIs call for ejecting on the strength of a light alone whereas the CF100 AOIs do not mention ejecting. The notion that a forward fire warning light in an F86 would be followed promptly by a catastrophic explosion persisted for years despite no evidence to suggest the truth of this notion.
- "Some time ago" the USAF deactivated the fire warning systems in the B47 and B58 because of numerous false fire warnings and excessive maintenance man hours; to date "there has been no outstanding evidence to quarrel with the SAC decision".

RPI Lap Belt

Installation Underway

New lap belt is Forces' choice for all jets....

Within a few months, the automatic opening lap belt will appear in ejection-seat aircraft – the opening gun of a fleet-wide modernization program planned for all ejection systems. The RPI* lap belt, a preview of which appeared in the Jul-Aug 65 Flight Comment, is completely interchangeable with the present MA5/MA6 lap belts. A simple conversion should ensure prompt installation.

To review the capabilities of the new belt:

- positive opening,
- accurately timed,
- hang-up proof,
- cannot be latched without connecting the all-important parachute arming tab.
- positive locking,
- relatively easy to open in the manual mode regardless of belt tension.

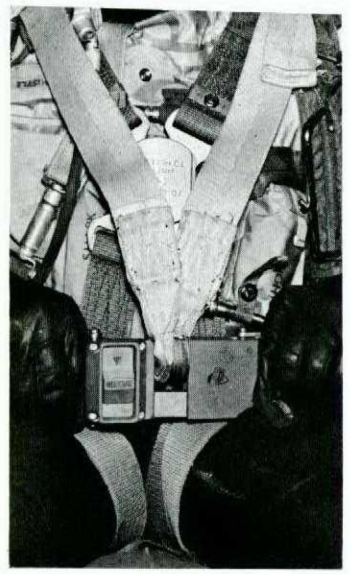
Plans call for:

- installing this belt on Tutor and T33 aircraft coincident with the fitment of rocket sustainers to ejection seats, which means installation could commence during the latter part of 1967;
- the CF104 and CF101 to be modified as soon as belts are received;
- the F86 to await procurement of man/seat separators which complement the automatic lap belt.

* *Rocket Power Incorporated*

With lanyard end piece in position and shoulder harnesses secured the box halves are ready to engage.

The box clicks shut; thumb pressure down on release slide is handy and simple.



Box will not lock unless chute lanyard is inserted.

Green Vehicles

The BOpsO stated that many vehicles in use on the flight line were painted the standard green and that this creates a hazard during night operations. After discussing the matter the Committee agreed that all vehicles in use for the flight line should be painted yellow.

– Flight Safety Committee minutes

We all learned about flying from that!

We were just beginning to enjoy that "real easy" feeling —everything was ticking like the proverbial clock. Then the inverter failure light flashed on . . .

Early last winter, I was co-pilot on a C45 bound from St Hubert to Lakehead, a distance of some 750 nautical miles. Our two passengers were both veteran pilots, a fact which definitely tends to take some of the pinch out of a tight situation.

After a complete weather briefing, we took off in the late afternoon on what should have been a fairly routine flight of a calculated 5 hours and 5 minutes. Our destination was Lakehead with Duluth as an alternate; Sault Ste Marie was forecast to be 1000 overcast and 1-1/2 miles visibility in light snow, light rain, and fog. We planned to fly at 6000 feet to best avoid airframe icing. Our calculated fuel endurance was 6 hours and 40 minutes, so we were eager to "tape" our fuel consumption early. We all knew how our consumption would increase with icing. Fuel consumption proved to be very close to our flight planned figure; groundspeed was slightly higher than expected. We were just beginning to enjoy that "real easy" feeling – everything was ticking like the proverbial clock. Then, the inverter failure light flashed on.

Before the captain had time to switch on the standby inverter, the whole aircraft went black. A few moments' confusion ended when a flashlight was produced. I assumed control of the aircraft on the vacuum-driven instruments on my side of the panel. With the exception of a brief burst of light, the aircraft defied every effort to restore electrical power for the remainder of the flight.

Within five minutes we began to accumulate an entirely unwelcome build-up of rime ice. Only minutes later the pitot tubes began to ice over. The airspeed indicators became inoperative.

With headsets removed, a loud-voiced conference was held from which it was decided to continue as flight-planned in the hope of eventually becoming VFR – Lakehead's forecast condition. We were operating with an artificial horizon, vertical speed indicator, altimeter, standby compass, needle and ball, engine rpm, and manifold pressure. Not without some reluctance did we venture out over Lake Superior, knowing we couldn't feather an engine should that become necessary.

The captain ordered a turn to the left to get us clear of airways and from then on we turned at Sault Ste Marie on ETA and hopefully paralleled our track using flight-planned headings. I recall suffering twinges of concern – our headings were calculated using one average wind for the entire 750-mile trip.

With de-icing equipment unserviceable, we climbed to 10,000 to prevent further build-up of ice. At this altitude, though still in cloud, it appeared as though our ice build-up problem was now in check.

Things had been fairly hectic for the first 10 to 15 minutes after the electrical failure, but now with the situation well assessed, we once again began to feel a little relaxed. We were beginning to feel confident of pulling this one off safely, after all.

The emergency equipment, mae wests and dinghy were broken out; everyone in turn donned the warmest clothing available in case of ditching.

When my turn came, I moved aft to put on my thermal underwear. While rummaging through my belongings, I came upon an unopened bottle which I made sure was transferred to the emergency pack – just in case! I returned to the cockpit and took the controls so the skipper could move aft to complete ditching preparations.

Shortly after I resumed control, our only source of light – the flashlight – began to flicker and went out. Our supply of matches and lighters were plentiful, but not inexhaustible, so in a dire moment of need came a brainwave. I reasoned that the beany lights on a mae west could serve as a cockpit light. We quickly acquired a small carton of milk from a flight lunch and into this the liquid-activated batteries of two beany lights were dunked. We were delighted with the results, although I spent the rest of the trip with an open milk carton between my legs.

We were now in reasonably good humour – for the circumstances. A passenger, sporting a bright smile, reminded me that some wartime bomber pilots had flown whole combat tours with less equipment than we had left.

About half-way to Lakehead, someone thought he saw lights below. After checking the minimum safe altitude within 100 miles, we descended to 3300 feet and circled but the lights could not be seen. We climbed to 6000 feet and proceeded until our estimate of 15 minutes to Lakehead. We again descended to 3300 feet.

Things began to get a little tight. As we rapidly approached our ETA there was still no sign of VFR weather. When we reached our Lakehead estimate, the captain maintained heading for about 10 minutes then flew a radar pattern for complete radio failure. At the same time, I transmitted a fruitless Mayday with the battery master switch on.

Time was running out – we had to start our descent below safety altitude some time. Turning to a southerly heading and after re-briefing to be prepared to ditch, the captain commenced a slow rate of descent. The next five minutes were probably the most anxious of the whole trip. There's a couple of spot heights nearby about 1500 feet above the runway elevation! To our great relief, we broke out of cloud at 2600 feet, over flat terrain with quite a few lights dotting the area.

With the maps we were carrying we couldn't fix our position. Apparently, we were north of Lakehead; with fuel gauges inoperative we could have as little as 30 minutes fuel left. Shortly, we saw in the distance what appeared to be the lights of a town. We headed that way keeping a sharp lookout for a suitable place to land.

Someone said he thought he could see a lighted runway in the distance, but we were all skeptical of this. As we approached, sure enough, there was an orderly group of lights – the nicest looking lighted runway I have ever seen. We flew a VFR circuit and low approach. With fuel an unknown quantity, the captain decided on a full-stop; the landing gear and flaps were hastily cranked down by hand. Two or three extra inches of power provided the fudge-factor for our ice load and lost airspeed indicator.

About 100 yards back on final, a lighted windsock indicated a gusty wind, but it favoured our direction of approach. The landing was smooth.

Now that it was all over I became aware that in my haste to retract the flaps, I spilled the carton of milk into my lap – mute testimony to the unsuspecting onlooker in the airport building on how frightening it had all been!

We managed to slow down enough to turn off at about 2000 feet (runway was 2600 x 50) and taxi to the flight office. We still had no idea where we were but the ground felt nicer than ever before. Our spirits were running pretty high at this stage, otherwise we wouldn't have spent that two minutes performing the oil dilution ritual – which requires electrical power.

With high spirits and all, it still hurts just a little when four professional pilots are obliged to ask one of the local populace "Where are we?" It didn't soften the pain very much when he replied, "Rusk County Airport, Tony, Wisconsin."

(cont'd from page 5)

common: if the system originated with the user unit it worked, but those designed by some other agency were often given lip service only, and in some cases met with open opposition! This reaction was not unexpected as the Planned Periodic Inspection system had met with a similar reception before. With this problem in mind a general engineering order was produced to explain the principles and aims of the standardization system. The order permitted freedom for maintenance managers to apply their own techniques and to schedule the work as they saw fit. After considerable review at all levels EO 00-15-10B "Aircraft Planned Inspection Card System" was approved in 1965.

MATCOM selected units to develop card systems for designated aircraft using the EO 00-15-10B as a guide to achieve standardization.

These aircraft are now using a card system:

Argus
CF101
CF104
Cosmopolitan
Hercules
Tutor
Yukon.

Card systems are underway for these aircraft:

Albatross
CF5
Buffalo
Neptune
T33
Falcon.

The policy now is to acquire from the contractor the card system as part of the basic purchase.

Once a year MATCOM staffs visit units using the card system, and with Command representatives, gather comments and criticism of technical contents, format, etc. This method recognizes that the user is in a better position to evaluate the card system and, of course, can offer more constructive ideas.

Well, cards are here to stay; that fact alone best answers the question: Do They Work? They achieve a far better utilization of manpower than in the past. They have proven effective in reducing periodic inspection times – to say nothing of the greatly increased assurity of job items and sequences being followed. We have also been able to employ them as a source of technical data for failure reporting; a noteworthy side benefit.

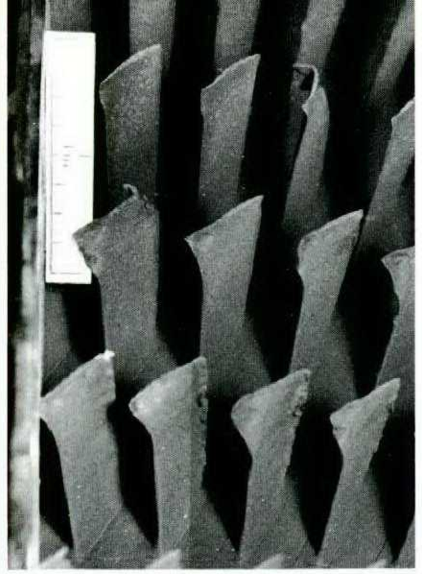
Work? They sure do.

The card system is briefly described in these publications:

EO 05-(   )-7C Engineering Inspection Requirements
EO 05-(   )-7D/1 Planned Inspection Card System Instructions
EO 05-(   )-7D/2 Primary – BFI and PFI cards
EO 05-(   )-7D/3 Supplementary Inspection Cards
EO 05-(   )-7D/3A Work Cards for Periodic and Progressive Structural Inspection
EO 05-(   )-7D/3B Record Cards
EO 05-(   )-7D/3C Check-off cards and Procedures cards.

EJECTION AT 25 FEET

The pilot states "... I consider it vital to decisively overrule a tendency to be concerned with analysis of situation designed to save aircraft".



Foreign object damage to the compressor blades.

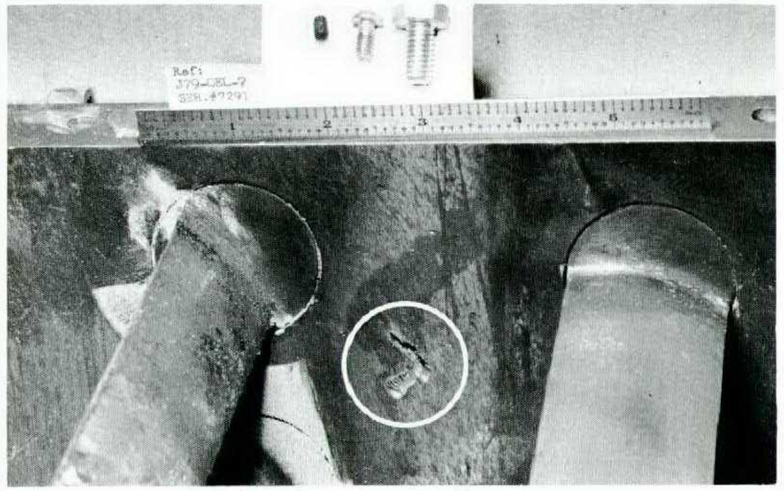
An expert eyewitness testified that upon lift-off "a large sheet of flame emitted from the tailpipe". This was followed almost immediately by a marked increase in flame which enveloped the entire aft end of the aircraft.

S/L MacGregor had just retracted his undercarriage on takeoff when he experienced a sudden major loss of thrust typical of a compressor stall. He quickly pulled back on the stick to trade airspeed for altitude. Heavy with fuel, the 104 got to a scant 25 feet. S/L MacGregor ejected. This sequence took 1/10th the time it takes to read this paragraph!

What had caused the compressor stall? Examination of the engine showed a distinct indentation in the surface of the compressor casing (see photo); too, a distinct semi-circular indentation in one of the blades confirmed that a machine screw had entered the engine intake. The other foreign objects found in the engine could well have been ingested after the crash. The ingestion of an object (or objects) progressively damaged the engine turbine blades causing a compressor stall.

As the stall occurred almost simultaneously with the "up" selection of the undercarriage, investigators suspected the engine air by-pass flaps. Selection of the undercarriage on the 104 causes two movable engine air by-pass flaps to open. Although there was no evidence of scratches or indentation in the areas around these flaps, it is possible that a bolt or other object could have come from this area. Something small such as a screw could be easily missed in this recess even prior to engine installation; certainly, it would be almost impossible to see a foreign object there after the engine had been installed. The aircraft was on a post-maintenance test flight.

Not discounting the possibility of a bird ingestion the investigators carefully examined for any traces of bird material. The chemical analysis of the engine determined that no bird had been ingested (although at the very end of the runway is a field of grain – a large outdoor dining room for birds).



Indentation (circled) of 10-30 round-head machine screw. Thread pattern can be seen at point of impact on inner surface of compressor casing.

S/L MacGregor was in a very tight spot. His aircraft was accelerating beyond liftoff speed when he sustained the loss in thrust – at the worst possible moment. Riding the crippled 104 back down on the ground at that speed was virtually suicidal; the charred hulk of the 104 in the photo shows why. He was left with two choices – eject or regain that thrust. The latter choice meant sticking around to combat the emergency and there was little time for that – the decision had to be made within a few seconds. It was here that experience, training, plus instant recall of vital facts and figures – call it judgement – enabled him to see the dividing line between success or disaster.

Here's what the pilot was up against:

- The engine malfunction occurred 1.8 seconds after lift-off
- The reaction time of the pilot was two seconds – and consumed about 700 feet of runway!
- The aircraft crashed two seconds after S/L MacGregor ejected
- The chute blossomed 4.4 seconds after ejection.
- The blossomed-chute descent of about 40 feet took two seconds.

Thirty-six seconds after brakes-off, S/L MacGregor was back on the ground, his aircraft a flaming wreck two miles away from the takeoff button. Investigators concluded that "conditioned response must have played a significant role along with fitness and training". This was a fine demonstration of flying skill in an extremely tight situation.

At the heart of the problem is assessing a "point of no return" at which ejection must take place. S/L MacGregor's instant recognition of this moment exemplifies the point, whether you're given two minutes to make the decision – or two seconds.

On the Dials

In this column we hope to spread a little new gen and try to answer your questions.

And we do get questions. Our staff members in their travels are often faced with, "Hey, you're a UICP, what about such-and-such?" Rarely is it a problem that can be answered out of hand. If it were that easy the question wouldn't have been asked in the first place. The required answer is often found only after some research and consultation. Also, often the follow-up of a particular question reveals aspects which would be of general interest to all airframe jockeys. We hope to answer this type of question, and any can of worms opened up in the process can be sorted out for everyone's edification.

Any questions, suggestions, or rebuttals will be happily entertained and if not answered in print we shall attempt to give a personal answer. Please direct any communications to the Commander, CANFORBASE Winnipeg, Westwin, Manitoba. Attention: UICP Flight.

MEAs—Canadian and US Airways

Pilots operating aircraft in Canadian and United States airspace are probably quite familiar with the term "minimum enroute IFR altitude" (MEA). Those flying in the high-altitude structures have few occasions when they must be concerned with MEAs, however pilots operating in the low-altitude structures are more concerned not only when applying communication failure procedures but also in routine flying. Although the term may be familiar, the criteria used in determining MEAs may not be as commonly known.

MEA is defined as the lowest altitude above sea level between specified fixes on airways or air routes at which acceptable navigational signal coverage is received, and which meets the obstruction clearance requirements. The MEA is often higher than the minimum obstruction clearance altitude (MOCA) but in no case is it lower.

Low altitude airways and air routes in Canada are normally 10 statute miles wide. MEAs provide at least 1000 foot terrain and obstruction clearance within the dimensions of the airway or air route. For the purpose of determining the terrain clearance in Western Canadian mountainous regions only, the area protected is 20 statute miles wide, however, the airway width remains 10 statute miles.

Noteworthy, is that obstruction clearance is provided only *between* the fixes throughout the width of the airway (double the width out west) and *not beyond* the fix (Figure 1). For this reason, in Canada the aircraft must be at the *higher* MEA by the time it crosses the fix. The governing obstruction for the entire segment may be just beyond the NAVAID. An example is shown in figure 2.

Figure 1

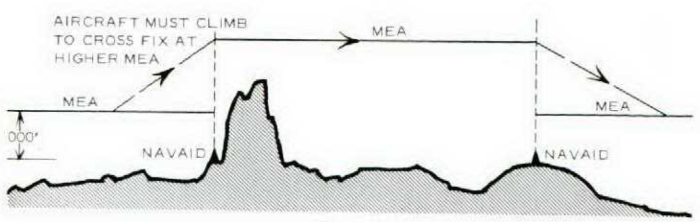


Figure 2

In the USA the criteria are essentially the same (except for 2000-foot terrain clearance in mountainous regions) but *normally* the climb to the higher MEA is made *after* the fix. This climb must be made at a rate not less than:

- 150 feet per nautical mile from MSL to 5000 feet
- 120 feet per nautical mile from 5000 feet to 10,000
- 100 feet per nautical mile above 10,000 feet.

The pilot must decide whether he can climb at this rate; if he cannot he must commence his climb earlier. Obstruction clearance is provided up this climb slope as well as along the remainder of the route segment – see figure 3.

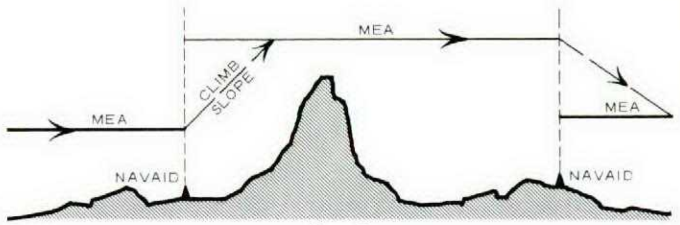


Figure 3

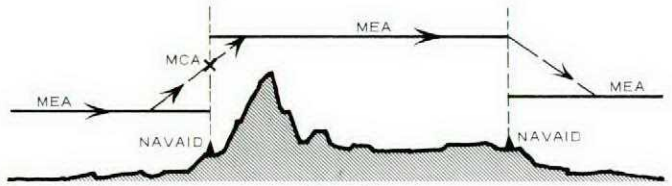


Figure 4

There are areas, however, where the climb rates listed above are unuseable because of an obstruction penetrating the criteria climb slope. This makes it necessary to establish a minimum crossing altitude (MCA) – see figure 4.

In figure 4 the pilot must commence his climb to cross the fix at the MCA and then continue his climb at the rates mentioned earlier.

Remember that MEAs are true altitudes and the required calculations must be made before using them.

A reminder to aircrew.
Make use of the notice of unreliability form (NOTUN) to assist in keeping our FLIPs up-to-date and accurate.

PIREPS

The BMetO said he is pleased to be receiving PIREPS.

Flight Safety Committee minutes

From the AIB

Thank you, Dr Kornfeld

Dr Kornfeld's recent departure from the Quality Assurance Laboratories ends a long association with the Accident Investigation Branch; over the years his skill and knowledge in metallurgy provided vital assistance to accident investigators. The AIB wishes to express their thanks for his contributions to the flight safety program and to wish him success in his new work.

Please, please don't pick the daisies —*or anything else*— at the scene of an aircraft accident

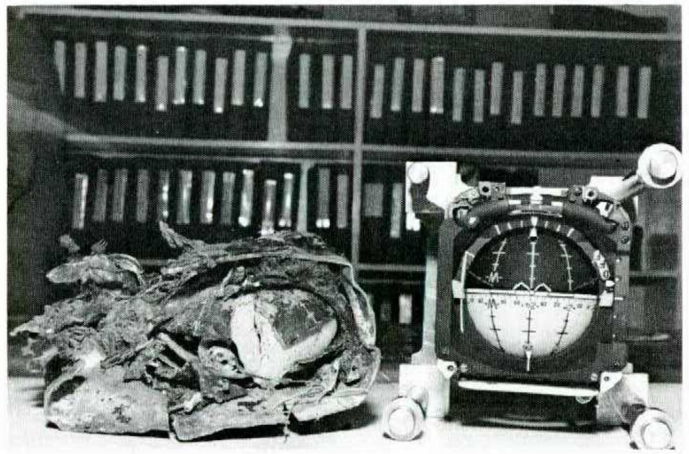
We should all understand that the purpose of an accident investigation is to prevent future loss of life and damage to property – and not simply to find a culprit or assess blame. In this search, nothing is more vital to preventing accidents than the work of investigators at the scene of the crash . . .

Accident investigation is specialized work. Crime detection and medical diagnosis often entail a microscopic search for unknowns. Similarly, every item of evidence – however remote or small – must be discovered, weighed and considered in order to reconstruct what actually occurred. The process may be tedious and painstaking but sustained operational effectiveness relies upon complete accurate explanations of our aircraft accidents.

Trouble at the onset will occur if the crash area is not adequately secured. The photos show an investigator's nightmare. Protecting the wreckage and preserving evidence at the crash site is imperative. Curious onlookers who turn parts upside down, move pieces, kick parts, move a wing flap control handle, move the fuel shut-off switch, rotate the radio frequency selector, and pull or push one or more circuit breakers unwittingly cause the accident investigators untold headaches. Some person or persons may, in one thoughtless act, set an investigation back a month – or forever.

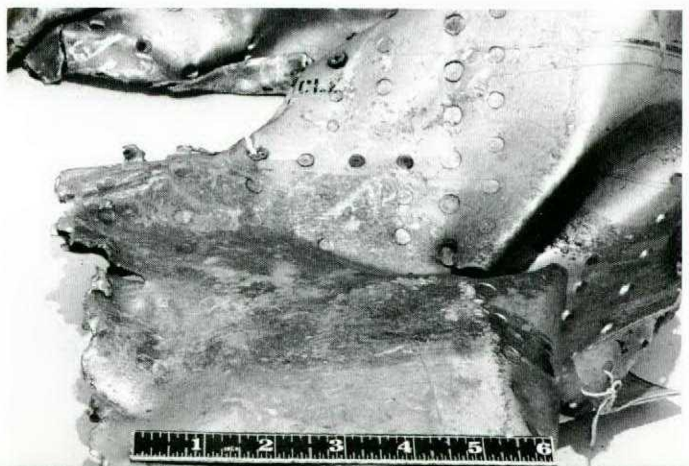
The guards who are placed to safeguard the wreckage may be civilian police, RCMP, military or persons specially recruited. They should be sufficient in number and equipped to perform continuous duty efficiently for several days. They should know thoroughly and be aware of the importance of their duties:

- protect civil and military property
- prevent servicemen or civilians from stealing, removing or interfering with the aircraft or wreckage. (Only the MO, his staff, or others authorized to attend the occupants, or those authorized to investigate, disarm explosives, or salvage, are permitted.)
- ensure the wreckage is not disturbed and that *no* part – no matter how small or apparently insignificant – is moved
- ensure damage to trees or shrubs, and the marks on the ground made by the aircraft are not obliterated by foot or other traffic.



This severely damaged main attitude indicator was recovered from a wet muddy field after a fatal accident. An uninitiated observer was overheard to remark "And what do you suppose he could possibly learn from that piece of garbage?" Investigation of this component showed that at the time of impact the power to the indicator was "ON", heading at impact was 224°, pitch angle between 5° and 10° nose down, and 10 degrees left bank.

Fuselage skin with baked spray pattern – evidence of an in-flight fire.



Crash area over-run by the local populace prior to arrival of adequate guards.

On arriving at the scene of the accident, assuming the prior arrival of the civil police, the investigator should contact the senior police officer and check that the procedures above are in effect, and if not, ensure that the arrangements are completed without delay. The police official will normally be able to supply a considerable amount of basic information about the accident. This information, combined with a preliminary survey of the wreckage, will give the accident investigator an idea of the work confronting his team and he can make his plans accordingly.

Where time does not allow the recording of wreckage position by the usual plotting, ground or air photography may be used as a substitute, but must be immediately employed.

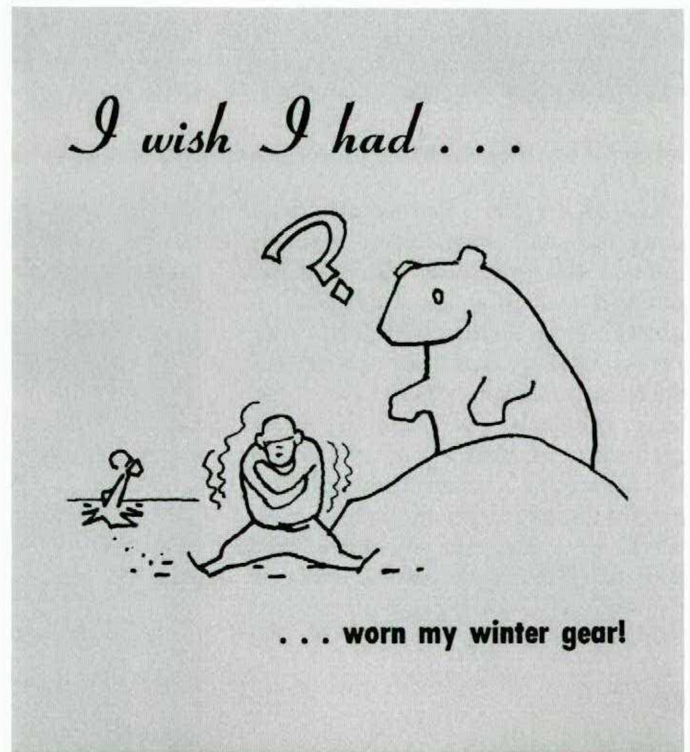
The collection, packing, handling and shipping of wreckage materials whether liquid or solids requires care to retain both the quality and quantity of the sample material. Here, proper procedures for the type of material involved ensure the items arriving for analysis well-preserved. For liquids:

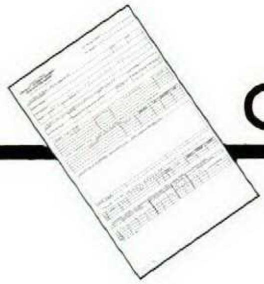
- Ensure that the sample is not contaminated in the process of removal.
- Ensure that no contamination occurs by contact with foreign matter on any portion of the container.
- Tag and identify the type of fluid and the location in the system from which it was taken.
- If contamination was present at the collection sources, a note with control samples of this contamination should be included in the request for laboratory analysis. The laboratory can then differentiate between this and other types of contaminents which might be found.
- The container in which the liquid is collected should be protected from breakage or environmental factors which could change the chemical make-up of the liquid or contaminant. Avoid too large a container.

When collecting and handling solids carefully protect the surfaces. Fracture surfaces to be preserved for lab analysis must be protected against further abrasion or damage. A surface bearing evidence of impact with another surface or object must be protected.

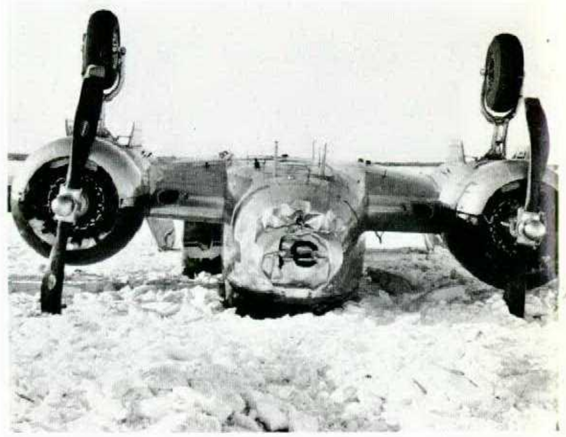
Light bulbs may reveal vital information; this evidence must be handled with the greatest of care. (See Flight Comment, May/Jun 1967, pp 23-5). All annunciator panels and individual light bulbs should be carefully removed from the wreckage noting where they come from and each bulb placed in a labelled container. All glass fragments from a broken bulb should be collected.

CFP 135 adequately describes the procedures to be employed for guarding crashed or forced-landed service aircraft. If you are selected to assist with any aspect of an aircraft accident investigation remember as a guiding principle that the object of the search is not merely to find out solely *what* happened but to discover *why* it happened, *how* it happened, along with all contributing causes. The next crash can be prevented – only if we get the fullest story from the evidence at the crash site.





Gen from Two-Ten

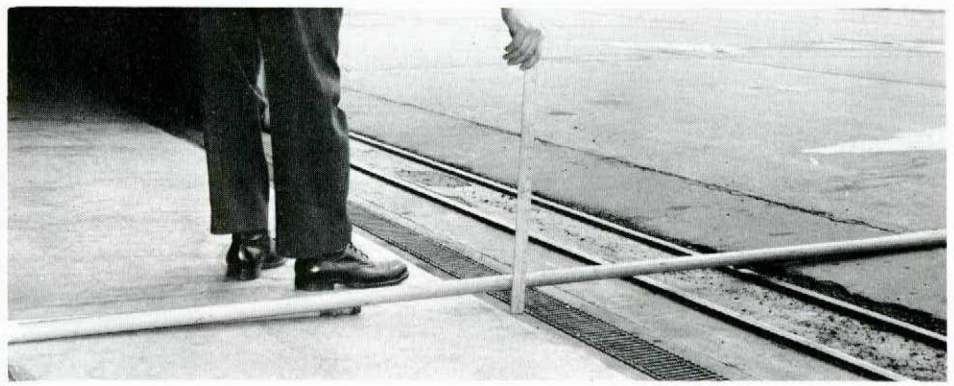


C45, UPSIDE-DOWN ON TAKEOFF On a mutual trip two students lined up, applied power, and commenced what appeared to be a normal take-off. The aircraft swung to the left after rolling about 500 feet. The student claimed that his foot "jammed", and that he was unable to return the aircraft to the runway direction. (There was no evidence of this jamming on the student's boot).

The aircraft left the runway into the snow winding up in the position shown in the photograph – a writeoff. Looks like this pilot, who had enough experience on type to know better, let things get out-of-hand before making a correction. The C45 is most unforgiving of this error.

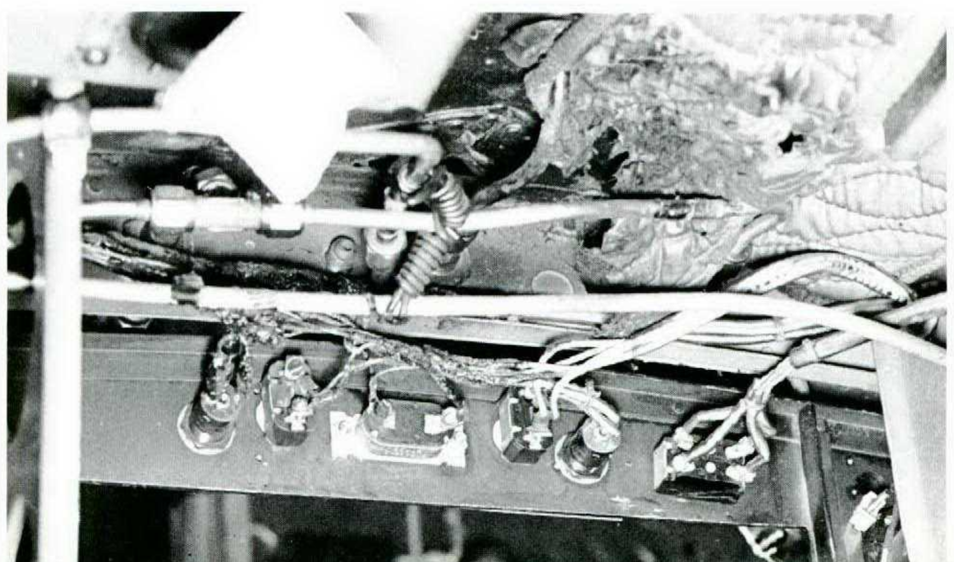
DAKOTA/C45, TOWING The tow crew elected to take a chance and permit the Dakota wing to pass over the wingtip of a nearby Expeditor. All went well, with six or seven inches to spare, until a dip at the lip by the hangar door dropped the aircraft sufficiently for the impact. The photo shows the reason for the rapid loss of altitude of the aircraft being towed.

When towing gets to be this squeaky the margin for error is too small.



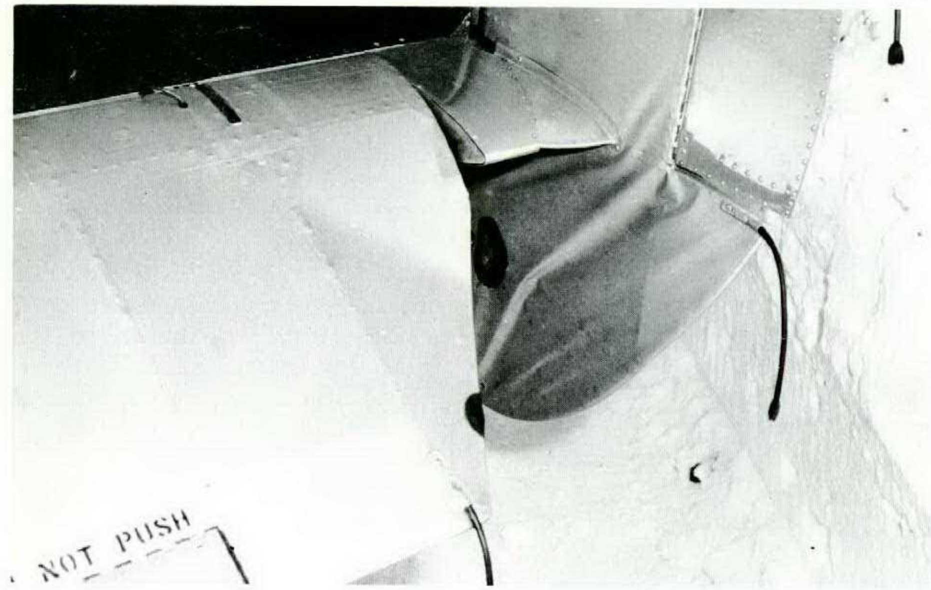
DAKOTA, FIRE To investigate a snag on the windscreen de-icing system the technician was crouched on his knees in an awkward position up behind the instrument panel. First, the alcohol system was opened and drained; to catch the excess fluid, rags were placed in the autopilot instrument recess.

Using the correct wrench but in a partially-obscured location the removal of a jam nut proceeded until suddenly FLASH! and the rags caught fire. Quickly, the technician grabbed one of the burning rags and threw it out the pilot's window and in doing so set fire to the alcohol-soaked sleeve of his coverall. The other man carried, then kicked, the second rag out the rear door. Their timely action prevented further damage to the aircraft. Both men were injured.



Ironically, the wrench had touched the hot side of a battery relay connected to fire extinguisher switches!

Turning the aircraft master switch off in this aircraft does not deactivate some emergency circuits, such as extinguisher circuits, crash impact switches, dinghy release circuits. Looks like a change in the EOs is in order to ensure that batteries are disconnected before work of this kind is permitted to proceed.



C45, SNOWBANK STRIKE Stated simply, the aircraft was towed out of the hangar and into a snowbank.

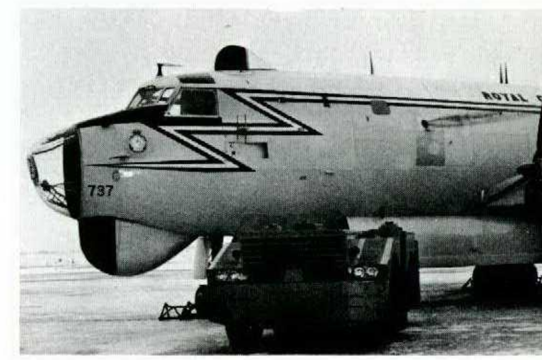
The NCO driving the tow vehicle had five years of experience in towing all types of aircraft. It is unlikely that he towed the aircraft on this occasion in a radically different manner from the normal care he would exercise. This being the case, he was succumbing to an all-to-human disposition – overconfidence. A supervisor should expect this kind of behaviour from his men; it is a statistical certainty that this man continued to develop an overconfident attitude towards his work. This, the report suggests, "...reflected supervisory weakness".

ARGUS, TOWING ON ICE Under pressure of operational necessity the towing proceeded:

- Strong winds were blowing 90° to the towing direction
- 80% of the tarmac was ice-covered.

The sand which had been laid earlier had blown away. Several aircraft had been towed into the hangar successfully but a maverick in the group refused to be corralled. The tow vehicle turned to enter the hangar but the aircraft didn't; the result was a jack-knifed mule and a damaged nosegear.

This brings into question whether tow vehicles are truly in command of the situation under all conditions; if not, either the vehicle itself is inadequate or the traction it delivers is too low. The latter may well be rectified with the introduction of studded tires.



Comments *to the editor*

I read with interest your article entitled "Protective Clothing: the new generation" in the Jul-Aug issue. It would certainly seem that very positive steps have been taken in this important area.

There are three points, however, that I feel should be aired.

The first involves the statement "the dark blue summer weight combat and transport coverall now in service." There may well be some units wherein this apparently very good coverall is in service, however the response this sub-unit received to a demand for the new suit was "CLO WAS AUTH FOR ISSUE ON ATTRITION BASIS ONCE STOCKS OF COVERALL FLYING OXFORD KHAKI EXHAUSTED". Some of us must use up an unacceptable suit before we can be issued the safer protective clothing. Could your feature writer possibly be accepting changes in Air Force equipment as 'fait accompli' in the rest of the CDF?

The second point involves the implied disapproval of the tropical suit due to it being Jungle Green in colour. It would seem that perhaps Mobile Command aircrew, who must operate closely with ground forces, might prefer a jungle green suit as being more acceptable as camouflage. A reader of the article gets the distinct impression that unless a flying suit is in the blue colour preferred by the airforce, the suit is automatically unacceptable.

The third point concerns the notes on the trousers and jacket, flying, winter, Type IV. I hope that, unlike the other variants, this suit design will be issued to aircrew supporting the ground forces. It is quite one thing to have a winter suit protect aircrews from hangar-to-aircraft-to-hangar plus giving a reasonable chance of survival if required. It is quite another thing to satisfy the fixed and rotary wing aircrew, who must wear the suit while co-operating on the ground, for considerable periods with ground forces operating in winter exercises far from shelter.

I should not want the impression gathered by anyone that this is being written as any form of inter-service protest but rather as a reminder to some personnel in programs such as this, that the needs of all CDF aircrew may be very similar but they are not necessarily identical.

Perhaps the information gathering resources of DFS could ascertain for we avid readers of Flight Comment to what depth this and similar trials are studied from the viewpoint of operational units of the sea and land forces.

Capt RI Adams
CFB Petawawa

First point. The statement "now in service" is correct. When complaints of non-availability of combat and transport style flying coveralls came in, CFHQ initiated action to ensure that they were made available. In one Contract Demand a premium clause was written in to ensure quicker delivery. We even went as far as to recommend the reclassification of all remaining stocks of blue-grey Oxford cloth flying coveralls to "overalls", to hasten the attrition process. Until full integration has been achieved and Materiel Authorizations are handled by one clothing group, Materiel Command has no other alternative but to provide flying coveralls as in the past; this seems to be confined up to the present, to units of the air force which have adopted the dark blue flying coveralls. To our knowledge no instructions have gone out to purchase cloth in the colour preferred by army air elements.

Second point. Objections were raised when the 12 sample tropical coveralls in the fire-resistant Nomex fabric were put on trial. These complaints originated with Transport Command. However, as we stated, the fabric will not take any other colour. There was also some conflict between those who want to be camouflaged and others who want to be easily spotted on the ground after bailout. Your comments are appreciated and we would be pleased to know that a decision has been made about colour, other than dark blue.

Third point. The Type III garments have been available for several years to army air elements. If not, this must be an oversight in scaling which could be quickly corrected by the submission of the army equivalent of the RCAF Form E336 to Materiel Command.

The design of flying suits will always involve compromises but the operational requirements of an optimum number of users is always the paramount consideration. Also, already in evidence is the development of more specialized clothing; "windpants" for flight-line groundcrew is an example.

I have often enjoyed your magazine and like many others have gained from reading "Gen from 210". However, I have a "bone" to take up with you. It is in regard to your account of the rocket strike on my aircraft in Flight Comment, Mar/Apr 1967.

The MAID report states: "Unit SOP allowed rocket firing from 900' instead of 1000' as laid down by the base cdr – pilot used poor technique in clearing target area – unsatisfactory condition of area (metal debris)." This was not under the aircrew error section. I believe in flying by the book because in the end it is your best and often your only defence.

Now, my points:

In the accident investigation it states I was recovered from my run at 600 feet commencing a climbing turn. A recovery in 300 feet from a 25° dive at 220 kts after taking into account altimeter lag and reflexes (we fire as we reach 900 feet then pull out), in a non hydraulic-assisted 10-ton aircraft is not exactly a "very leisurely pullout".

As far as the bank is concerned, 30° was as far as we rolled before ten pounds of rocket came through the aircraft and smashed my instrument panel.

The fact that neither my copilot nor myself were injured is *fortunate*, the fact that we flew an aircraft with minor control jamming 15 miles VFR to a straight-in landing was merely an uncomplicated emergency landing (much lower on the scale of apprehension than a night carrier landing.)

As you can see, I don't fully agree with the AIB decision but when I read what seemed to me to be a cynical, out-of-context account of my incident reflecting not only on myself but on my fellow naval aviators as well I had to attempt at least for my own piece of mind to correct the account.

Lt J Paquette
CFB Shearwater

The very brief account in MAID reflects what was, in fact, stated in the accident docket. Similarly, the Flight Comment account reflects information in our records. However, your remarks do clarify the situation.

The quick-turn-around nature of our MAID (Monthly Accident Incident Digest) precludes our inserting items under more than one heading – in this case, supervision, aircrew, other personnel. The insertion of this item under "Other Personnel" was, as are many of the items, a tentative arbitrary decision.

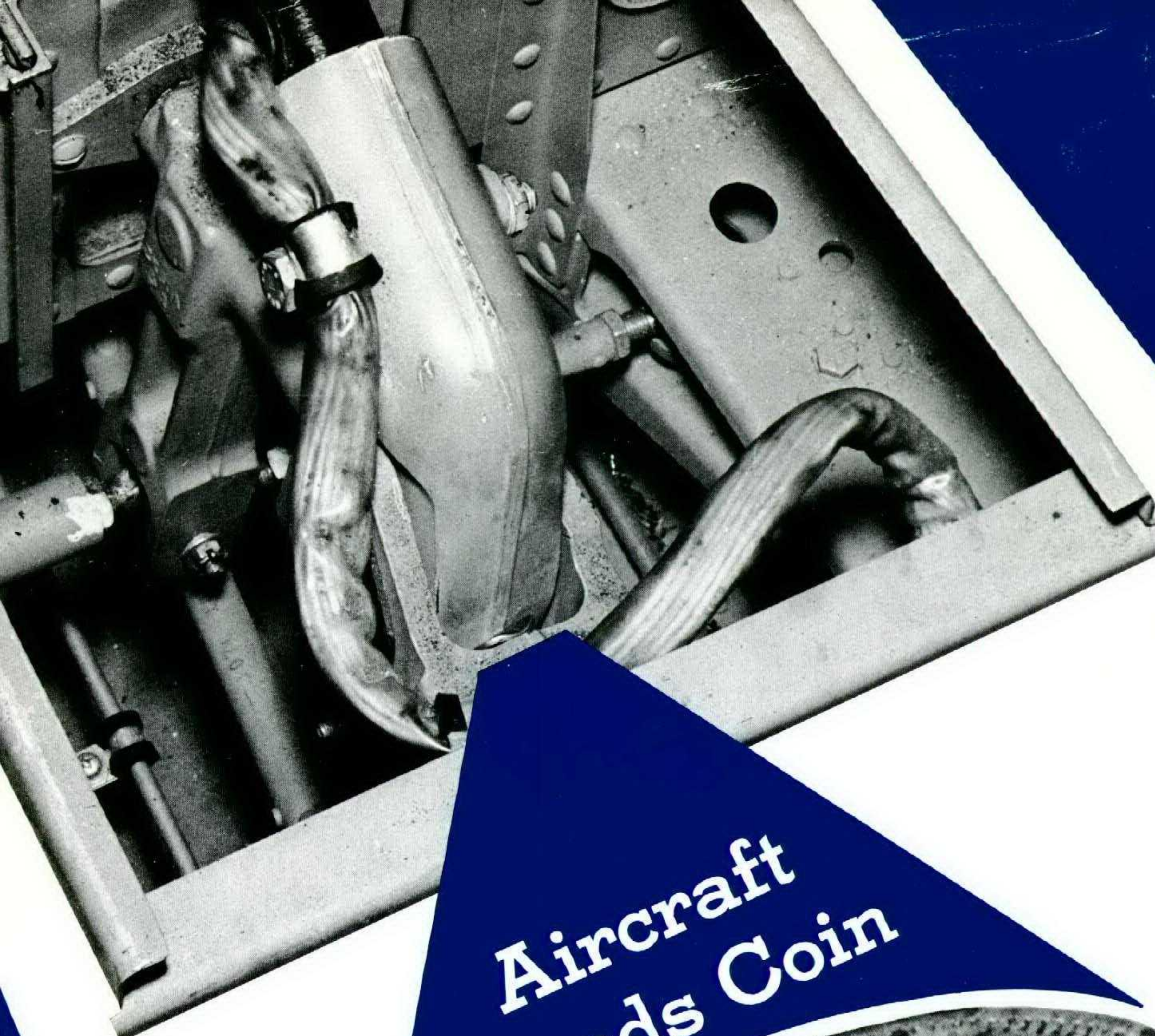
By ending the story with the remark "So it's back to the regulations" we hoped to leave the reader with the impression that flouting published procedures on matters concerning safety of flight is asking for trouble. We apologize for giving your input in this very dangerous occurrence too much prominence.

BIRD WATCHERS' CORNER

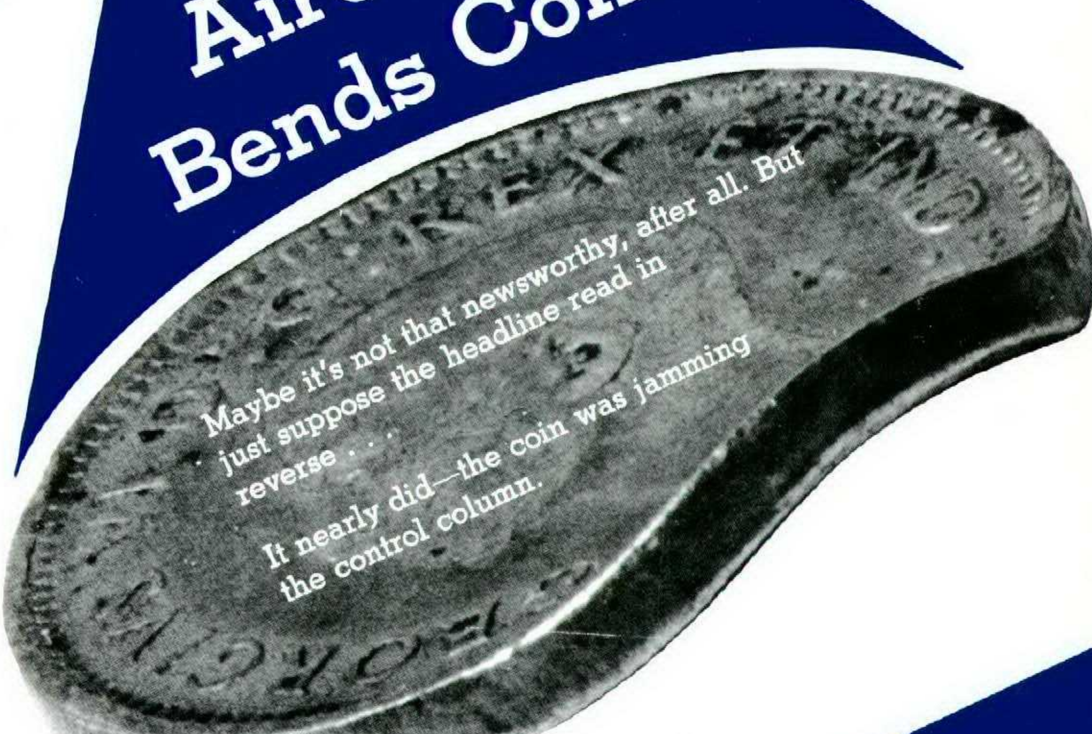
ZIPPED-LIPPED SWALLOW

If judged by its behaviour and congenial ways on the ground, the Swallow would be almost unrecognizable aloft. The serrations in the beak which superficially resemble teeth, on closer examination actually comprise a device common to flies and other insects — hence its name. To compensate for this immobilized mouthpiece while airborne, Nature imparts a matching disinterest in communicating. Other species emit warning distress calls — but not this bird. In fact, even when penetrating deteriorating weather and knowing other birds are following, Zip-lip maintains his deadly silence. Swallowing the urge to relay the vital information, he hums inaudibly to himself:

I'LLFLYTHEWHOLETRIP WITHOUTMOVINGALIP



Aircraft Bends Coin



Maybe it's not that newsworthy, after all. But just suppose the headline read in reverse . . .

It nearly did—the coin was jamming the control column.