# FLIGHT COMMENT

SEPTEMBER · OCTOBER · 1965

# Comments

■ VASIS seems to be getting a hard time from some pilots. Our first reaction to such opinions was "why"? VASIS has been adopted by several major air forces and every report we had received from other sources had been favourable. Could it be that those who expressed disappointment in the value of VASIS did so because they regarded it, perhaps subconsciously, as unnecessary. Pilots have traditionally resisted such aids as being an insult to their flying ability - remember the fracas over the use of landing lights? By the time a pilot reaches the state of competence, say, for 104 flying he is confident of his ability to accomplish something as rudimentary as eyeballing a proper approach angle in VFR.

These pilots may be sincere but a short walk down the hall to our statistics department proves something is needed. Particularly in high speed aircraft, undershoot accidents are dangerous and expensive and statistics dictate the need for a visual approach guidance system.

There is no question about it - and our personal experience is involved here - it's a matter of making an honest effort to employ a proven landing aid, in the way it was intended. *It is not a touchdown aid nor is it designed to take over where GCA leaves off for a blind landing in below limits weather.* It is what the "Meat Ball" is to the Navy: an approach system for VFR landing patterns. At heights greater than 300 ft where the eye cannot perceive an excessive sink rate, VASIS if you use it, will give an early warning so that a no-sweat correction can be made. In every short landing we know of, the pilot thought the approach was going just fine - until it was too late to avoid touching short. We have no sympathy for any pilot who does not make use of an aid which will help him fly safely.

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■ This issue contains material written by six persons, only two of whom are directly associated with the production of Flight Comment. Perhaps, not often enough, do we laud our contributors who, after all, help to make the magazine topical and authentic. We do so now in public and with great pleasure. But we would like to point out that existing as we do from *voluntary* contributions, our position as producer of a magazine lacking advertising revenues is akin, on occasion, to the distressing circumstances of Old Mother Hubbard's dog. The cupboard in our case, however, is bulging - we know that - but rarely does anyone open that door! You won't get 10¢ a line, a logbook endorsement or a Good Show, but comforting is the thought that even a George Bernard Shaw had to "break in" somewhere - Flight Comment might be your starting point.

Our address for submissions is in our masthead on this page.

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■ Integration has increased our need for a broad knowledge of Canadian military aviation in all its aspects. This issue features the Navy - we wish to thank Lieutenant Commanders JM Riley and JGS Campbell of the DFS Accident Investigation Branch for their co-operation in submitting material on naval aviation and flight safety.


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Contributions, comments and criticisms are welcome; the promotion of flight safety is best served by disseminating on-the-job experience and opinion. Send submissions to: Editor, Flight Comment, CFHQ/DFS, Ottawa 4, Ontario. Annual subscription rate is $1.50 for Canada and USA. Subscriptions available at Queen's Printer, Hull, P.Q.

ROGER DUHAMEL, F.R.S.C.
QUEEN'S PRINTER AND CONTROLLER OF STATIONERY
OTTAWA, 1965


This issue of "Flight Comment" features flight safety in the Navy. I am pleased to be able to remark on the progress and aims of our safety program. The Naval safety drive has, over the years, had the same objective as the efforts of our brothers in arms, the Air Force and Army; the conservation of our resources in order to maintain the best fighting posture. The accident rate both ashore and afloat has been declining, which reflects improvement in the vital areas of maintenance, training and operating. Experience has taught that accidents can be kept to a minimum only through the efforts of every officer and man who is concerned with aircraft operations. The highest ranking commander has a responsibility, so has the recruit naval airman.

The introduction of the SEA KING helicopter into the fleet with the accompanying destroyer conversion is taking place on schedule. The operation of these complex aircraft and the new flight deck equipment will place great demands on everyone concerned. The inception of the Tracker program a few years ago presented the same type of problem. We overcame these problems with a minimum of delay to produce the efficient units now in service. I was proud to be very much a part of the Naval Air Arm in those times.

The unique circumstances, caused through ship-flying operations, make it sensible for us to profit from the experiences of other navies. The principle of helping each other, on an international front, is a highly desirable aim. The past liaison will continue. The combining of the Army, Navy and Air Force under one Director of Flight Safety, Group Captain AB Searle, in Canadian Forces Headquarters will, I am sure, give to all the maximum results and the real benefits that result from experts working closely together.

The challenging period that is with Naval Aviation right now requires a high standard of performance. I am confident that "Naval Aviation" will continue to display the skill and high professionalism that has brought it so far.

Robert Welland

REAR ADMIRAL RP WELLAND
DEPUTY CHIEF OF OPERATIONAL READINESS


# FLIGHT SAFETY IN NAVAL AVIATION

The responsibility for flight safety rests at all levels of command; this is clearly stated in CFP 100, and extends from the admiral to the ordinary seaman arriving for his first day of duty in his first squadron. All very well but exactly what is flight safety? No one has as yet clearly defined "flight safety" - though many have tried. In practice, the definition is not too important provided all concerned are aware of the purpose of the flight safety program. We are trying to achieve the maximum efficiency in terms of combat readiness of men and equipment with the minimum loss due to needless wastage. The loss of an airplane due to an avoidable accident means one less airplane available for its operational function.

We have problem areas in naval aviation, some more or less permanent. The carrier environment is an example. The relative size of the carrier to today's aircraft leaves little margin for error. Weather, platform motion, landing aid limitations, fatigue, and equipment performance are all factors we know contribute to an accident. To operate efficiently in this environment we must insist on the highest standard of performance from each individual and each piece of equipment.

1964 saw the introduction of the CHSS-2 into the fleet and the beginning of the trial program in HMCS Assiniboine (DDE), which is covered in this issue. The latter is a real challenge to seaman and aviator alike. The destroyer/helicopter combination has brought new flight safety problems. Progress to date has been encouraging. Many problems, mostly technical, have been encountered but so far each has been overcome. As in carrier flying, the requirement for high standards of performance and teamwork is obvious.

There are other problems which have been with us a long time and which are now reaching the stage where corrective action cannot be deferred much longer. For example, the aircraft establishment at Shearwater is gradually increasing; with the new helicopters the operation of the field is becoming more complex. Tarmac and airfield areas are becoming more crowded; an airfield layout - adequate ten years ago - can barely meet the operators' needs in some respects today and may not be adequate in the near future unless improvements are made.

We have had problems in the past year with our aircraft. The Tracker's rate of engine failure is still cause for concern. An investigation in March revealed lubrication inadequacy as an engine problem and we expect introduction of a higher viscosity oil will help reduce the failure rate. The need for more attention to airframe corrosion has been recognized and special training in detection and prevention is being introduced for technical tradesmen. Aircrew can help by keeping alert to any evidence of corrosion as early detection is the key to control of this problem.

Interest in the "pitch-up" characteristic of the Tracker has been stimulated by a recent series of S2F accidents in the USN. The RCN has had several near misses where picking up of ice or slush during the takeoff run was believed to have been the cause. The USN has instigated a full scale investigation, with the Naval Aviation Safety Center, Bureau of Naval Weapons and the airframe contractor all participating. No decision regarding our own Trackers will be made until some lead or cause is found from the extensive investigations being carried out.

A recent problem was brought to light following a Near Miss report by a pilot who encountered violent vertical oscillations in flight with the autopilot engaged. It was found that an electrical wire to the elevator servo had broken, giving the effect of a full control input. Wires leading to the folding console had been breaking from fatigue due to constant bending through the years but recognizing this as a safety hazard was slow in coming.

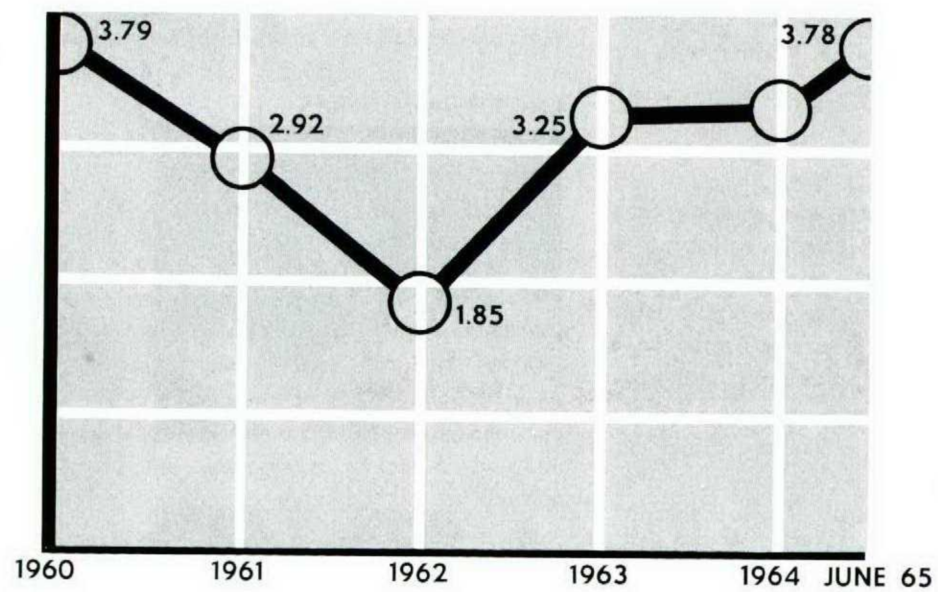
The CHSS-2 has been in squadron operation since September 1964. We were prepared for difficulties to arise since the CHSS-2 is a complicated weapon system. A strong emphasis is placed on flight safety from the beginning of the training. Training the aircrew and maintenance personnel with the USN prior to receiving the CHSS-2 has paid off. The airborne emergencies which have occurred have been skillfully handled and reflect credit on those involved. There have been minor accidents and incidents but the fact that the squadron is now deployed at sea in the carrier and operating with a high degree of success in a brief eight months, so far without a serious accident, is an excellent illustration of what education and the professional approach can achieve.

A typical safety problem arose in 1964 following a series of H04S-3 helicopter accidents. Three aircraft were damaged when the tail rotor struck the ground during practice autorotations. A hard look at the requirement led to a better way to achieve the required skill with less risk, by a slight change of procedure. No further accidents have occurred.

It adds up to this: since the majority of our accidents and incidents are avoidable, our accident rate can be reduced. Your flight safety officers and accident investigators will continue to do their part, but the full benefit cannot be achieved unless every officer and man involved in aviation considers himself an active participant in the program. Do "Look Alive in 65" - 1966 may be a very nice time to be around.

LCDR JR Burns
SFSO, RCN Air Station
Shearwater, NS

Navy Accident Rate in 10,000 hours



# GOOD SHOW

## F/L JR McCULLOUGH

Nearing the completion of a routine mission in a T33, F/L JR McCullough, RCAF Stn Portage la Prairie was doing a practice flapless GCA. Power was set at 65%, but as this turned out to be a little high, it was reduced to 58%. When the airspeed reached the desired level F/L McCullough attempted to increase the power again but found the throttle rigidly stuck. The rpm began to slowly decrease and height could not be maintained. F/L McCullough, demonstrating a thorough technical knowledge of his aircraft, selected the TOE switch on. The rpm increased to 65%, paused, increased to 85%, paused, and finally stopped at 94%. By this time the throttle could be moved but it had no effect on the rpm which remained at 94%; the airspeed increased to 350 kts. F/L McCullough reduced speed with tight turns so that the undercarriage could be lowered, flew to a low key position and flamed out the engine. He then performed a faultless "dead stick" landing. A check on the ground revealed that a nut had come off the throttle linkage making the throttle inoperative.

F/L McCullough, through his pilot skill and knowledge of his aircraft saved an expensive jet trainer with an exemplary display of professionalism.

## LAC RH RASMUSSEN

LAC Rasmussen at Stn St Hubert was working on a CF101 Serviceability Assurance Check following a double engine change. Checking the starboard aileron, he carefully examined the area around the hinge assembly and noticed a foreign object which turned out to be a ¾" castellated nut. Foreign object damage could have easily occurred with serious consequences if this object had fouled the control mechanism. Since no maintenance had been performed recently in the area the question arises "How long had it been there?"

LAC Rasmussen has the satisfaction of knowing he averted a possible serious accident resulting from jammed flight controls. His integrity in carrying out the check as carefully as he did is a fine example of competent maintenance - Good Show.

## F/L WT FLOYD

F/L Floyd, 427 Sqn, 3 Wing, was at 500 feet and 540 kts on a low-level training flight when the undercarriage came down. At this speed the air blast caused the doors to open violently, striking the wings and leading edge flaps. The left undercarriage door carried away the left leading edge flap, both striking the fuselage causing considerable damage. The right door jammed against the right leading edge flap. The aircraft began a severe buffeting, yawed violently left and went into rapid deceleration. F/L Floyd had to apply considerable back pressure to overcome a nose-down tendency. He reduced the aircraft speed immediately and climbed to a safe altitude for a low-speed flight check. The aircraft was controllable down to 230 kts and was returned to Zweibrucken for a landing. However, low visibility and the possible need for a high landing speed forced F/L Floyd to divert to another base. Fortunately, the undercarriage itself remained undamaged and a valuable aircraft was saved.

The photos with the D14 show the extensive airframe damage and indicate the formidable control problem facing F/L Floyd. His excellent handling of the aircraft in all phases of the emergency is commendable indeed.

F/L WT FLOYD

LAC RH RASMUSSEN

LAC RM CONDRON

F/L JR McCULLOUGH



## LAC RM CONDRON

A hydraulic snag had just been fixed on the CF104. LAC Condron was assisting in bleeding the system, when he noticed what appeared to be a small crack in the starboard main wheel brake assembly casting. Later, using a strong light and a magnifying glass he was able to confirm his first observation. There was a hair-line crack of approximately ½ inch, starting at the edge of the protruding portion of the brake casting that accommodates the banjo fitting on the flexible brake line. Caught in time, the unserviceable assembly was replaced; otherwise it could have caused a serious accident.

LAC Condron's obvious enthusiasm paid off by eliminating a potential accident. A Good Show for that *extra* effort - the mark of the professional maintenance man.

## FS JWG PETIT

One May morning this year Flight Sergeant JWG "Pete" Petit talked down an aircraft on Ground Controlled Approach for the 20,000th time becoming the first GCA controller in the Canadian Forces to accumulate this remarkable number - thirteen years of talking, talking, talking!

Previously in Air Traffic Control, FS Petit's service as a GCA controller began at the GCA School in Biloxi, Miss; tours at 4 Wing, Uplands and Bagotville followed.

In May 1957 at Uplands he performed his 10,000th run on Air Force 10000 with Governor-General Vincent Massey on board, who later endorsed the NCO's logbook and invited him to Government House. The 20,000th run was a talk-down of a Voodoo piloted by W/C MJ Dooher, OC 425 AW(F) Sqn.

Twenty-thousand runs is impressive indeed – a well earned Good Show to FS "Pete" Petit.

## LAC DW NEUDORF

LAC DW Neudorf at RCAF Stn Winnipeg was Flight Technician aboard an Albatross flying routine night circuits. During the third circuit the undercarriage was selected down and the indicators showed all three gears down, red light out, and hydraulic pressure normal. After doing his visual check, LAC Neudorf advised the captain, F/L EJ Miles, that the starboard main gear down lock was not in position. The undercarriage was recycled and the emergency hydraulic by-pass handle was used to maintain pressure in the system until the gear was down and locked.

LAC Neudorf's vigilance in detecting this malfunction under difficult conditions undoubtedly prevented a landing being made with an unsafe gear which could have resulted in serious damage to the aircraft.

LAC DW NEUDORF

LAC DM SANGSTER

FS JWG PETIT

F/O RW SLAUGHTER

## LAC DM SANGSTER

While performing an airframe BFI on a CF104 at 3 Wing, LAC Sangster noticed a small lock pin with an excessive protrusion; this pin secures the large pin supporting the main undercarriage drag strut to the leg. On further inspection, part of the pin separated showing it to be faulty.

Small though it is, had this pin come free it could have caused a serious accident; LAC Sangster's alertness is a fine example of competent maintenance.

## F/O RW SLAUGHTER

The test flight proceeded normally, until following an intentional flameout, the engine refused to relight. Four relight attempts (three with the TOE switch and one with TOE off) failed to start the engine. F/O Slaughter was in a position to reach high key and in his words "the forced landing was carried out successfully without further incident". A maintenance error in which three airmen were involved resulted in the high pressure fuel-cock link assembly separating. A quick disconnect fastener had not been locked.

F/O Slaughter in the words of his supervisor "... is to be commended for an excellent forced landing.... His approach was faultless, in fact he was able to land on the runway in such a way as to turn off at the normal runway turn-off and not block the runway for even a few minutes".

# GOOD SHOW

## F/L KA HARVEY

F/L Harvey, CEPE Detachment at Northwest Industries Limited, Edmonton, was on an acceptance flight test in an F84F when the engine began a severe vibration and loud banging, accompanied by surging between 50 and 85% with a tailpipe temperature over 800 . F/L Harvey set up an emergency landing pattern from about 5000 feet and 10 miles from base. At approximately 5 miles the vibrations and banging increased and the engine seized. F/L Harvey was under considerable pressure since abandoning the aircraft over the city could easily have caused a disaster. During the final approach the aircraft hydraulic system was on battery power only, and held out for a successful landing.

F/L Harvey's competence, knowledge of his aircraft, and coolness during an extremely hazardous situation is professionalism at its best.

# FOAMING THE RUNWAY

The EO on runway foaming has been revised to eliminate some misconceptions it contained...

An aircraft circles overhead, watched intently by a group of men in the tower. The pilot has declared an emergency and is burning off fuel. The crash alarm has been sounded and the mobile equipment are in the ready position. A chase pilot confirms that the nosewheel is cocked but appears locked down. The pilot has suggested that a foam strip would help him control the aircraft on the landing run.

There's a thoughtful look on the face of one of the men in the tower - he's the man who is about to make an important decision: "Should I call for foaming the runway?" This man is carefully weighing the several factors involved, all basically stemming from the question: "What will foam accomplish for that pilot?"

If his decision is made on a popular misconception he might foam the runway for the wrong reason; or, to put it another way, he and the pilot may count on foam having qualities which it does not possess. And there's plenty of opportunity for misconceptions to continue as the literature on the subject contains conflicting information. The choice of words in these articles is interesting: "cushion the contact", "blanket", "reduction of decelerative forces", "slippage" and so on.

Perhaps the image of suds and its association in our minds with soap which is slippery is the source of our confusion. Perhaps too the sheer volume and depth of the lather creates an impression of a soft, shock-absorbent carpet. This is just plain wishful thinking. For all practical purposes foam is merely lathered water, nothing more. The pilot cannot and should not count on any of the qualities suggested above; actually, the "slippage" he will experience will be derived primarily from the layer of water the foam holds on the surface of the runway. In other words a foamed runway is no more slippery than a wet runway.

To get back to this pilot and his problem: it would be dangerous wishful thinking on the pilot's part to expect the foam to provide the lubrication necessary for a controlled no-sweat landing run with a cocked nosewheel. Contrary to a runway foaming booklet presently in circulation (which gives a figure of 50%) the co-efficient of friction is reduced only a scant 5% between a dry and foamed runway.

Well, just what does foam accomplish? The man in the tower and the pilot should think of foam as almost exclusively PROTECTION AGAINST FIRE both from sparking and friction-generated heat. The cocked nosewheel, for example, could snap off, or the tires blow, exposing metal to the runway surface with the resultant fire hazard. When the aircraft comes to rest a fuel spill hazard might exist so it's important to have the strip extended far enough down to contain the entire landing run.

The USN in an elaborate test program produced some interesting results which were recorded on film. This film (14C/3791), on spark and fire prevention by foaming is strongly recommended viewing for all persons involved in any phase of the foaming operation. Materials tested in this program extended from titanium to aluminum and in every case foam significantly reduced the fire hazard. EO 125-130C-2 outlines the factors involved in more detail. Since it's been re-written, it would be a good time to thoroughly review it, or for some of us - to read... read it for the first time. And remember, no matter in what order the merits of foaming a runway may be listed, the only really important one is spark and fire suppression.



# Carrier Wind Effects

In spite of their long smooth runways, "shore" pilots might on occasion be a little envious of their carrier-based brothers who can cruise exotic paradise isles, smoke tax-free cigarettes - and turn their runway into wind. There is no doubt that a mobile runway can reduce the crosswind problem, but there are drawbacks. One of them - and it's a big one - is the way the wind behaves around a carrier.

A flat-top underway churns up an invisible wake which has been the undoing of many a naval pilot. The problem is inherent in moving a large object through the air and since a carrier moves through air as well as water, this wake is an inevitable part of a navy pilot's flight environment. It's no easy job to predict with reliability the effective wind at, say, touchdown point; the interaction of winds and eddies is too complex. Actual hand-held anemometer readings are the only practical way to resolve what would otherwise require some tricky vector diagrams and computations.

## Surface Winds

While the pilot is primarily concerned with the wind over the deck, he should be aware of the components involved in carrier wind phenomena:

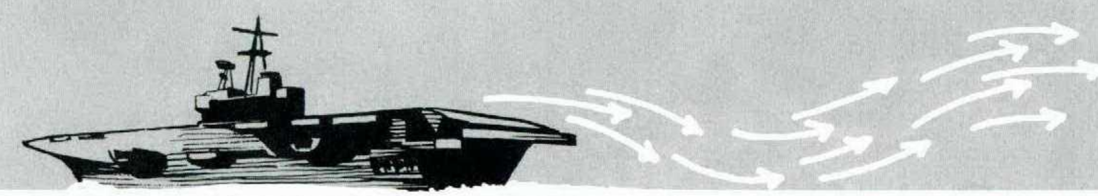
- true surface wind - the undisturbed wind measured at 33 feet over the sea.
- relative wind - the resultant of the true surface wind and the carrier's speed and direction. This is measured in the undisturbed air by an anemometer on the ship's mast.
- wind over the deck - the wind that actually exists at specific points on the flight deck. Since this varies from point to point, the simplest and most satisfactory method of getting an accurate figure is to use a hand-held anemometer at the position where the information is required.

## Effects on Landing

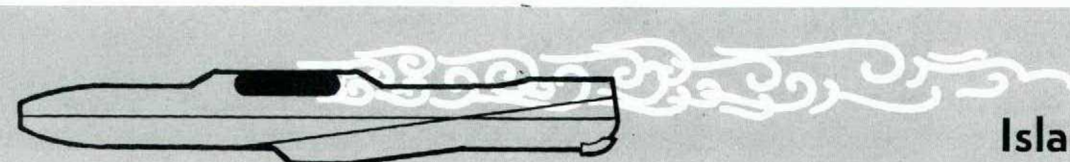
During flight operations the carrier attempts to steer a heading which will keep the wind as nearly as possible down the angled deck. The pilot should not be required to crab or sideslip to maintain direction on approach. The narrow, short landing strip plus other corrections for ship movement, etc, make him busy enough without having to contend with a crosswind. But a surface wind is seldom constant and the effective wind more often than not turns out to be somewhere between the axial and angled decks. A slight crosswind in itself is not much of a problem but what is significant is the "Island Effect". The carrier's island, too, creates its own wake. If the effective wind is exactly down the angled deck, the island's wake will be far enough to starboard to not appreciably bother an approaching aircraft. A slight starboard crosswind, however, can put this turbulent wake right in the approach path at a very critical stage of flight and is something for which the pilot must be constantly on the alert.

Another phenomenon - and the more dangerous - is known as the "rooster tail". This can cause the unwary pilot to overcontrol on the approach or even hit the round-down. As the wind flows off the stern of the ship it dips down to fill the void formerly occupied by the ship and then as it strikes the sea, it is deflected up again. Thus an approaching aircraft first encounters an updraft and then a downdraft. Although not as strong, the updraft can cause a power reduction just as, in fact, a power increase is required. The wind velocity over the deck determines the severity and the distance the rooster tail extends behind the round-down. Under high wind conditions its effects may be felt more than 500 feet astern.

In this brief account of the vagaries of the wind around a carrier we may have created the impression that a deck landing requires skill, co-ordination, good reflexes and so on - yes, indeed.



Rooster Tail



Island Effect

# DITCHING AT SEA

Now and then every pilot should give some thought to the problems to be faced in ditching an aircraft, and those who fly frequently over large bodies of water should have their drills and procedures down pat. Several years ago an RCN Tracker aircraft on a night IFR flight from Shearwater to Bermuda was forced to ditch. The experiences of that crew illustrate vividly some of the difficulties of surviving a crash landing into the sea on a dark night. Due to a problem in navigation the crew became lost at sea with insufficient fuel to make land when a valid fix was finally obtained. Committed without alternative to a ditching, the occupants made ready. The Captain briefed the crew and passengers over the intercom outlining in detail each step of the ditching procedure. By now the aircraft was in radio contact with New York who could relay messages to Bermuda and the US Coast Guard in the area. From them the recommended heading for ditching along the swell was obtained. The co-pilot selected "MAYDAY" on the IFF and began continuous transmissions on guard frequency.

With about 15 minutes fuel remaining the pilot began his descent from 10,000 ft, and at about 1500 ft the engine which had been previously shut down to conserve fuel was started. The escape hatches were then released and the aircraft turned to the recommended heading for ditching. Because of the darkness a power approach completely on instruments was necessary. The passengers were told to stay in their seat harness until the second impact. In accordance with navy practice the hook was lowered. A power-on approach was made at 85 knots, full flaps down. A vertical speed of 150-200 FPM was maintained in a 5 to 10 degree tail down attitude, propellers fully fine and 21 inches of manifold pressure.

As expected the aircraft flew into the water with two impacts spaced very closely together, the tail hitting first: the downward impact was negligible and the forward deceleration was about three times that of an arrested deck landing. On the second impact the aircraft nosed down and travelled for approximately 150 feet with nose submerged. Water cascaded continuously through the open hatch above the pilot's head and filled the fuselage to about shoulder height at all crew positions. The co-pilot's hatch had closed on impact but did not jam. The aircraft sank about 1½ minutes later. During this time both pilot and co-pilot released harnesses and escaped through their overhead hatches which were about six inches under water. The two passengers in the back escaped without difficulty — one through the main door, the other through the overhead hatch. The senior passenger, a Petty Officer First Class, checked that everyone was out, pulled the handle to release the 6-man dinghy, made sure he had his own dinghy, and pushed up through the overhead hatch. As soon as he reached the surface he joined the captain and swam toward the tail to recover the 6-man life raft. The raft had released and inflated satisfactorily and was riding on top of the fuselage. As the aircraft sank it was discovered that a line was entangled with the horn balance of the elevator and before this could be cut free the large 6-man raft was pulled under with the aircraft and lost.

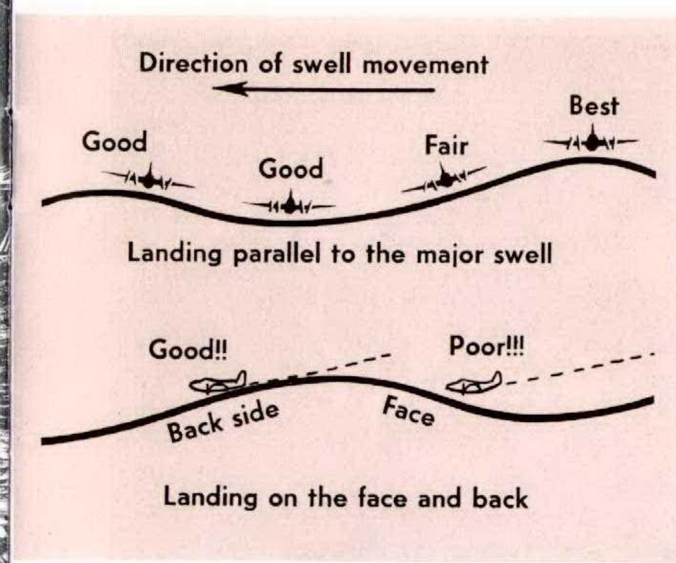
## Ditching Procedures

Now that we have the aircraft in the water let's leave the Tracker story for a moment and review some points on ditching procedure. Of course, the fundamental techniques of ditching are taught in elementary flying courses and the peculiar ditching characteristics of each aircraft are outlined in the AOI or Pilots' Manual for each aircraft type. Nothing in this article is intended to supersede or replace information obtained from these excellent sources. We do believe, however, that a review of the techniques from time to time and a study of the experiences of others helps to make us more proficient when the real emergency occurs.


According to a United States Coast Guard Instruction, a successful aircraft ditching is dependent on three primary factors. In order of importance, they normally are:

- Sea conditions and wind.
- Type of aircraft.
- Skill and technique of the pilot.

• The actual sea condition and wind, of course, are factors we cannot control. What we can do is carry out a preliminary sea evaluation and selection of a ditching heading prior to every major overwater flight. Occasionally during the flight the situation can be reviewed for the actual conditions noted over the ocean. The pilot must be prepared to resist a natural instinct to head into wind for landing, (except on a level smooth sea or glassy lake). In winds up to 25 knots the major swell system should be used to determine the landing direction. The easiest touchdown will be made parallel to the major swell and on a crest (see diagram). This gives two possible headings; pick the one that is more into the wind. The best heading is more difficult to determine if there is a secondary swell because the smaller swells obscure or fill the troughs of the major system. Although the primary swell will show up most clearly at altitudes of 2000 feet or more, it is necessary to get down to, say, 500 feet to evaluate the secondary system. When the minor swell is large enough to be a factor, it is best to land parallel to the major swell (as recommended above) and down the minor swell. If possible, hit the minor on the backslide just beyond the crest of the major. It may be necessary to accept a tailwind component to achieve this. The guiding rule, to keep always in mind: "Avoid the face of any swell". In winds between 25 and 35 knots a compromise heading will probably be best, giving the wind and swell equal allowance, say 45 degrees out of wind and 45 degrees to the swell system. In winds above 35 knots it is generally best to forget the swell system and point into wind. The higher winds are going to create a difficult situation, and the effect of wind will probably outweigh the danger of the swell system.




## Aircraft Characteristics

Considering the characteristics of your aircraft is the second most important point. Here the instructions in the AOI or Pilots' Manual are vital and should be carefully memorized. In general, big airplanes experience less violent gyrations during ditching than smaller types. The built-in strength of the modern fighter or attack aircraft, however, helps even the score. In almost every aircraft type, the extension of full flaps is recommended. Flaps will cause some diving tendency but they reduce landing speed, deceleration forces, impact forces and length of run-out. Ditching with gear down, on the other hand, is never recommended. The deceleration forces and diving characteristics with landing gear down will not help in any known sea situation. A lowered arresting hook can provide an important last second warning of impact. This may be important under night or glassy conditions when height perception is difficult.

Each aircraft has its own peculiar ditching characteristics and the AOI is the place to go to get the straight gen. However, there are a few general rules each pilot should consider along with his knowledge of the aircraft when faced with a ditching. In general, protuberances under the aircraft are undesirable and AOIs usually recommend jettisoning external stores and underslung drop tanks. Jettisoning decreases aircraft weight enabling a lower landing speed. Protuberances aft of the centre of gravity are the most undesirable because they may cause diving. Tiptanks, if empty, or half-full for the T33, should be retained for buoyance. The aircraft type will dictate prop feathering or not; in general, the added control of using engines in the last few seconds outweighs the advantages of feathering. In jet aircraft the location of the air intakes is a critical factor in the ditching technique recommended.

In aircraft equipped with ejection seats it is advisable to eject. If a ditching is unavoidable, it is essential to use the technique recommended in the AOI. Oxygen should be selected to 100% as most oxygen systems will then permit breathing under water. The canopy should normally be jettisoned, but if trapped in the aircraft underwater it should be possible to use the ejection seat without injury.

## Pilot's Part

Pilot technique is the final key to a successful ditching. The pilot's task is essentially to set the aircraft down on a proper heading in the right spot at the best combination of attitude and speed. The importance of a low touchdown speed must be stressed, remembering that the energy of the aircraft which is dissipated during the run-out is proportional to the square of the speed. Although speeds and rate of descent are key factors the most important factor of all is to achieve the optimum nose-up attitude on impact. Forgetting everything else, the best nose position for ditching is very slightly nose high, something like 5 to 8 degrees nose high. All aircraft that have good ditching characteristics can be held at that attitude for the impact. If the nose is too far down the aircraft may dive after impact; if too high the after-body digs in hard and the nose is slammed down on to the water. The old rule: maintain flying speed and fly all the way to water.

A brief summary then, of factors which you should always keep in mind:

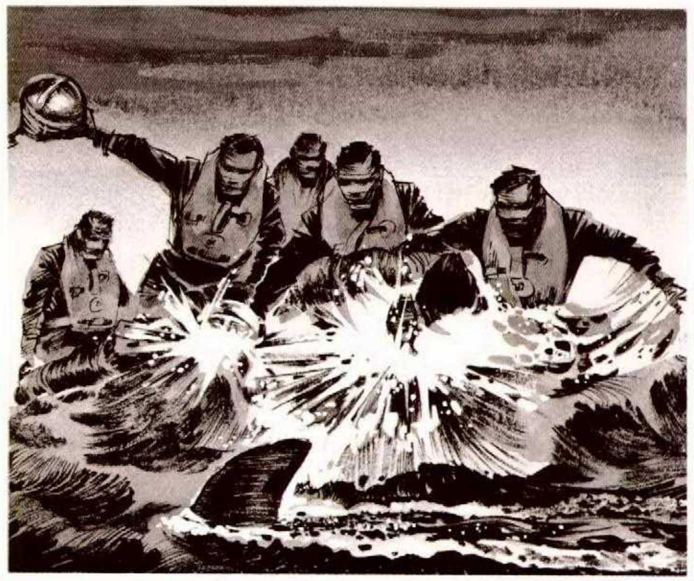
- In many cases little time will be available, but your assessment of the sea and wind conditions is vital.
- The factors which affect a water landing are similar to those of a normal landing but tolerances are much more critical.
- The angle of descent at touchdown is the most important variable you can control. A rate of descent of 100 ft per minute, 6-8 degrees of nose-up attitude is best for most aircraft.
- Low speed is important but never at the expense of angle of descent or attitude.
- In most high-speed aircraft bailout is recommended in preference to ditching.

## Survival

So much for ditching - let's return to the Atlantic and see how they made out in the water. There are a few survival points illustrated in this part of the story. Finding themselves alone in the ocean at night, the five crew members swam together and took stock of the situation. All life jackets had functioned normally except one which was torn during exit from the aircraft. Three of the five however, had unwittingly released their dinghy lanyards when working clear of their seat straps and parachute harness. This, coupled with the loss of the 6-man raft, placed them all in a hazardous position. The first K-type dinghies inflated and later required topping up via the mouthpiece. The two dinghies were tied together and the five men supported themselves around and in them as best they could. The one with the torn life jacket also did not have an emersion suit, so he was given priority for sitting in a dinghy, while the others took turns in and out. A muster of equipment produced K-type paddles, bellows, K-pack distress signals, shark repellent and a package of dye marker. After about an hour an aircraft circled overhead several times and it was believed that their life jacket lights might have been sighted.

## Shark Treatment

With the first light of dawn, the group was attacked by four medium size blue sharks. Splashing the water with their helmets seemed to be effective in causing the sharks to keep their distance. When the package of shark repellent was carefully spread around the dinghies, the sharks moved away and did not return. About 9 am a US Coast Guard C47 appeared overhead, circled and dropped a 20-man life raft, which drifted out of range and was lost. The C47 was joined overhead by a USAF C54 and during the next 30 minutes four more 20-man life rafts were dropped. The survivors took turns attempting to recover a 20-man raft until they all became exhausted. The captain seriously considered prohibiting any more attempts but the sixth raft dropped came reasonably close and after an exhaustive struggle they were able to get on board and recover one another. They had been in the water for eight hours with only the two K dinghies when the large 20-man rafts were boarded. In these rafts they found full rations and equipment and a 2-way UHF/VHF radio. Two hours after boarding the rafts a large German freighter hove to and they were carefully helped on board. The time was 11:30 am, ten hours after the ditching.





Our ditching/survival story ends on a happy note with everyone safe and well, and perhaps appears simple and straightforward. However, looking back over the events there are several important points to be reviewed. Once the emergency occurred the air discipline, flying and general conduct of all on board were exemplary. Every effort was made to assist shore authorities in obtaining accurate last-minute fixes of the aircraft. Advice regarding surface conditions and swell was obtained from the Coast Guard. Everyone on board was carefully briefed and prepared. (Aircrew had had ditching drill within 3 months, non-aircrew had full pre-flight briefing). In the water good discipline and organization overcame the handicap of the loss of the 6-man dinghy and the shortage of K-type equipment. Recovery of the 20-man rafts (perhaps the most dangerous phase) was conducted with judgement and restraint. It all added up to a safe return with everyone together and in good shape. But, if their environment had been less hospitable, say, in colder water, would they all have made a safe return?

Would you have fared as well?

• • •

### SEA EVALUATION CHART

| Beaufort Number | Velocity Knots | Sea Indications | Height of Waves Ft. |
|---|---|---|---|
| 0 | Calm | Like a mirror. | 0 |
| 1 | 1-3 | Ripples with the appearance of scales. | 6 in |
| 2 | 4-6 | Small wavelets; crests have glassy appearance and do not break. | 1 ft |
| 3 | 7-10 | Large wavelets; crests begin to break. Foam of glassy appearance; few very scattered whitecaps. | 2 |
| 4 | 11-16 | Small waves, becoming longer. Fairly frequent whitecaps. | 5 |
| 5 | 17-21 | Moderate waves, taking a pronounced long foam; many whitecaps. | 10 |
| 6 | 22-27 | Large waves begin to form; white foam crests are more extensive; some spray. | 15 |
| 7 | 28-33 | Sea heaps up and white foam from breaking waves begins to be blown in streaks along the direction of waves. | 20 |
| 8 | 34-40 | Moderately high waves of greater length; edges of crests break into spindrift; foam blown in well marked streaks in the direction of the wind. | 25 |
| 9 | 41-47 | High waves. Dense streaks of foam; sea begins to roll; spray affects visibility. | 30 |
| 10 | 48-55 | Very high waves with overhanging crests; foam in great patches blown in dense white streaks. Whole surface of sea takes on a white appearance. Visibility is affected. | 35 |

NOTE: The heights given for the wind-driven sea are approximate. The height depends on the length of time and steadiness with which the wind has blown, and the fetch. It should also be remembered that it is possible to have a heavy swell running in an area where there is little or no surface wind. Also, a heavy swell system may be obscured or hidden beneath a local wind-driven system.

## "Flash-Back" A perfect wheels-up landing

*The destroyer-helicopter combination has for several years been much-discussed as a promising anti-submarine team. Now, with the planning stage over, our first units will be operational in November. The concept of employing a destroyer as a small carrier is simple, but at the same time, ambitious. This article, by a pilot who has flown the helicopter chosen for the new role, the Sea King (CHSS-2), comments on the problem areas and the safety implications.*

Sea King helicopter nearing touchdown. Note hauldown cable and bear trap device.

# DESTROYER-HELICOPTER TEAM

Sea King helicopter approaching HMCS Assiniboine for landing. Size of deck and hangar can be clearly seen.

Beginning of landing phase—cable connected to bear trap.

Attitude as aircraft nears deck—positive tension on cable is pulling aircraft down.

Final touchdown probe is locked in jaws of bear trap.

After the HO4S-3 (S55) had indicated that the helicopter had considerable ASW potential the feasibility of a helicopter-destroyer marriage was explored. The results of preliminary trials using an S55 on the frigate HMCS Buckingham were encouraging. A more comprehensive evaluation was commenced using a later model S58 helicopter borrowed from the RCAF using HMCS Ottawa with a modified deck. The results of this second evaluation were more encouraging, but we needed a helicopter without magnesium components which are vulnerable to salt water corrosion. The Sikorsky Sea King (CHSS-2) helicopter fulfilled the prerequisites the RCN had stipulated and a contract was let, the aircraft to be built under license in Canada. The Sea King's two turbojet engines produce 1250 brake horsepower and yet weigh only 300 lbs each. The aircraft has a maximum weight of 19,100 lbs and a top speed of 150 knots in operational configuration. A highly modified version of this same helicopter broke the the helicopter world's speed record at over 210 mph in 1962.

From the pilot's standpoint the Sea King's most interesting equipment is the automatic flight control system and transition coupler. For its anti-submarine role, the inherent instability of the helicopter meant that some form of stabilization giving hands-off flying capability had to be provided. With stabilization alone, however, in cloud or fog or at night, the pilot would still have to fly the aircraft to a hover on instruments, and here, a guidance system known as a "coupler" is employed. Similar in some respects to the inertial guidance of a missile but employing Doppler radar, the coupler takes over once the pilot flies to a "window" of 150 ft radar altitude and 60 kts groundspeed. The coupler will then fly the helicopter automatically to a hover altitude of 40 feet.

For landing, the Sea King is equipped with a "down haul" mechanism consisting of a cable with which the helicopter, while hovering above the postage-stamp size landing area on the destroyer, can be "reeled in" to a safe landing even on a rolling sea. The device employs a slip clutch to provide a positive tension between the aircraft and the deck during the entire landing manoeuver.

A typical night mission consists of a flight under instrument conditions between 40 ft and 150 ft and between 0 and 100 knots. During flight and on transition, descent, hover, and climbout, the pilot is exposed to conditions conducive to vertigo and disorientation. The hover particularly, must be extremely stable; even a 2-3° nose-up can give the pilot the sensation of doing a back flip. These sensations are due to constantly changing altitudes and airspeeds during the approach and climbout, plus the vibrations prior to and during the hover. The jet helicopter pilot can no longer rely on the sound of his engine for altitude information, thus he must rely on a visual presentation of instruments whether in VFR or IFR. Many pilots who have had considerable reciprocating experience appear to have problems initially on conversion due to this phenomenon. Obviously, a helicopter night mission can be quite a challenge and requires a proficient crew.

The CHSS-2 conversion course includes an RCN Instrument Rating and throughout the training there's an emphasis on instrument flight in this aircraft. Upon reaching an acceptable standard, the pilot flies night missions over water beginning at 500 ft and later, lowering this to 150 ft as proficiency is reached. So rigid are the requirements during this type of operation that it is not unusual for pilots to fly on the radar altimeter at night within only 3 to 4 feet variation in altitude over extended periods. The limits for proficiency are ± 10 feet at 150 feet.

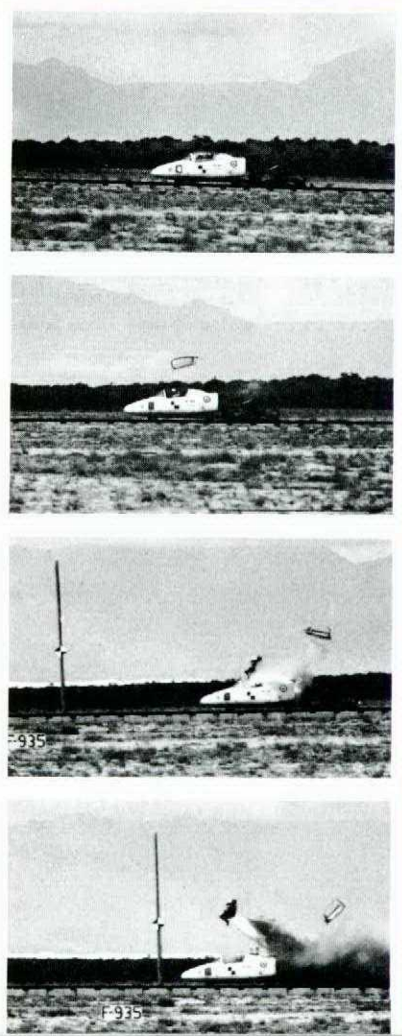
When the Sea King was first introduced to the USN, aircraft were lost at night primarily due to pilot inattention to the instruments at low altitudes, although in some cases losses were associated with the aircraft itself. The USN's valuable experience and information on accident causes were made available to the RCN. It became obvious that to cut the accident rate meant more emphasis on low-level instrument training, and a high standard of proficiency maintained.

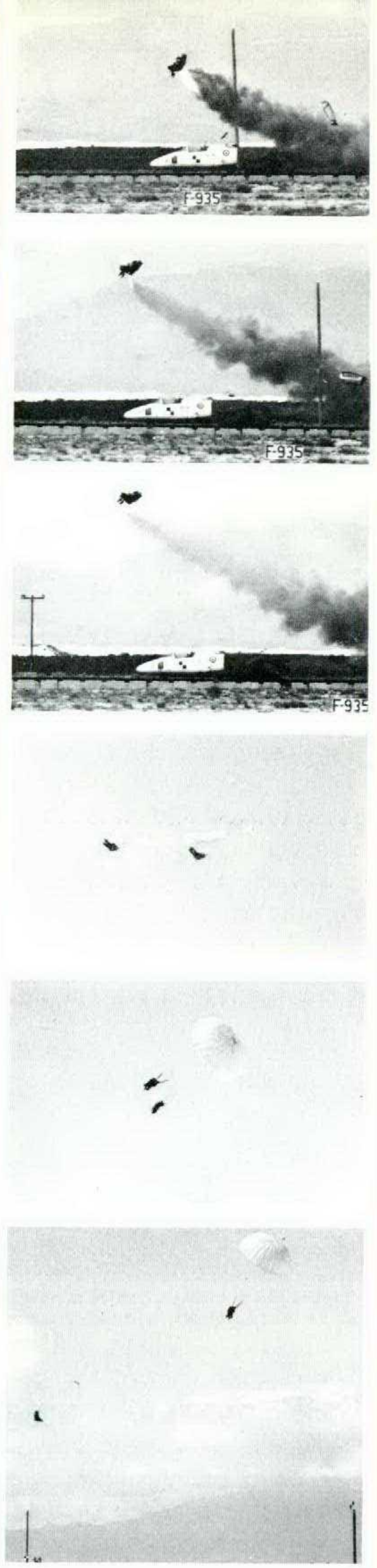
Perhaps our most serious problem in the flight environment is that of ice accumulation when involved in flying in icing conditions. The center windshield is not equipped with de-icing and due to its position can ice over at an alarming rate. Engines have been severely damaged by ingesting ice from the aircraft surfaces. Following a descent from freezing conditions ice can break off in chunks, slide up the windshield and be ingested through the intakes directly overhead. Depending on the size of the chunks, moderate to severe damage can occur to the compressors and cause an incipient, or even a full compressor stall. It appears that a modified streamlined baffle shield mounted in front of the engines will prevent ice or FOD ingestion.

Humans have difficulty in sustaining the span of attention required to fly an aircraft to these tolerances for an extended period; the pilot is susceptible to distraction and inattention. A pilot may become mentally tired and inadvertently commence a descent while transiting between dips particularly after two or three hours of concentrated flying. To prevent a catastrophic collision with the water it became mandatory for both pilots to fly instruments — one controlling the aircraft, the other monitoring the flight path. Occasionally, a co-pilot observing the aircraft descending, has assumed control and prevented an inadvertent ditching. Clearly, the requirements and high degree of concentration necessary to accomplish the helicopter all-weather mission are critical.

# THE RAILROAD WITH THE ROCKET ENGINE

With an ear-splitting roar and spewing flame a heavy metal "sled" gathers speed gradually at first in the characteristic manner of rocket power and in a few seconds is clocked at over 400 miles an hour. On the sled is the front half of a Tutor fuselage looking deceptively operational, its dummy crew sitting side-by-side. Pieces start flying off the truncated mock-up; first, an object, painted orange rises kite-like through the air; the canopy climbs upward and back; flame and smoke engulf the open cockpit heralding the dummy's ejection up the rails and into the hot summer air. This complex sequence transpires with such rapidity that without recording it on film and tape to reduce it to slow motion, it would remain beyond the comprehension of the most alert observer. Thirteen seconds and $10,000 later, the canopy, crash position indicator airfoil, the ejection seat, and the "pilot" lie scattered at intervals along the track. The bits and pieces are carefully observed, measurements are made, the recordings are very closely and minutely pored over - and the whole sequence is begun again, perhaps at a slower speed, or through the canopy, or maybe with a bird strike thrown in to make things interesting.





As told to F/L JT Richards
by F/L Dave Wright CEPE

New aircraft these days are ideal breeding places for "bugs"; escape systems particularly have been plagued with problems resulting primarily from urgent demands to provide "any height – any speed" capability – to be designed and proven before the aircraft is introduced. The CF104 trials preceded the introduction of the aircraft into service and happily, several dangerous inadequacies were revealed and corrected. The recent Tutor trials at the USAF Missile Development Centre, Holloman Air Force Base, New Mexico, in similar manner, demonstrated the Tutor's present equipment and attempted to assess the feasibility of providing the ultimate in escape systems – the on-the-deck ejection. To achieve this, the "ballistic" (or explosive) catapult such as is in the T33, F86 and presently the Tutor, must be replaced by the rocket catapult. One intriguing question immediately comes to mind – just look at the Tutor cockpit – would it be safe to sit within a foot or so of a rocket blast? The manufacturer had equipped the Tutor with the Webber seat and M5 ballistic catapult giving an above 150 ft capability at all speed ranges; except for static testing this escape system had not been proven. These were the basic reasons for the RCAF using the Holloman sled track in a series of eight runs from June to November 1964. A Central Experimental and Proving Establishment (CEPE) detachment of six men: F/L DE Wright, F/O RL Spickett, FS LA Steeves, Sgt EG Grison, Sgt J Bedard and Cpl J Boisvenue, conducted the runs. Observing the vital physiological aspects were an Institute of Aviation Medicine (IAM) team of S/L JH Kerr and F/L RJ Leather.

The Tutor-Webber seat test program was in three phases:

- to examine and test the equipment already installed by the manufacturer — some shortcomings of the equipment were detected in the test phase and corrected at the factory during production.
- to conduct a through-the-canopy ejection — the canopy breaker was proven inadequate; the dummy did most of the hole-punching! The breaker was redesigned.
- to test eject a Webber seat — this was done at Cold Lake from a CEPE T33 using both the ballistic, and the rocket catapult.

Later, at Holloman the rocket seat was fired from the Tutor sled. As part of this program we were anxious to explore several "dark areas":

- an IAM study on the human problems, particularly the side-by-side configuration with a rocket seat
- canopy ejection tests
- bird strikes on the windscreen
- a flight performance of the Crash Position Indicator/ Accident Data Recorder (CPI/ADR)
- test a new-design lap belt mechanism.

The trials began at Uplands and Cold Lake in which both the ballistic and rocket seats were tested -- the exploratory areas were, of course, the rocket catapulted seat, as the Webber M5 ballistic seat is a proven product—although with limitations.

The rocket seat is far more complex to design. It must be critically balanced, ie, the line of thrust must be through or at least as nearly through the centre of gravity as possible. This is difficult when such a requirement must satisfy the various shapes and sizes of the human body. Even more difficult is the problem of maintaining this thrust equilibrium after the seat is free of the aircraft. Wind blast, body movements, etc, all tend to destroy this equilibrium which is vital to maximum height on ejection. Height is the one capability aimed for; the man/seat separation and parachute deployment all take precious seconds — seconds during which gravity accelerates the pilot toward the ground.

The present Tutor seat can accept a rocket catapult - this was proven at Cold Lake. The CEPE-modified Webber seat, ie, with the rocket, performed well on its first trials; the hybrid looked like a workable combination.

## Cold Lake—First Phase

Six ejections from a CEPE T33, one with the ballistic seat and five with a rocket-powered seat, were most encouraging as a prelude to the more sophisticated trials at Holloman. Ejected at 1000 ft, the seats performed satisfactorily over a speed range of 130 – 380 kts. The rocket seat was now proven as an escape system at 1000 ft but the zero-height capability would have to await testing on the sled. The seats reached from 57 — 117 feet above ejection height; the recovery altitude (ie, full chute deployment and speed decay) at 43 — 86 ft. The existing system in the Tutor was operationally OK; the trials to the south could proceed. Incidentally, the lower recovery altitudes were induced by special test conditions not experienced in an actual ejection. While the highest recovery height (86 ft) was achieved at the highest speed (380 kts) a meaningful correlation between speed and recovery height could not be established from these runs. For example, on an earlier CF104 sled run at 70 kts the chute deployed with a loss of only 20 feet.

## Holloman, New Mexico—Phase Two

Years before, Col Stapp of the USAF underwent the now-famous runs on this track to determine how much deceleration a man could withstand; today, the track is still tightly programmed for research. It's much like a very broad gauge railroad nearly seven miles long in a near-desert area, about 150 miles south of Albuquerque, New Mexico, and 90 miles north of El Paso, Texas. An intriguing "recreation resort" at Juarez, just across the border in Mexico, and only 90 miles away, was for the Canadians, a fascinating tourist mecca. Its gross dissimilarity with Toronto-on-Sunday made it a popular... well, back to the track.

The railroad's "engine" is a rugged steel frame, and slides on special alloy steel runners in a metal-on metal dry ride. Despite the speeds, heat, and no lubrication, these "slipper pads" last about 10 to 12 runs. The sled is driven by rocket units of 4500 lbs of thrust each; for example, two were used for the 100 kt run; ten were needed for 450 kts. Braking is inertial by the simple device of putting water in the trough between the rails, into which a scoop from the sled extends. Frangible "dams" retain the water; the depth determines the deceleration. Slowing the sled can be programmed; a gradual deceleration is produced by increasing the depth of water by stages.

The runs were to prove the rocket seat and to create the actual conditions of a side-by-side rocket ejection. Instrumented dummies — and for one run, a monkey — were employed to measure this unknown. Generally speaking, the sled runs accomplished their aim: it is feasible to install rocket seats for the Tutor for ground and near-to-ground level ejections. Trajectory heights of 63 to 137 ft were achieved at various speeds from 100 — 400 kts. These trials constitute a preliminary test series only; production-type components would then be tried in another series. The unqualified description of the seat's capability will have to await the operational runs.

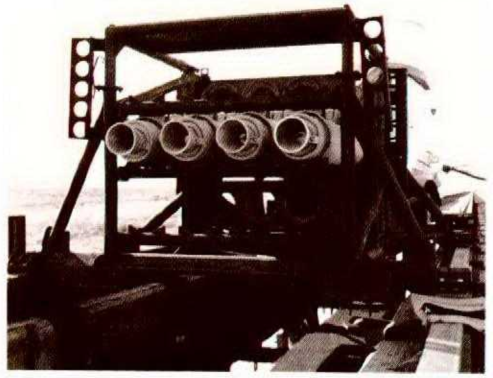
The first two runs were unsuccessful. A design flaw in a new-type lap belt being tested (see Flight Comment Jul-Aug page 16) prevented the dummy/seat separation. The flaw was found immediately and rectified in time for the remainder of the sled runs. The second run produced an unexplainable hang-up between the dummy shoulder harness and seat. At this point, the trials were somewhat disappointing but for the remaining six runs it was clear sailing — all components functioned well. The ejection altitudes reached as high as 137 ft and recoveries varied from 44 to 114 ft — not much manouvering time from 44 ft, of course - but safe.

## The Medical Story

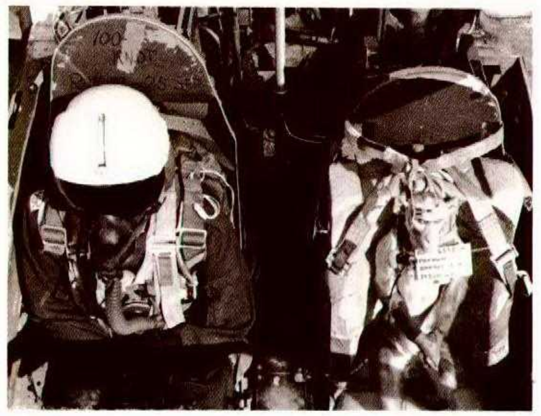
The dummy who sat out the ejection run was elaborately outfitted with sensing units to detect the heat and blast effect of the rocket. Overpressures up to 1½ times ambient were known to exist in the vicinity of the nozzle; this poses a blast threat to hearing. The standard jet one-piece helmet provided adequate protection to the eardrums, and the new-type flying suit gave good skin protection. For these runs the visors were down.

The Tutor fuselage section is hoisted onto the track

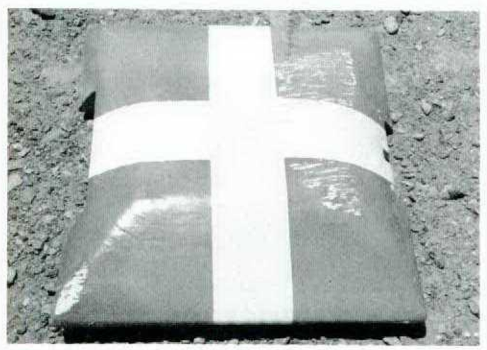

The truncated Tutor fuselage on the sled and ready to fire



Propulsion end of sled showing four rockets, each of 4500 lbs thrust

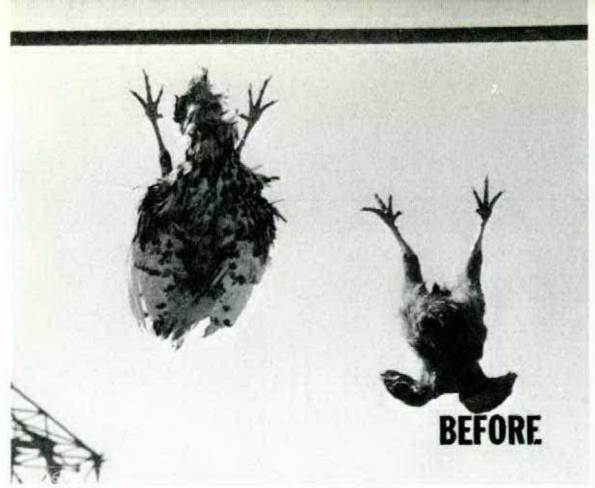


Attention navigators—which one is the pilot?



The CPI-ADR lies barely scratched following release at high speed






The birds were suspended above the track in the sled's path


Windscreen damaged by bird strikes

The temperature and blast readings were encouraging enough to further prove the system with a live monkey who, as predicted, suffered no effects from his sled ride. The earlier misgivings on side-by-side ejection have been removed.

## The "Slump" Story

Dummies, unlike their animate brethren cannot perform the rapid-fire pre-ejection drill which ensures good posture at blast-off, and so obligingly exaggerate the slump on ejection. A restraint harness and seat configuration which cannot support a man during ejection is unacceptable. In the ballistic, kick-in-the-pants type ejection, a bent back could mean a broken back. This is also true of the rocket but slumping could be fatal if it means upsetting the fine balance between rocket thrust line and centre of gravity. For this reason, the earlier seat shape led to such a bad slump and consequent disequilibrium that a static test yielded an ejection height of only 38 ft; the rocket simply wasn't thrusting upward long enough. Part of the problem was that the contour of the seat did not match the pilot's back and posterior — a good many Sabre-jocks could say "amen" to that.

A modified back-pan and seat was not only safer but far more comfortable; the next static shot with a reshaped back block and seat pack produced good results. The real villain turned out to be the badly angled and unshaped seat pack. Ironically, the pilot had finally been given a good comfortable seat, if only to solve the engineer's seat balance problems!

## Some "Extras"

The CPI/ADR, (a device coming into more extensive use each year) was fitted at the top of the Tutor fuselage just behind the canopy. (The CPI/ADR is described in Mar-Apr 64 Flight Comment). The lightweight plastic airfoil is designed to flip-flop through the air carrying its beacon and data safely away from the impact point. It performed as advertised; its position on the fuselage, however, rendered it susceptible to inadvertent release from the rocket blast, although it may be argued that an ejection is as good a moment as any for a CPI/ADR release.

Bird strikes are a jet aircraft designer's nightmare. Windscreens rugged enough to withstand impact without penetration or hazardous fragmentation are often very thick, heavy and difficult to engineer. A trainer ideally should have a large cockpit lookout area, and in the Tutor the windscreen is not unlike an automobile's — curved, wrapped-around and large. It is therefore particularly vulnerable to a bird strike. Flight Safety experts, long concerned about the Tutor's ability to withstand windscreen impacts requested realistic trials. Two very dead chickens, one four pounds, the other two, were suspended in the sled's path. At a little over 200 kts the two-pound bird reduced the windscreen to an opaque sheet of glass honeycombed with cracks; portions of the four-pound bird penetrated the outer glass layer, the internal vinyl layer, and shattered the inner layer. Glass slivers capable of causing injury to the occupants were released at high speed from the inner layer of the windscreen. It is interesting to note that this bird strike test was made when the reinforcing plastic interlayer was at its optimum strength at about 90°F — somewhat warmer than January at Gimli. These findings have resulted in a program to develop a better windscreen as soon as possible. In the meantime, clear visors have been procured for Tutor aircrew.

The canopy jettison tests covered the 100-450 kts range and functioned satisfactorily. At 450 kts the rear hinge points were torn off; this actually assisted in the canopy release and did not compromise safe tail clearance which was good at all speeds:

- 100 kts - 12 ft
- 200 kts - 25 ft
- 450 kts - 6 ft

If the canopy fails to eject, can the pilot who might be understandably reluctant to punch through, crank the canopy into the slipstream and have it tear off? The canopy was raised into the airstream at 200 kts using the normal raising system. It jammed momentarily on its way up then tore off, slid along the fuselage and would have struck the tailplane. The rupture point was at the attachment between the thruster which jettisons the canopy, and the raising and lowering mechanism. At 200 kts or above, the jamming probably would not prevent the canopy from tearing away but — and it's a big BUT — suppose, that at lower speeds the canopy raised partly, jammed and stayed with the aircraft? Depending upon its position, the frame could be a dangerous obstruction on ejection. With the new canopy breaker now installed, the through-the-canopy ejection is safe.

While we're on the subject; since the sled trials, breakout tests show the Tutor canopy to smash readily using the standard breaker tool.

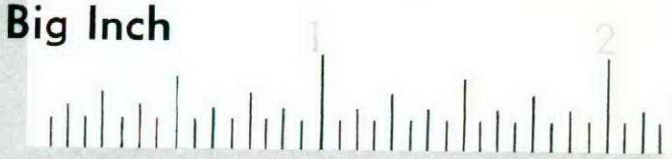
## Trial's Over—Now, the Paperwork

All-in-all the trials had been a gratifying success. Except for a few problem areas which in any case, the trials were designed to uncover, the equipment had performed as expected. The present Tutor systems showed up well and future installation substantiated. Largely as a result of the valuable data collected the decision has been made recently to fleet fit the Tutor with rocket catapulted ejection seats giving it a potential of on-the-deck above 60 kts, or perhaps, better. Other areas: the CPI/ADR and bird strike problem will continue to receive close attention by the flight safety organization.

Time-consuming and expensive? Yes. But saving lives makes good sense from any viewpoint — the Holloman sled trials were a significant step forward in our safety program.

F/L DE Wright, now Mr Wright, schoolteacher, served until this summer in the safety equipment division of the Central Experimental and Proving Establishment at Uplands. An RMC graduate, he received a Civil Engineering degree from the University of Toronto, served as maintenance officer at the Sabre OTU Chatham; for three years he held a research and development post at the Institute of Aviation Medicine in Toronto and in 1963 was transferred to CEPE. He is presently teaching science at Prince Edward Collegiate, Picton, Ontario.

# The Big Inch



Many pilots have set an altimeter 1000 feet in error; fortunately, the error is usually detected before it causes an accident - but not always. For example, an incredibly lucky crew of a T33 actually flew into the ground during a letdown at Calgary and managed to get airborne again, damaging only the speed brakes, flaps, and tip tanks!

One common factor causes these errors: *the altimeter setting required an adjustment of more than 500 feet.* In other words, it required less winding of the subscale to set the altimeter 1000 feet in error than it did to set it correctly. An inattentive pilot concentrating on only the last two digits could understandably overlook his error when given the altimeter setting, because the 1000 feet represents one inch of mercury.

This potentially dangerous error can be eliminated:

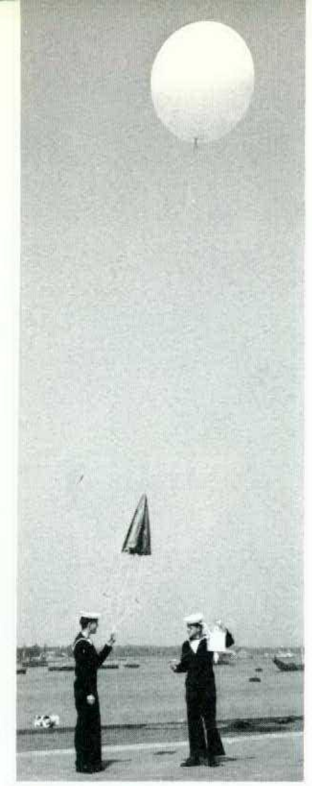
*PILOTS—beware of large pressure changes and of an aircraft that has not been flown recently.*

*TECHNICIANS—on BFIs, don't leave altimeters badly out of setting.*

*FORECASTERS—special mention of rapidly changing pressures can alert the pilot.*

Flight Comment wishes to compliment RCAF Stn Winnipeg for the poster they produced as a result of a near miss from an altimeter being set 1000 feet too high. The poster appears on the back cover.





Releasing a radiosonde from the flight deck of HMCS Bonaventure

# Weathermen at Sea

**LCDR D Nowell**
**Staff Officer Meteorology, Atlantic Command**

**During the course of a bitterly cold January night the supply of steam heat from the shore to the ship failed. Its restoration some time later split the radiators in the weather office and for several hours steam poured unnoticed into a locked office. By morning the storage compartment beneath the office was flooded; there was two inches of water on the deck; charts and publications had been reduced to pulp and almost every piece of equipment in the office was either ruined or inoperative. The next few days were hectic ones. Radio receivers and facsimile recorder were sent ashore and rebuilt; teleprinters, typewriter and meteorological instruments were disassembled, dried out and thoroughly oiled to prevent corrosion; phones and communication boxes were replaced and new supplies of charts, publications and stores were procured. The office itself was dried out, chipped down and repainted throughout. Ten days later the ship slipped from jetty 4 in Halifax for winter exercises in the Caribbean. By then, however the job was completed and the weather office was once more fully operational. It was, after all, just one of the many unusual and challenging problems encountered by the Bonaventure Weather Office.**

HMCS Bonaventure is employed primarily in an anti-submarine role. In support of that role it is the responsibility of the ship's weather office to provide advice and timely forecasts on all aspects of the weather which may affect the ship's operations and the safety of the ship, her aircraft, equipment and personnel. This is true whether the ship be operating in hurricane areas of the Caribbean, in ice conditions off northern Labrador, in gales to the north of Scotland, in dust storms in the Mediterranean, or more commonly in thick fog off the east coast of Canada and the United States. The forecaster, therefore, must deal with a much greater variety of weather conditions than is normally found at a shore air station.

## Cramped Quarters

The weather office is situated on the starboard side of the ship, immediately below the flight deck and just aft of the island structure. By shore standards it is small and cramped for space and it has numerous wires, pipes and ventilating ducts cluttering the deckhead and bulkheads, (ceiling and walls). Despite this, it manages to pack in most of the essentials of a modern forecast office including specially designed radiosonde equipment and a considerable amount of communications equipment. Meteorological instruments are mounted at suitable vantage points on the bulkheads while any remaining space is utilized for the display of weather charts and diagrams.

Unlike the shore office, the ship's requirement for weather charts and basic weather data changes considerably from day to day. Thus, the weather broadcast which meets today's need may be almost useless three days later and a thousand miles away. It follows that the forecaster must devote a considerable amount of time and energy to acquiring sufficient weather information before he can even begin to think about analysing charts and preparing forecasts.

## Info via Radio

Weather information is obtained by radio facsimile and radio teletype (RATT) receivers installed in the weather office. With the facsimile recorder in continuous use and the RATT copying two simultaneous weather broadcasts at 60 to 100 words per minute, the office has the capability of receiving a tremendous quantity of weather information. Unfortunately, however, the reliability of radio weather broadcasts falls far short of that provided by a landline transmission. Interference is common, not only from atmospheric sources but also most annoyingly from the ship's transmitters. Broadcasts which can be heard loud and clear one moment fade into obscurity the next. Often, especially during the early hours of the morning, it is impossible to copy any weather broadcast. The forecaster therefore, must acquire a considerable knowledge of the various weather broadcasts available, and become familiar with their assigned frequencies and schedules. Thus he becomes adept at switching from one broadcast to another. It is this aspect of his job which is so different from that of the forecaster ashore.

## Observations

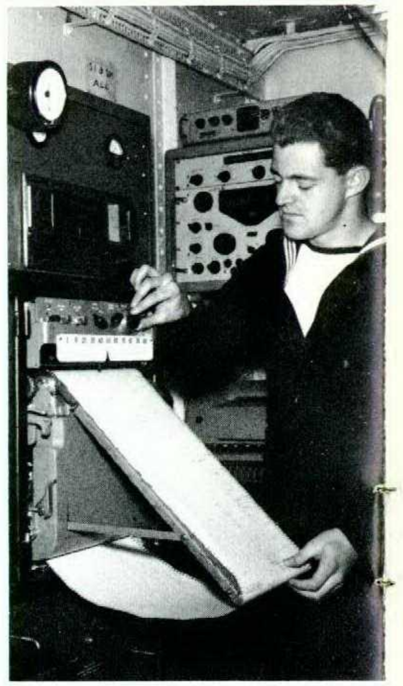
At sea the weather office is manned continuously and a full weather observing and forecast program is carried out. Coded reports are prepared every three hours and transmitted to the appropriate shore authority after which they receive widespread distribution through the international meteorological reporting system. A radiosonde release is made each morning and provides invaluable upper air data for use in the shore weather centres as well as in the ship's own forecast program. Preparing and releasing a radiosonde during rough weather can be both difficult and hazardous. It requires considerable skill and experience to avoid dunking it in the water immediately after release. To ensure a successful launch the carrier may have to alter course in order to provide more favourable winds across the deck. Using helium instead of hydrogen removes any risk of explosion should a balloon be accidently burst during release.

## Forecasting

Preparation of the forecast for use by the ship and the squadrons is made difficult since it is frequently impossible to know exactly just where the ship will be at a given time. During an exercise the ship may make frequent alterations of course and be in a position far removed from that anticipated when the forecast was issued. Thus, a forecast of rapidly clearing weather, made on the assumption that the ship would continue on a westerly course, becomes invalid a short time later when the ship is diverted to the southeast. Aircraft returning to the ship may now find landing in conditions of rain and low ceilings instead of the fine sunny weather predicted at the briefing.

## Any Alternates?

When the ship is operating far from land it is often impossible to provide her aircraft with an alternate airfield ashore. This does not prevent flying, however, which will usually continue unless the ceiling and visibility fall below 2–300 feet and half a mile. This places a heavy responsibility on the weather office so that a very close weather watch has to be maintained when the ship is at flying stations. Observations are then taken hourly or more frequently if necessary. Formal weather briefings are given in the ship's briefing room to the aircrew prior to each launch. Briefings include all aspects of significant weather over the operational area, and a terminal forecast for the ship. Details of the 'beach' weather, including the latest weather actuals and forecasts, are provided when applicable.



Operating radio teletype receiver to obtain meteorological information

A met mate computes an upper air ascent in the Bonaventure

A weather map is received in Bonaventure's meteorological office by radio facsimile

LCDR D Nowell, Staff Officer Meteorology, Atlantic Command, has been in the weather service in Canada since 1956; four years with DOT and five with the RCN. He was Weather Officer on the Bonaventure for 3½ years. Before coming to Canada he was a forecaster with the RN Weather Service in England and on the staff of the RN School of Meteorology. LCDR Nowell has an honours degree in Applied Mathematics and a MSc in Meteorology from Imperial College, London University, England.

## Sea-fog—a Nightmare

Undoubtedly, one of the greatest weather hazards facing the ship's aircraft is sea fog. This forms when warm and moist air moves over a cold water surface. It is therefore prevalent over the cold waters to the south of Nova Scotia and Newfoundland especially from May to August. Since this is the area in which Bonaventure frequently operates, the forecaster has a heavy responsibility to ensure that the ship is not caught in thick fog when the time comes to recover aircraft. With sea temperature changes of 15-20 F occurring in less than a mile this is no simple task; the ship can become enveloped in fog in a matter of minutes. However, with care, and experience in preparing sea temperature charts and a constant watch on the sea thermograph for indications of a drop in sea temperature, it is possible to permit flying operations in very marginal conditions. But there have been many anxious moments and the forecaster is ever mindful of an incident which occurred during a NATO exercise off Iceland during the 1950s when only a miraculous and brief clearing in the fog prevented the ditching of many aircraft.

## Winter Storms, Gales etc

If fog at sea provides the occasional news item it is the hurricane or storm which makes the headlines. A single storm may result in damages amounting to hundreds of thousands of dollars to a ship the size of Bonaventure. The hurricane, though spectacular, can usually be avoided since it is likely to be slow moving and cover a limited area. The winter storm of the North Atlantic, however, is quite a different problem. It deepens rapidly, moves quickly, extends over many hundreds of miles and may contain winds and seas the equal of those encountered in a hurricane. Since it may be impossible to avoid, the forecaster must attempt to provide adequate warning of its approach so that the ship can be secured for rough weather. Provided he does so, the amount of storm damage to the ship and to aircraft secured on the flight deck, can be held to a minimum.

Gales also provide many other problems for an aircraft carrier. The deck may become too unsteady for safe flying operations while aircraft secured on the forward end of the flight deck may make it impossible for the ship to turn into wind without risking considerable damage from waves breaking over the ship's bows. In the weather office there are also minor problems and discomforts. The barometer becomes difficult to read with the mercury pumping up and down; even a simple task of typing requires a new skill in timing if the carriage is not to fly across the machine each time the ship rolls. There is something quite hilarious in watching a forecaster attempt to hold onto and draw up a weather map while the roll of the ship forces him to run from one side of the office to the other!

Rather strangely, interruptions in the carrier's flying program are caused more frequently by light winds than by gales. Then, even with the ship making in excess of 20 knots there may still be insufficient wind across the deck for the safe launch and recovery of aircraft. In the tropics this problem is further compounded by conditions of high temperature and high humidity. The resultant reduction in air density and engine power may well be sufficient to prevent a helicopter from hovering.

Perhaps the greatest satisfaction in the work of the forecaster aboard an aircraft carrier is derived from the fact that he is a part of a well organized and smoothly run operations team. Through personal weather briefings given to the ship's Captain and Operations Officer he has a very considerable influence upon the planning and conduct of operations. The ship may move 200 miles south during the night on the basis of his forecast of deteriorating weather, or a refuelling may be advanced by 24 hours in anticipation of approaching gales. Indeed, his advice may often mean that an operation is successfully completed when otherwise it might have failed. From time to time there are the inevitable wrong forecasts. These are accepted as being cases of the weather letting the forecaster down! Just occasionally, however, the selection of suitable weather areas permits an early completion of operations and an early return to harbour. The forecaster is then a very popular man aboard ship and he can truly feel that his job is well worthwhile. ■

# FROM AIB FILES

## COSMOPOLITAN
### Eland Engine Turbine Assembly Problems

Thermocouples will be installed to give the turbine bearing temperature, enabling the crew to detect an incipient failure well before actual failure of the bearing. We expect this change will be issued as a 6A modification, installation to be completed by October.

Instances of turbine blade rubs are suspected to be caused by vibration of the turbine shaft due to a slight imbalance of the engine rotor assembly. This imbalance is believed to be caused by loss of torque on the compressor shaft rear ring nut. A special inspection, at the time of turbine removal, has been called for on all engines with Eland Mod EL1111 incorporated.

## ARGUS
### Horizontal Stabilizer Attachment Fitting Problems

During a routine inspection an alert technician discovered some under-torqued bolts securing the attachment fittings to the primary structure. An inspection of all aircraft resulted in the discovery of cases of stress corrosion, mainly in the reinforcing channel of the front tailplane attachment fittings. As a result of these findings the tailplanes were removed from all Argus aircraft and the associated channels and fittings were thoroughly inspected. The channels, originally manufactured from an aluminum alloy, are being replaced by steel channels. The replacement program should now be complete.

## T33
### Turbine Blade Failures

Preliminary investigation on a failed turbine blade on a T33 Nene engine has revealed bluing of the turbine blades and buckling of the nozzle guide vanes. The turbine had been subjected to overtemperature. Of course, the only way this problem can be eliminated is not exceeding JPT limits; in any case, religiously report inadvertent overtemps in the L14. The report should include maximum temperature, duration of overtemperature, and rpm at time of overtemperature.

### Overheat Warnings

In 1964, out of 36 inflight fire or overheat warnings on the T33, 27 were false. The majority of the real warnings were caused by "blow-by" of exhaust gases at the tailpipe adapter ring. CEPE are investigating changing the tailpipe adapter from an expansion fitting to a solid fitting. CFHQ and AMC are looking at the sensor probes to see if the false warnings can be eliminated. Meanwhile, continue to view every case as a "real" one and get the Bird on the ground.

## EXPEDITOR
### Repositioned Feathering Buttons

A prototype installation has moved the feathering buttons to the top centre panel so that both pilots can see and reach them. The B16 compass, presently in this location has been removed and a B21 compass mounted on the forward side of the overhead panel. Fleet fitment has been approved.

### Undercarriage Warning Horn

The warning horn activation system will be changed so that retarding one throttle with the wheels up will not blow the horn. This feature should help prevent wheels-up landings during SE practice by eliminating the need to press the horn cutout button. Of course, the horn will still sound if the other throttle is retarded with the wheels up.

### Undercarriage Warning Lights

The undercarriage warning light system will be changed so that the red light will be on only while the wheels are unlocked or in transit. No lights will indicate when the wheels are up and locked; the green light will indicate a down and locked condition.

The Training Command suggestion calling for the installation of a light in the nose of the aircraft, to indicate to ground observers that the undercarriage is down and locked has been supported. It is expected that approval for local modification will be issued in the near future.

## NEPTUNE
### Structural Damage

Two cases of fuselage buckling and associated structural damage were found in the area ahead of the wing leading edge. Not all users had experienced this type of failure; the cause was most probably harsh use of brakes at low speeds. If this cause assessment is correct, brakes must be used with extreme caution. Regular inspections of the suspect areas are required.

## TUTOR
### Canopy Loss

Two Tutor canopies have come off in flight. The cause of the first occurrence is undetermined; the cause of the second canopy loss was a short circuit in the external canopy switch. Directions were issued by AMC in the Spring for "potting" the external canopy switch and for covering it with a boot to prevent moisture entering the switch. An engineering procedure being prepared, calls for wiring the "canopy open" circuit through the ground/air safety switch, isolating the circuit in flight.



# ARRIVALS and DEPARTURES

J57, ENGINE RUN-UP The NCO and his crew of two were detailed to test run a J57 engine (from a Voodoo) in the test cell. All connections were made in accordance with the check-list and the engine started. All seemed well up to military power but as the afterburner was cut in, the restraining mounts let go and the engine took off! However, without wings, the flight was at high speed but short; the engine came to rest 100 ft from the test cell, a write-off. As the engine left its mounts, the fuel lines ruptured and fire broke out. The fire fighting equipment at the site was insufficient to control the fire and the test cell suffered heavy fire and smoke damage.

This very expensive accident was caused by the sergeant inadvertently installing unserviceable thrust rod pip pins. As a result all units have been instructed to drill the ends of the pip pins and install a safety pin as an added safety precaution. Obviously the pip pins should have been checked for serviceability, but significant is this man having run up or trimmed 32 engines in the preceding 38 working days.

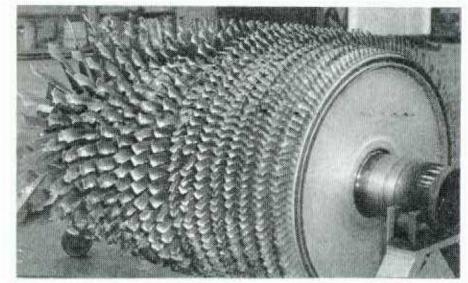
Prolonged and repeated exposure to high intensity noise such as are encountered in an engine test cell area is known to reduce a man's working efficiency. Noise-exposure symptoms such as distraction, irritability and nervousness have been observed even in persons wearing protective equipment.

T33, WHEELS-UP LANDING In the words of the supervisor "our efforts to prevent this type of accident with a number of built-in safety features failed". The student pilot was flying a practiced forced landing pattern and while at the high key position he elected not to lower his undercarriage. "While concentrating on making the field I neglected to select gear down and subsequently landed with the gear up."

"When I originally took power off...the horn was blowing...so I was not aware of anything unusual when I turned on final. It was still blowing when the aircraft came to a stop on the runway."

Enough said.

CF104, FOD Undercarriage safety pins probably come at $2 a pin, but jet engines cost somewhat more. In this case one pin wrote off one engine. On shutdown the groundcrew man, in untangling the pins "didn't realize" that he was close enough to the engine intake to have one sucked out of his hand and into the intake.

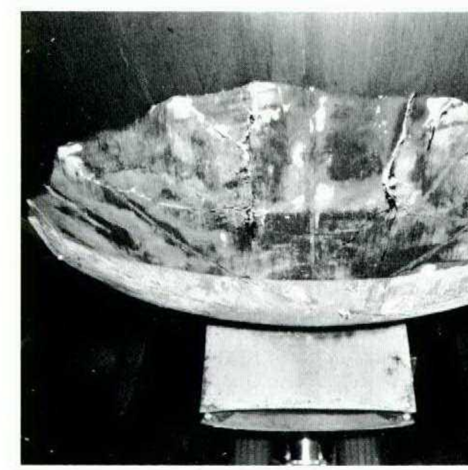


While this unnecessary damage to a valuable engine appears to be carelessness the prescribed shutdown procedures weren't sufficiently explicit to preclude this happening. In fact, the procedure which the man had followed did not sufficiently guard against the possibility of FOD, but had been in force for several years.

When things are being yanked from your hands - you're too close.

ARGUS - WHEELS UP The Argus touched down smoothly and as the nosewheel settled to the runway, the captain ordered yoke forward and flaps up. The co-pilot, inexplicably, reached out and raised the undercarriage handle! As the nose settled, the captain pulled back on the control column. Fortunately he had enough airspeed to raise the nose slightly. The co-pilot, realizing what he had done, immediately flipped the handle back down. Luckily the nosewheel locked back down and the aircraft was brought to a stop normally. The nose, however, had contacted the runway and the radome and undercarriage doors were damaged. The quick reaction of the captain, F/O JM Gauthier, undoubtedly prevented major damage to the aircraft.

Why do such accidents happen? The co-pilot himself could not offer any explanation as to how he could make such a basic mistake as raising the undercarriage instead of the flaps. He was not tired or preoccupied and was feeling fine—there was just no logical reason for it. What more can be said? We all know that when flying, it is vital to keep alert and make every action positive and deliberate. One point though, whether flying an Argus or a T-bird if there is no operational necessity to raise the flaps during the landing role it might be a good idea to leave them down until the aircraft comes to a full stop. Isn't that the way Training Command teaches it?



NEAR MISS

OPERATIONAL HAZARDS

SAFETY SUGGESTION

## Safety Pins

Every pilot is well aware that orders clearly state that it is his responsibility to insert the seat safety pins in aircraft equipped with ejection seats before leaving the cockpit. But pilots, unfortunately do not have infallible memories. Recently we had a case where one forgot to put the pins in; luckily, he didn't fire the seat when climbing out. However, the really disturbing part of this incident was that later, two technicians worked on the aircraft (in the cockpit) and were unaware that the seat wasn't safetied. Furthermore, neither of these two knew where to insert the pins had the danger been recognized.

This happened at a base with no jet aircraft on unit establishment, although it is open to transient jets. While it may be understandable that the technicians did not know about inserting the pins, it would seem that basic airmanship should have told them that when working around explosive devices such as an ejection seat it must be checked for safety pins. If they were so unfamiliar with the aircraft that they couldn't tell whether or not the seat was safetied, common sense should have warned them to check with someone who could.

It's not only against orders to work in a cockpit without the safety pins installed, it's downright dangerous.

## *Comments* TO THE EDITOR

**Dear Sir;**

With regard to the letter submitted by F/L Pridmore (May-Jun 65), I would like to voice a few comments from the other side of the fence.

The responsibility for the correct altimeter setting in the aircraft should rest entirely with the pilot once he has received it from ATC, and not left to a PAR controller to check. Airmanship, I think, is the word (see page 11 May-Jun 65). Traffic Control are responsible now for telling the pilot to check his wheels, his flaps, his zero lanyard, his trim, his canopy. Next thing we know it will be the pre-flight inspection.

Going back to this altimeter business, let me outline a few personal observations witnessed over the years:

- an F102 on a surveillance approach, in cloud extending from 1500 ft to above 30,000 ft, was advised "passing through surveillance limits" at 650 ft MSL and to report field in sight. The pilot reported still in cloud and executing a missed approach. As the base of cloud was 1500 ft, this proved rather mystifying to the radar controller. A second approach was initiated with the same results. On the next approach, the problem was solved. The pilot had misread his altimeter by *10,000 ft...*
- a T33 on an instrument approach, assigned a final approach altitude of 2000 ft (elevation 775), was observed on the elevation scope to be skimming the tops of the ground clutter at 9 miles from touchdown. When asked to confirm his altitude, as he was observed to be dangerously low, the pilot replied that he required azimuth information only and to disregard his altitude. When queried after the approach, the pilot stated that he had visual contact with the ground and did not want to reenter cloud. Weather at the time was 300 ft and less than one mile visibility...
- Precision Approach Radar (PAR) approaches, being flown in IFR weather, which have resulted in the pilot sighting a break in the overcast and diving for the ground, completely disregarding the frantic controller's plea to pull up or to go around; (remember, the radar controller is IFR for the entire approach)...

The PAR controller is a busy individual when doing his little bit during an instrument approach—cross-checking his cursor alignment, indicator alignment, operating controls, radio frequencies, circular polarization, and a few other odds and ends. To have this man consult a range/altitude chart while attempting to ascertain drift, azimuth corrections, elevation corrections, ranges, activating antenna servos, reducing gain controls, obtaining tower clearances, applying devices to reduce precipitation and ground clutter, and oh yes, to talk continuously to the pilot, really seems a bit much.

Air Traffic Controllers are really not a bad breed... and are most assuredly Flight Safety conscious... I feel, however, that it's just about time we put the shoes on the right feet. All we ask is an even break and we'll do our job, but we expect the man on the other end to do his.

F/L KD Macdonald
RCAF Stn Goose Bay



BIRD WATCHERS' CORNER

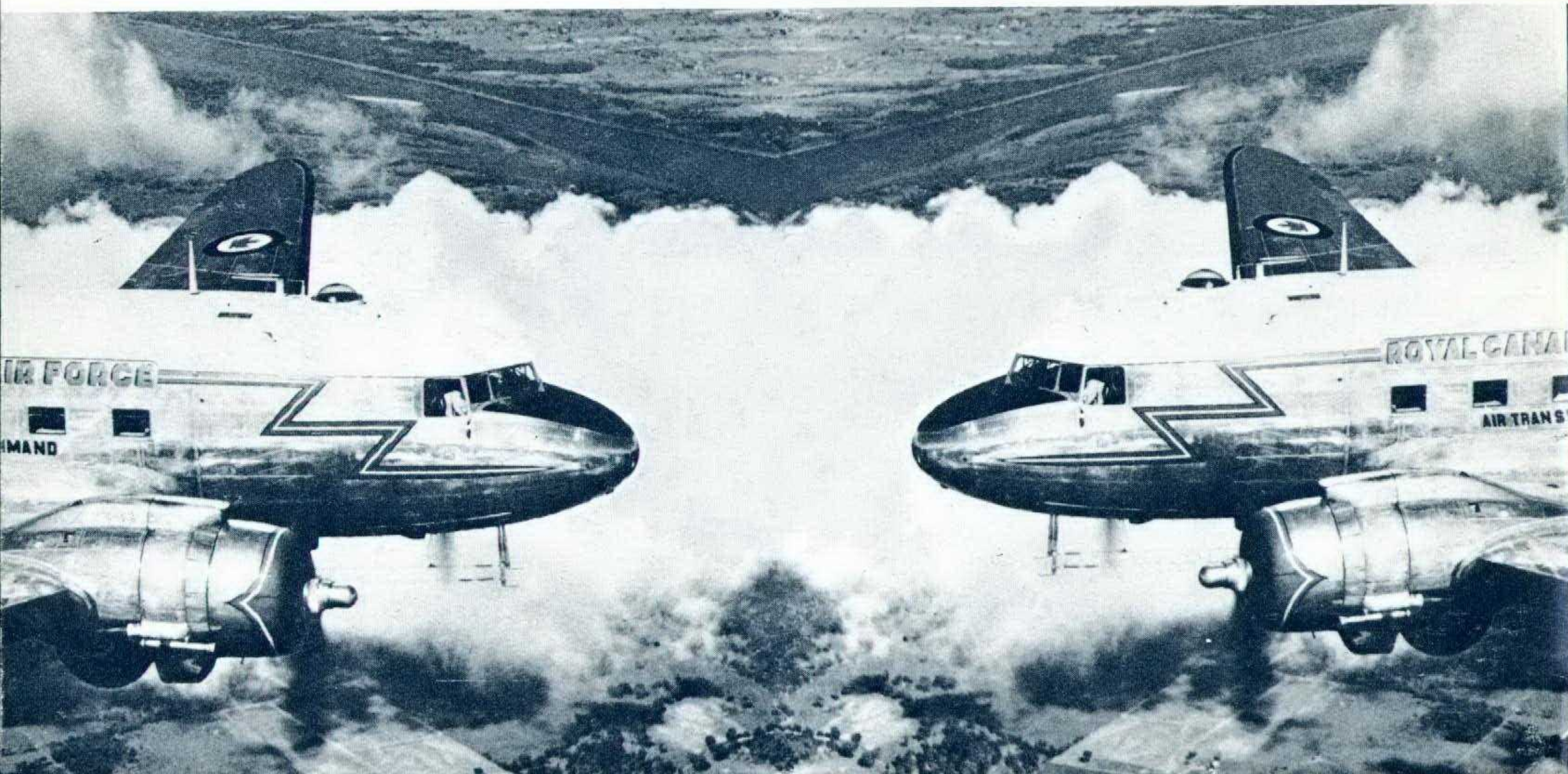
# THE BARE-BREASTED DECK DIVER

This bird (Nauticus Hypercontrolum), driven by a curious instinct, builds its nest on any sea-going object. Unfortunately the objects chosen have rather small alighting areas and in an attempt to preserve the species from extinction, nature has provided the Deck Diver's perch with various devices designed to assist him alight on the proper spot. The Deck Diver, however, in spite of repeated advice to the contrary, impulsively chooses at the last moment to ignore the devices and dives for the perch. His judgement is invariably faulty and too late he finds that his feet cannot clear the edge of the nest. With a resounding thud and dragging bruised feet, the Deck Diver slides to a halt, dazed and puzzled among the cables, wailing his characteristic cry:

GOTAROUNDDOWN-GOTAROUNDDOWN-GOTAROUNDDOWN

# 1000 FEET SEPARATION

# THEN HOW COME ?




# HERE'S HOW


Flight Comment wishes to compliment RCAF Stn Winnipeg for the poster they produced as a result of a near miss from an altimeter being set 1000 feet too high.