OCTOBER 1963
VOL. 15, No. 8

ROUNDEL

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ROUNDEL

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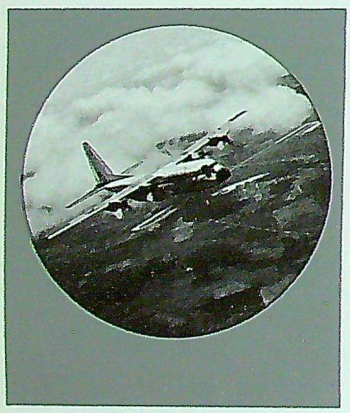

COVER CAPTION

No. 435 Sqn. *Hercules* leaves RCAF Stn. Namao and heads for the Arctic (see page 2). Photo by Sgt. K. Ferguson.

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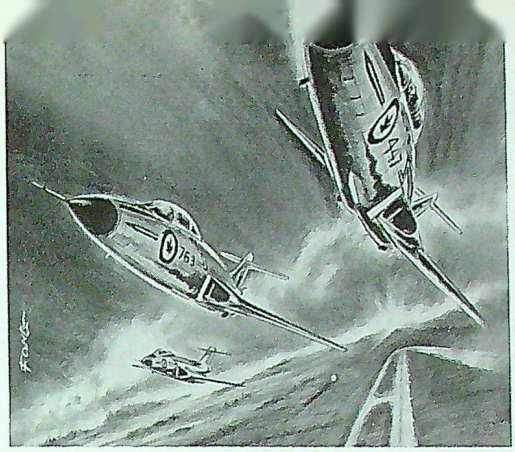


ON THE BREAK

Dr. J. C. Arnell

ACCORDING to Dr. Jack Arnell ("Operation Eclipse 1963", page 4), there were more aircraft in Canadian skies making measurements of July's solar eclipse than ever before. In the Great Slave Lake area, besides the *Yukon* carrying Canadian scientists, was a DC-8 chartered jointly by the National Geographic Society and Douglas Aircraft Company. It operated at 40,000 ft. and had a point of interception of the eclipse 30-40 miles west of the *Yukon* to prevent the two scientific expeditions interfering with each other.

Along other parts of the eclipse path specially-equipped USAF KC-135s and F104Ds carried out observations. In the southern Quebec area an RCAF CF-100 carrying infrared equipment obtained information on upper atmosphere radiation. How many private flyers went up for a look is not known.

S/L A. Booth

AIR traffic controller S/L Art Booth ("ATC's New Look," page 9) logged several years of tower time both in Canada and overseas before assuming his present assignment in 1961 as a staff officer at AFHQ. Most of the equipment he describes hadn't even reached the drawing board stage when he (and your editor) operated in what used to be the flying control field.

Enlisting in the RCAF in 1941, S/L Booth became a navigator and, at war's end, was on the staff of the Suffield Experimental Station in Alberta. He took an administration course after the war and in 1948 became a flying control officer, serving subsequently at Whitehorse, Rivers, Zweibrucken, Penhold and Winnipeg.

RCAF personnel serve in more than a dozen foreign countries as liaison officers, members of UN truce teams or attached to military missions. Some are also assigned as exchange officers in other air forces, which reciprocate by sending specially selected officers to serve in Canada.

Surely one of the most beautiful spots for such a tour is the USAF Academy near Colorado Springs, described by S/L Russ Barber on page 18. An air gunner during World War II, S/L Barber re-enlisted as a radar technician in 1946 and won his radio officer's wings and commission in 1948. He now serves as a staff officer at ATCHQ, Trenton.

S/L R. R. Barber

PHOTOGRAPHY is a hobby as well as a business for F/L Bob Warner ("Joint Photo Intelligence Centre," page 22). A wartime radar mechanic, he re-enlisted after graduating from university in 1949 and won his navigator's wings in 1951. Maritime operations and training tours followed until his present assignment to JPIC in 1961.

F/L R. G. Warner

WHILE this issue is on the press, we expect to be attending the RCAF Association's annual convention in Vancouver. Coverage of this meeting will appear in November.

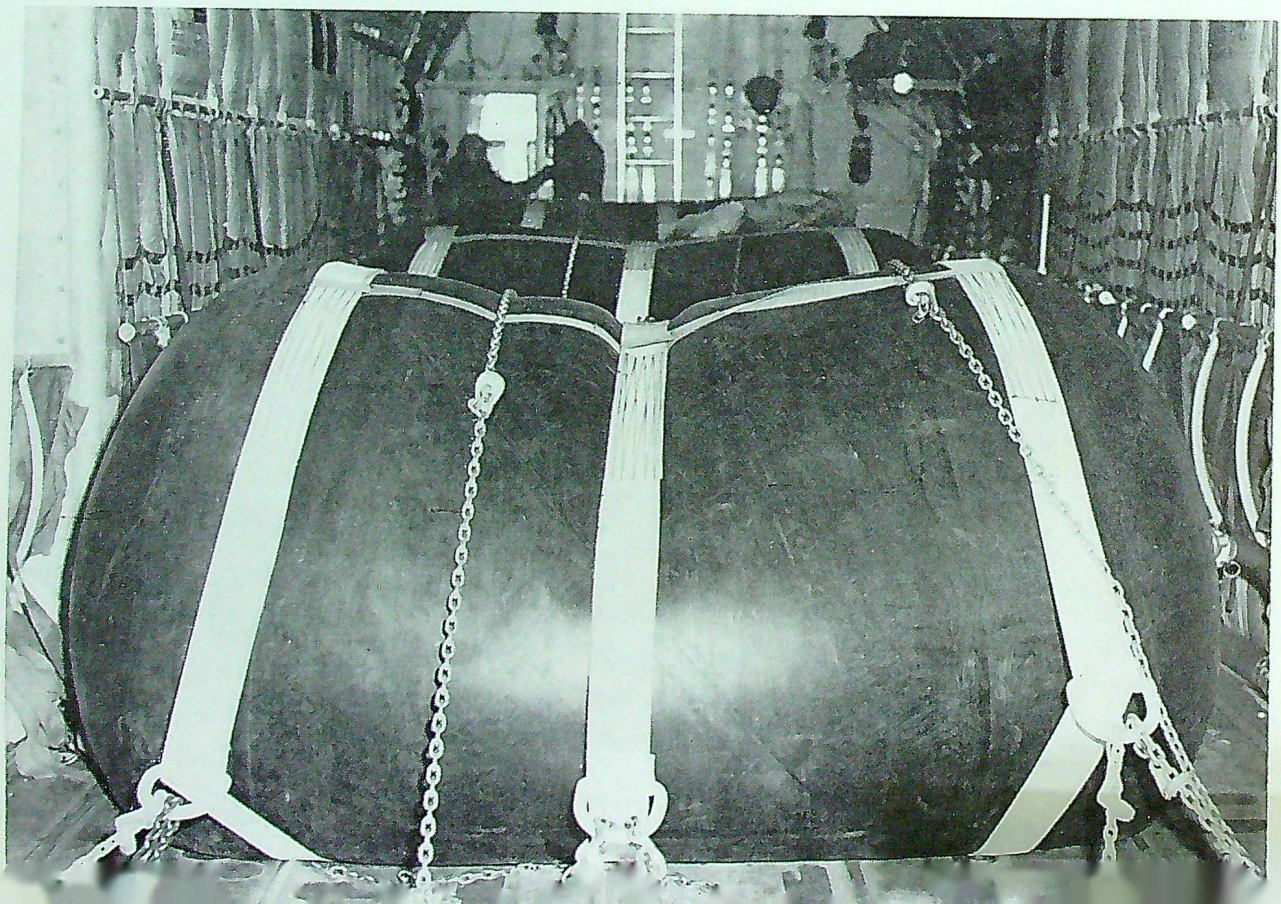
A. Patou S/L

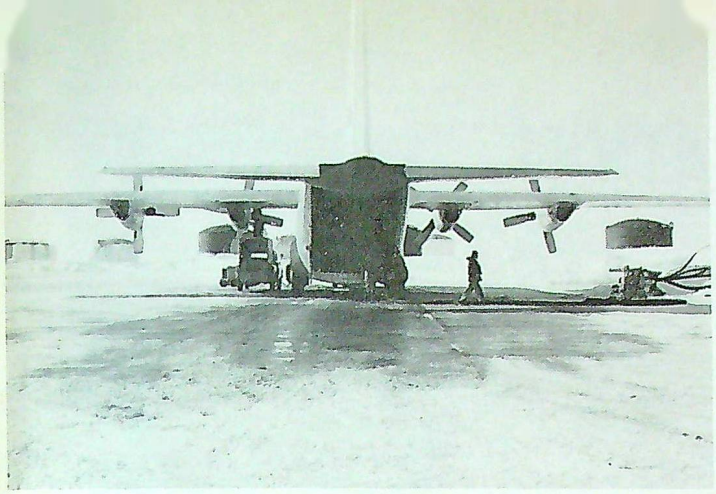
Editor

Five four-ply butyl rubber tanks, each capable of holding 800 gal. of fuel-oil, are installed in *Hercules'* cargo hold for spring re-supply of arctic bases.

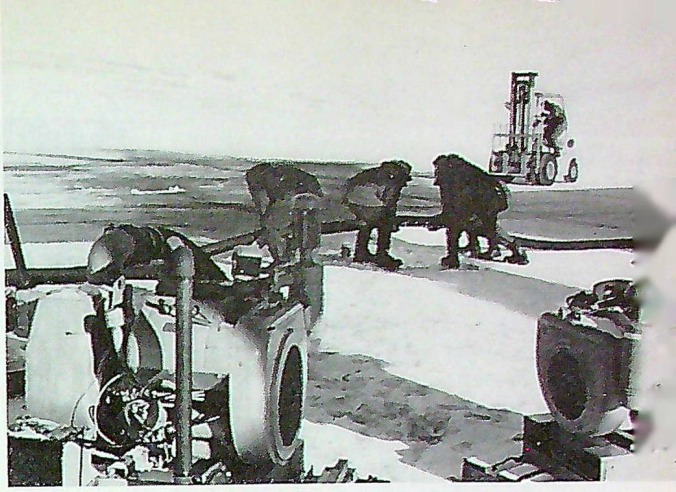
IT'S IN THE BAG

Fully-loaded tanks look like giant sausages. Loading time is reduced to 24 minutes (from the previous two hours when fuel-oil was carried in 72-drum loads) and only 15 minutes is required to pump out the cargo.





A 4000-gal. cargo of fuel-oil is pumped aboard *Hercules* from storage tanks at Resolute Bay. Tankers bring fuel in during summer six-week ice-free season. RCAF then airlifts it to arctic weather stations.



Airmen couple hoses from storage tanks at arctic airstrip to rubber tanks in *Hercules*. More than 150,000 gal. of fuel oil, plus 45,000 lbs. of general supplies and rations, were delivered last spring to Alert, Eureka, Mould Bay and Isachsen.

PHOTOSTORY FROM ALBERTA AREA PUBLIC RELATIONS OFFICE

LAST month the arctic tundra reverberated to the roar of turboprop engines as the RCAF carried out its annual fall resupply operation.

To the crews flying and servicing the C-130B *Hercules* from No. 435 Sqn., Namao, semi-annual arctic resupply operations are round-the-clock exercises. The latest airlift was under the control of S/L H. Cram, deputy commander of No. 435 Sqn.

Cargo is first delivered by ship to the forward bases of Resolute Bay, NWT, or Thule, Greenland. In both annual operations, the destinations are the same: the four arctic weather stations at Alert, Eureka, Mould Bay and Isachsen.

This year the spring resupply, code-named Boxtop Eight, had a "new look". Instead of hundreds of gas and oil drums being laboriously loaded and unloaded from the *Hercules*, the aircraft was fitted with five specially-designed rubber tanks. These sausage-shaped "blubber bags" are each seven feet long, four feet across and of 800 gallons capacity. They proved to be highly satisfactory. Mobile pumps loaded the *Hercules* from the 144,000-gal. storage installation at Resolute Bay, and from the tanks at the USAF Base at Thule, where the fuel-oil had been left by ships during the ice-free season. The liquid cargo was pumped from the *Hercules* at each weather station where tanks capable of storing approximately two-years' supply have been installed.

Only 15 minutes were required to discharge the 17-ton, 4,000-gal. cargo from the tanks in the *Hercules*' fuselage. Loading time was reduced to 24 minutes from the one and a half to two hour average time required when the fuel-oil was airlifted in 72-drum loads.

Significant savings in time, manpower and materials are realized from this new method. An immediately apparent saving was in drums, 6,000 of which were used in 1962's record-breaking Operation Boxtop Seven. Each drum is valued at approximately five dollars, and in many cases they are more costly to return than to abandon.

This fall drums rather than rubber tanks were used, due to small quantities of mixed fluids carried. Main portion of 570,000 lb. cargo last month consisted of food and other supplies.

OPERATION ECLIPSE - 1963

By Dr. J. C. ARNELL
Scientific Adviser to the Chief of the Air Staff

OPERATION ECLIPSE 1963 began in the summer of 1961 with a telephone call from Dr. C. S. Beals, the Dominion Astronomer, to Air Force Headquarters asking if there was any possibility of the RCAF making an aircraft available for scientific observations during the total eclipse of the sun on 20 July 1963. This inquiry prompted a quick study of the likely scale of such an operation and the breadth of interest among the scientific community. From this study, it appeared to be both feasible and in the national interest to mount the operation.

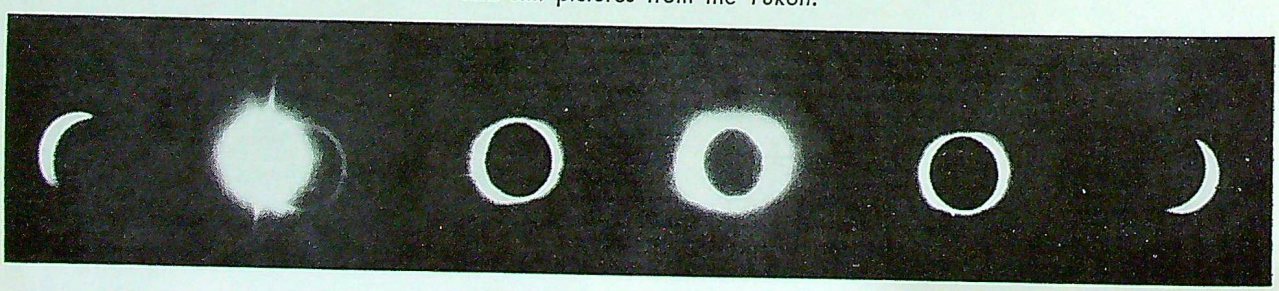
The Chief of the Air Staff then authorized the establishment of a planning committee with scientific representation from the Defence Research Board, the National Research Council and the Dominion Observatory under the chairmanship of his scientific adviser. At the first meeting of the committee, held in October 1961, the three scientific agencies all indicated that they were prepared to sponsor experiments. It was clear from the discussion that a very valuable scientific program could be formulated and the decision was taken to proceed with its development. The Dominion Astronomer was assigned the responsibility of co-ordinating the scientific program, while the RCAF assumed responsibility for all operational aspects.

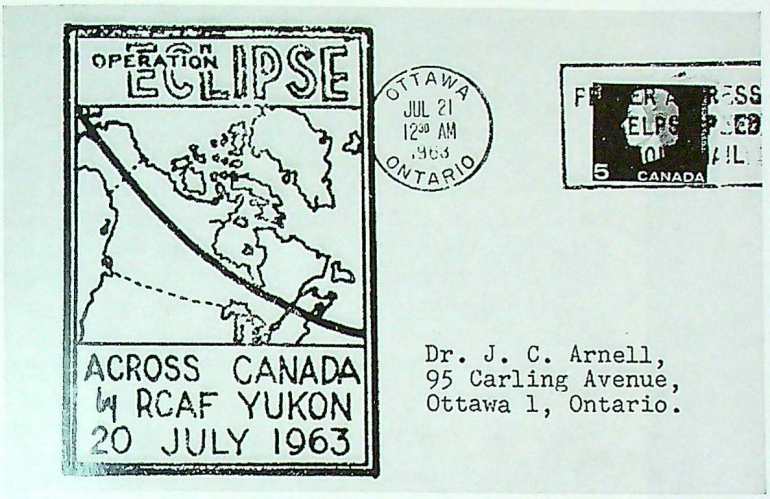
PREVIOUS OPERATIONS

This was not the first time the RCAF had undertaken to provide an airborne platform to view a total eclipse of the sun over Canada. On 9 July 1945 photographic observations from the air of the total eclipse were carried out by No. 7 Photo Reconnaissance Wing from a base of operations at the Central Navigation School, then located at Rivers, Manitoba. Four aircraft (a *Spitfire*, a *Mitchell*, and two *Ansons*) were used. In three of these, a total of seven cameras were mounted to provide both direct photography and spectroscopic data. The fourth aircraft, an *Anson*, was used to take motion pictures of the partial and total phases. All the cameras were standard types employed in aerial photography.

The 1945 eclipse occurred in the Manitoba area in the early morning, the period of totality varying from 33 to 38 seconds in the region of airborne observations. All aircraft operated in an area within 100 miles to the north and northwest of Dauphin. Different altitudes

To provide a visual record of the eclipse, RCAF photographers took both cine and still pictures from the *Yukon*.





This philatelic cachet was designed for mail carried on the *Yukon* flight of 20 July 1963. Following the flight, the stamp was defaced to prevent later use. Mailed in Ottawa immediately after returning from Great Slave Lake, the letters were postmarked "12:30 a.m. 21 July" — a measure of the length of the trip home.

were used with the *Spitfire* at 33,000 feet, the *Mitchell* at 26,000 feet and the *Ansons* at 15,000 and 17,000 feet respectively. The operation was viewed as successful. It is believed that the first photographs of an eclipse to be taken from an altitude of over 30,000 feet and the first spectra taken from the air were obtained.

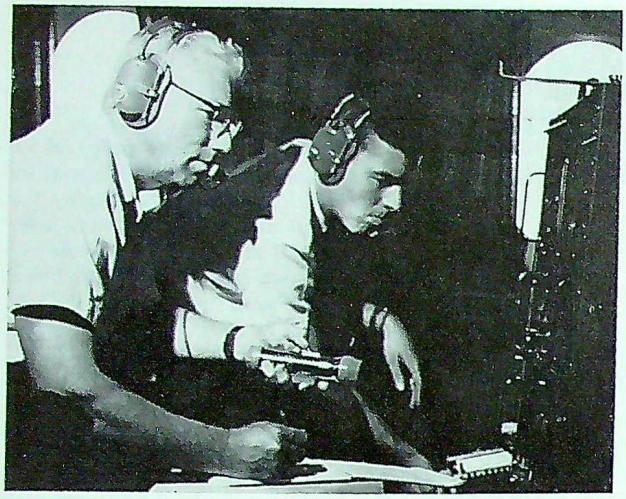
The second Operation Eclipse only involved one aircraft and was directed at the total eclipse of the sun on 30 June 1954. On this occasion the path of totality started in the area of Minneapolis, Minnesota, swung across northern Ontario, Quebec and Labrador, then on to Norway and Sweden. The planning for the operation was hurried, as the RCAF could not guarantee the availability of an aircraft until mid-April. At that time the "Ice Wagon", a *North Star* converted for studies of ice formation, was provided. The larger size of this aircraft afforded considerable flexibility in the number of personnel and amount of equipment which could be carried. However, the high vibration level in the cabin required that all instruments be mounted on specially designed tables with anti-vibration tops.

The scientific program, which was the responsibility of personnel of the Dominion Observatory and the National Research Council, was considerably more extensive than for the first Operation Eclipse. In addition to cameras, two spectrographs of a type usually used only in laboratories were mounted in the aircraft. These were used to record the coronal spectrum more precisely than had been possible with cameras. In addition, a search was made for a day-time display of aurora. To aid the observers in Sweden, a special report of the visual observations made during totality was radioed across the Atlantic and reached them before the sun was eclipsed there.

The *North Star* was adapted for the operation at RCAF Station Rockcliffe and several test flights carried out from there. Because the aircraft was unpressurized and had a normal ceiling of about 20,000 feet, it was recognized that weather might interfere with the observations. As a result, two possible observation areas were selected — one near Kapuskasing, Ontario, and the other near Goose Bay, Labrador. Full rehearsals of the operation were carried out at both locations on successive days a week before the eclipse. On 28 June the weather forecasts indicated conditions would be better at Goose Bay and the aircraft with the whole scientific expedition was flown to that station the following day. On 30 June high cloud was experienced in the observation area and only by forcing the aircraft to an altitude of 27,500 feet was it possible to view the eclipse in the clear. Again from the data collected, the operation was successful.

PLANNING FOR 1963

Before the airborne operation could be conceived, it was necessary to have some idea of the types of experiments which were contemplated. From these would come the definition of the size and complexity of the scientific apparatus to be installed and the necessary support services. It was decided at the outset that a large, pressurized air transport capable of flying at



Dr. M. D. Watson (right) and Mr. F. R. Park of National Research Council used this recording equipment to make photometric measurements of airglow.

30,000 feet was required. This reduced the choice immediately to either a *Yukon* or a *Hercules*. The subsequent choice of the *Yukon* was easy because of the need for a number of windows for making observations. During local flights to check the *Yukon's* stability and vibration level, it became obvious that both an autopilot and the synchrophasing equipment on the engines would be necessary. As both the *Yukons* in No. 412(T) Sqn. were so equipped, this squadron was assigned the responsibility of supporting the operation.

By November 1962 most of the experiments had been defined and the details of the installations were being worked out between the scientists and the CEPE technical officers. While it is one thing to build a scientific apparatus to function in a laboratory, it is quite another thing to construct it to withstand the accelerations of take-off and landing in an aircraft, together with the steady vibration in flight. Here real teamwork was necessary and could be observed at all times.

Preliminary tests had shown that the standard plastic windows in the aircraft were quite unacceptable for the more sensitive of the planned experiments. Special glass windows were procured for use with three of the equipments. Because of the pressure on these windows, their size had to be smaller than the normal windows for safety reasons. As a result, they were made circular and fitted into specially constructed metal window blanks, which acted as window replacements. In order to reduce handling, these were mounted in spare escape hatch doors, which could be removed from the aircraft and stored between flight tests.

During the spring of 1963 the tempo of effort began to increase and little by little the whole operation took shape. As might be expected, there were errors and oversights. Pieces of equipment could not be fitted into the aircraft in spite of careful measurements made beforehand; the special glass windows frosted over the first time they were flown at altitude; electrical power requirements increased beyond that installed to meet the stated needs. However, because of the early start, these were corrected with a minimum of inconvenience, wasted effort and time loss.

FLYING OPERATIONS

It had been decided early in the planning that the eclipse should be viewed over Great Slave Lake in the Northwest Territories, just where the Mackenzie River leaves the lake. This was the only location along the entire path of the eclipse across Canada where the sun was at right angles to the track of the moon's shadow. As it was planned to fly along the eclipse path to lengthen the period of totality, this was the one place where the sun would shine directly in the windows on the south side of the aircraft. The particular point chosen for interception was 61°12 N, 116°28 W.

The Great Slave Lake region is rather lacking in navigation aids and a study of the situation suggested that the DOT-operated low frequency radio beacon at Fort Simpson, about 175 miles down the Mackenzie River, should be the starting point for the run along the eclipse track to Fort Providence and on to interception. A round trip check flight on 3 June '63 from Ottawa to Fort Simpson showed that the radio beacon would be adequate as the starting point for the eclipse run. However, the absence of any other navigational ground aid made a cross-track error of 5-10 miles quite likely. Several solutions for an additional aid were examined and before any decision was reached, the DOT indicated a willingness to re-activate a low frequency beacon at Fort Providence to accommodate both the RCAF and the Douglas Aircraft Co., who were planning a similar flight along the same track with a DC-8 *Jetliner*. This permitted the use of the two radio compasses as ahead and astern indicators.

By early July the special windows were ready for installation, and most of the scientific equipment was available for calibration. Advantage was taken of the full moon to provide a light source similar to that expected during the eclipse. An early morning flight to a point beyond Anticosti Island was made between midnight and dawn on 10 July, during which the scientists had a couple of hours to make measurements

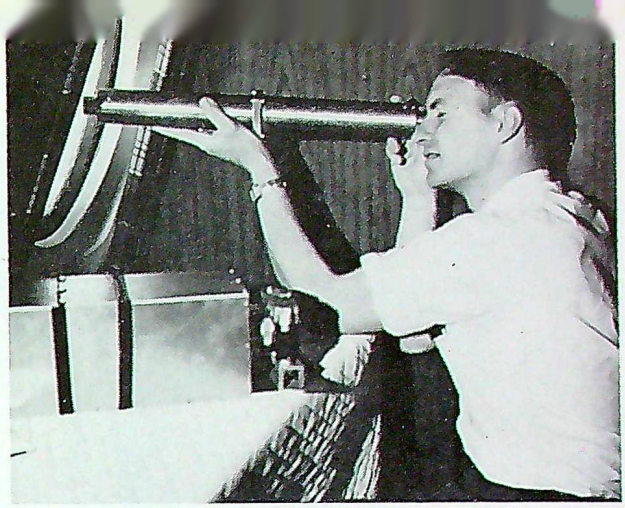
of the light of the moon until a line of thunderstorms blanketed the moon and forced a turnaround. It was on this flight, the first with the special windows, that difficulty was experienced with them frosting. This necessitated a further flight on 15 July to prove the effectiveness of small battery-powered automobile fans to keep the windows clear of frost.

Two further flights were made to Fort Simpson. A complete dress rehearsal took place two days before the actual eclipse observational flight. On both occasions, the aircraft was airborne before 0900 hours EDT to allow an enroute time of about 8 3/4 hours before eclipse intercept at 2138 hours GMT (1738 hours EDT). Although this should have provided at least an extra hour for eventualities, on the day of the rehearsal the aircraft reached Fort Simpson with only six minutes in hand. Adjustments in the flight planning and a slightly earlier departure on the final day resulted in approximately 45 minutes over Fort Simpson for last minute instrument checks and equipment calibration. On each occasion, a distance of about 4500 miles was covered.

WEATHER CONDITIONS AND NAVIGATIONAL PROBLEMS

Because of the northerly location of Great Slave Lake, it had been anticipated that clear, stable arctic air would overlie the area. If this were the case, it would have ensured ideal conditions for the observations. However, on the day of the dress rehearsal, the meteorological forecast for the area indicated the existence of warm Pacific air and a frontal line of clouds. Over Fort Simpson the situation was found to be worse than anticipated with a weather front lying across the flight track between there and Great Slave Lake. As a result, there was a solid cloud bank about 150 miles wide with tops reaching almost to 30,000 feet. Fortunately the aircraft was able to fly just over this cloud, so that no difficulty would have been experienced.

On 20 July nature was not as kind. The position of the weather front was very much the same, but the cloud formations were quite different. Instead of a solid bank of clouds, there were a number of layers of clouds which extended upwards to nearly 40,000 feet. These conditions existed all across Great Slave Lake and along the Mackenzie River. The cloud was not continuous and most of the time it was possible to see both the ground and the sun, but mainly through at least mist-like cloud. This was the situation at totality and while there was no noticeable effect on the appearance of the sun to the casual observer, there was some loss in the values recorded by the scientific instruments. The significance of this will not be known until the results are fully analyzed.

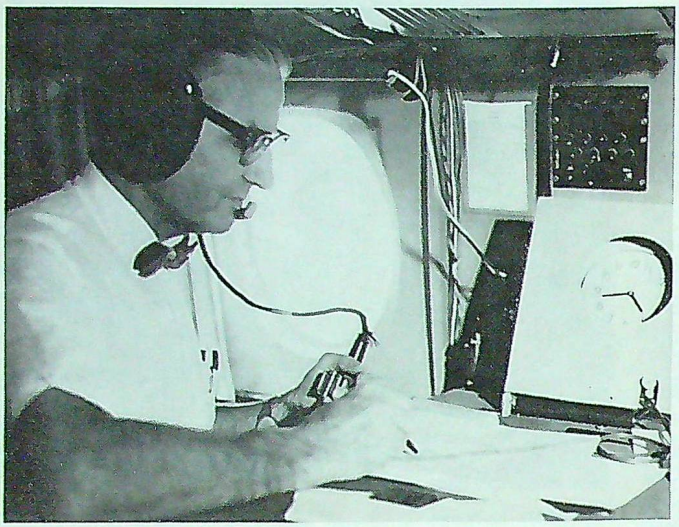


Prof. G. G. Shepherd, University of Saskatchewan, used this specially-designed telescope to search for daytime aurora during the period of darkness.

A further complication was the presence of a near-jet stream at 30,000 feet which was blowing from the south across the Fort Simpson-Fort Providence region and then turning to the east across Great Slave Lake. At the centre of this stream were winds of nearly 100 mph. This made navigation difficult during the run from Fort Simpson to the point of interception. Starting with a very large drift northwards, the navigator had to contend with a continually changing wind direction which increased the ground speed and reduced the drift. Everything had been allowed for on the run-in except a lack of any tail wind and as a result the aircraft was west of the planned point of intercept when overtaken by the moon's shadow, so that the eclipse was viewed approximately one minute early. It also seems likely that the aircraft had drifted several miles north of the centre of the eclipse path and about four seconds of totality were lost as a consequence. Thus, in spite of the best laid plans, nature intervened with excessive challenges and while viewing conditions and aircraft positioning were not all that were hoped, they were adequate.

SCIENTIFIC EXPERIMENTS

A total eclipse of the sun affords an opportunity to observe the corona of the sun, the effect of the gravitational field of the sun on starlight passing near it, and the changes which occur in the earth's upper atmosphere due to the sudden cessation of solar energy. It is also possible to scan the darkened sky for airglow and daytime aurora. Of all the experiments which may be conducted during an eclipse, only some are adaptable to an airborne operation. Some equipments, such as radio telescopes, are too large and others, such as



Mr. M. M. Thompson, Dominion Observatory, was "timekeeper" for Operation Eclipse. He announced over the *Yukon's* intercommunication system the exact moment of totality and counted off the seconds of darkness, helping the scientists to time their experiments for the greatest return.

special cameras, require too long exposures to be mounted in an aircraft. On the other hand, photometers, which are instruments capable of measuring light intensities instantly, are ideally suited for airborne operations. They are quite small and mobile and can thus be used for scanning the eclipsed sun or the darkened sky, while the readings obtained are continuously recorded on moving paper charts.

With the exception of the visual observations and hand-held camera photography for record purposes, all the experiments on Operation Eclipse made use of photometers. The photometers were of different sizes and sophistication and were used for different purposes, but the measuring principle was the same. The experiments performed by the Dominion Observatory team under Dr. Locke and by Prof. Blackwell and Dr. Petford of Oxford University, England, measured different aspects of the solar corona. In each case, the area around the eclipsed sun was scanned to several diameters beyond the disc to determine the light intensity of the hot gases reaching hundreds of thousands of miles into space. It should be noted that this was not the first airborne expedition for Prof. Blackwell. In 1954 he installed his equipment in a *Lincoln* bomber and observed that eclipse to the north of Scotland through an open hatch at 30,000 feet. For this, he was dressed in a winter flying suit and wearing an oxygen mask.

The National Research Council and the University of Saskatchewan experiments were designed to study a variety of effects of the eclipse on the activity in the earth's upper atmosphere. These experiments were searching for the glow produced by the air molecules at extremely high altitudes when activated by sunlight. The success of these experiments was somewhat reduced by the fact that it did not become as dark as had been expected. This appeared to be the effect of the altitude of the aircraft.

On the ground, all around an observer of a total eclipse is the darkness produced by the moon's shadow in front of the sun. However, at 30,000 feet, while the aircraft is in shadow, it is possible to look out beyond the shadow to the lighted landscape beyond. Although the intensity of the sunlight is greatly reduced because of the partial eclipse in that area, there is enough light reflected into the eclipse path to produce the effect of dusk, rather than night.

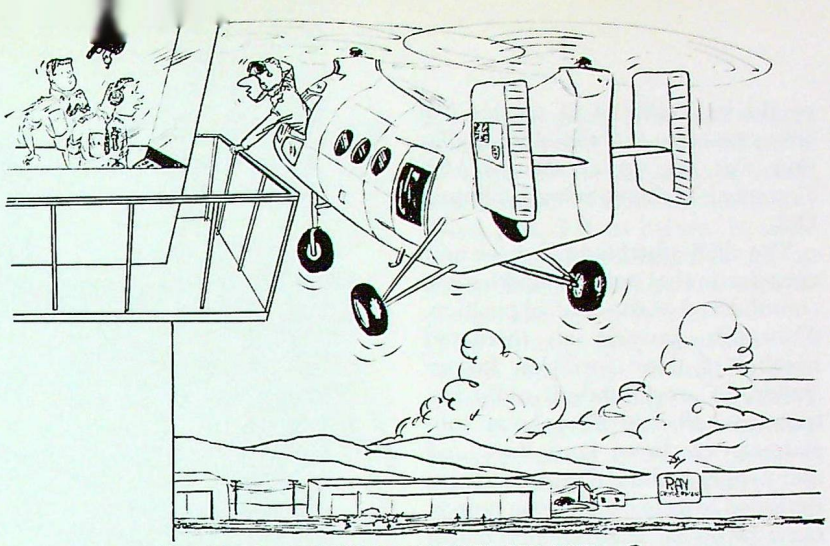
Finally, note should be taken of the visual observers and the photographers. To provide a visual record of the eclipse, motion pictures in both colour and black and white, as well as a set of still pictures were taken by three CEPE photographers. A number of visual scientific observations were made and a report was prepared from these immediately after totality and radioed to the Canadian Broadcasting Corporation for use in their live telecast of the eclipse from southern Quebec.

CONCLUSION

It will be many months before the scientists can assess the full value of Operation Eclipse 1963. In the meantime, it can be considered as a complete success operationally. Over the months of preparation, there was the closest co-operation between the scientists and both the technical and operational sides of the RCAF. This reached its climax when the *Yukon* converted to a flying astronomical laboratory was positioned over Great Slave Lake on the afternoon of 20 July 1963, the team of airmen and astronomers inside working as a closely knit team to achieve a single goal.

AIR TRAFFIC CONTROL'S NEW LOOK

By SQUADRON LEADER A. BOOTH
Directorate Of Air Services, AFHQ.



—HEY TOWER—! WE CLEARED FOR TAKE-OFF YET—?

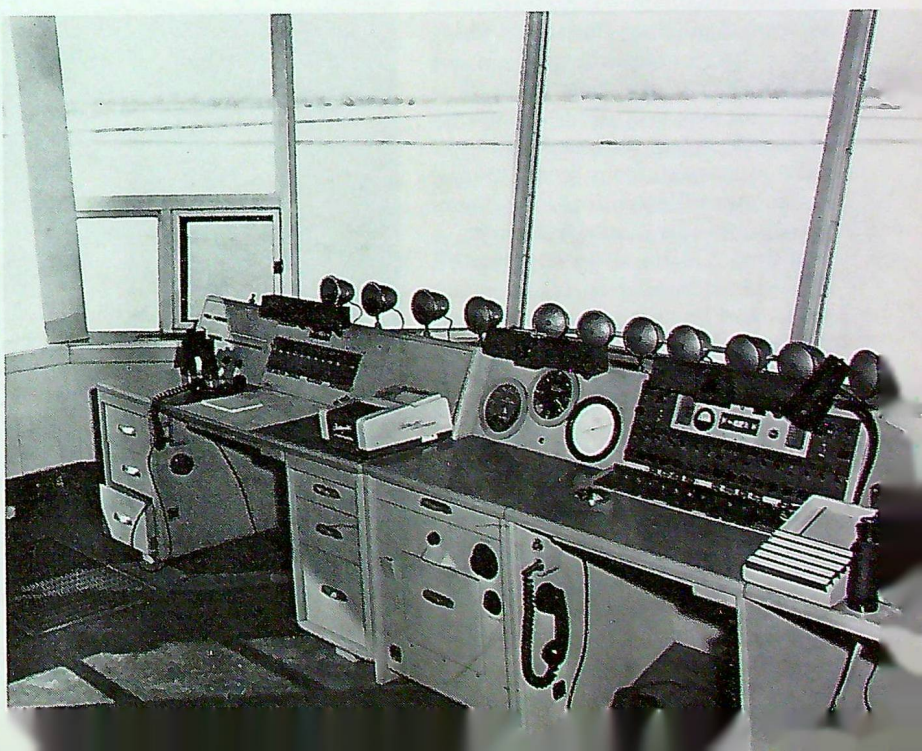
THERE was a time when the only signal a pilot needed to land or take off was a green light from a hand-operated Aldis lamp. Today the situation has radically changed. With an increasing number of aircraft operating in all types of weather and at a wide range of speeds and altitudes, the control of air traffic has become a complex operation. More and more emphasis is being placed on positive control of aircraft movements, both on the ground and in the air. This article has been written to indicate what has been or is being done within the RCAF to ensure that adequate facilities are available to meet the challenge.

Many improvements to air traffic control facilities have been in the development stage for some time. These improvements involve modification of existing facilities and the provision of new equipment. The program includes the installation of new communications and control consoles in the majority of our control towers and the establishment of eight Radar Terminal Control units in Canada and in Europe at the RCAF's No. 1 Air Division. In addition, all of the original Ground Controlled Approach units have been modified to improve the information provided by radar.

CONSOLES

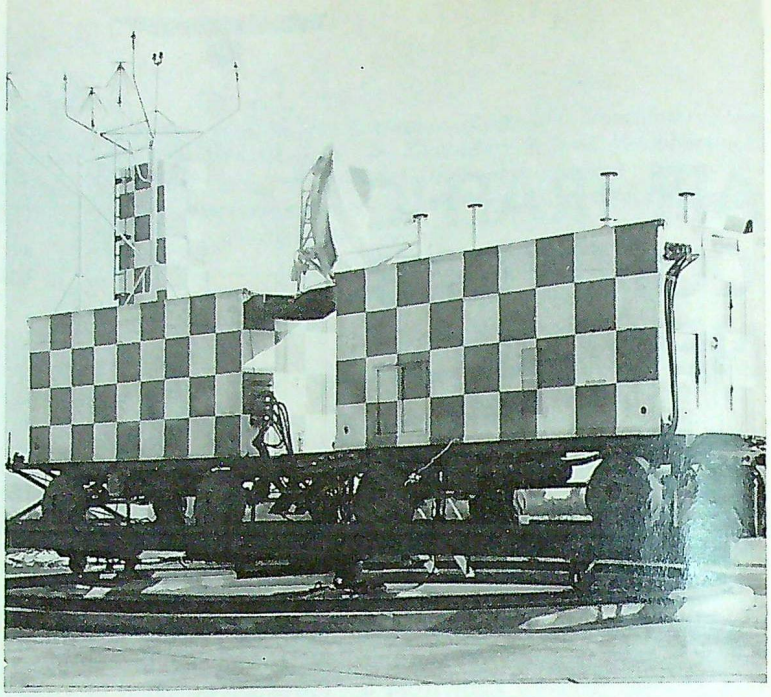
The new control tower console equipment consists of four separate consoles, each built to perform a specific function. These consoles were designed by DRB's Defence Research Medical Laboratories, following a period of research and investigation in Canada and other countries. The finished product was manufactured by Measurement Engineering Ltd. at Arnprior, Ont. Before placing the new consoles in operational use, Air Materiel Command installed a complete console mock-up at No. 6 Repair Depot, Trenton, for testing and evaluation. To ensure that sufficient technicians

New control console developed by DRB consolidates tower facilities and aids more efficient operation.



would be available to service the new consoles, a complete installation was set up at the RCAF's Technical Training School, Clinton, Ont.

The chief advantage of these new consoles is that tower facilities are consolidated at the control position. They also provide an increased number of these facilities: for instance, 18 air-ground-air radio frequencies, 18 dial interphone substations, 12 direct land lines and many other technical improvements designed to help combat the human error involved in air traffic control operations. Another feature is the provision of foot-switch operation for all communications, leaving the controller's hands free for other tasks. The overall effect is a neat, compact and much more efficient control tower arrangement.

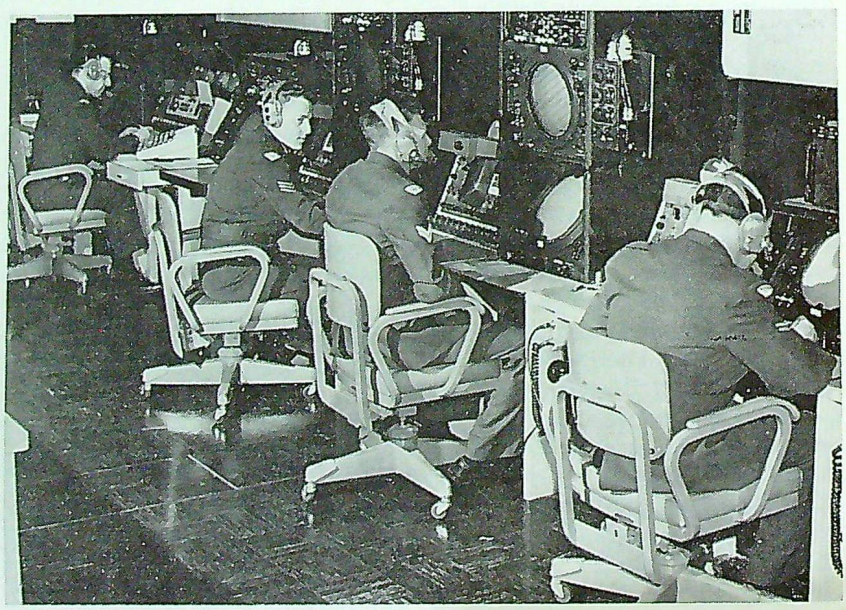


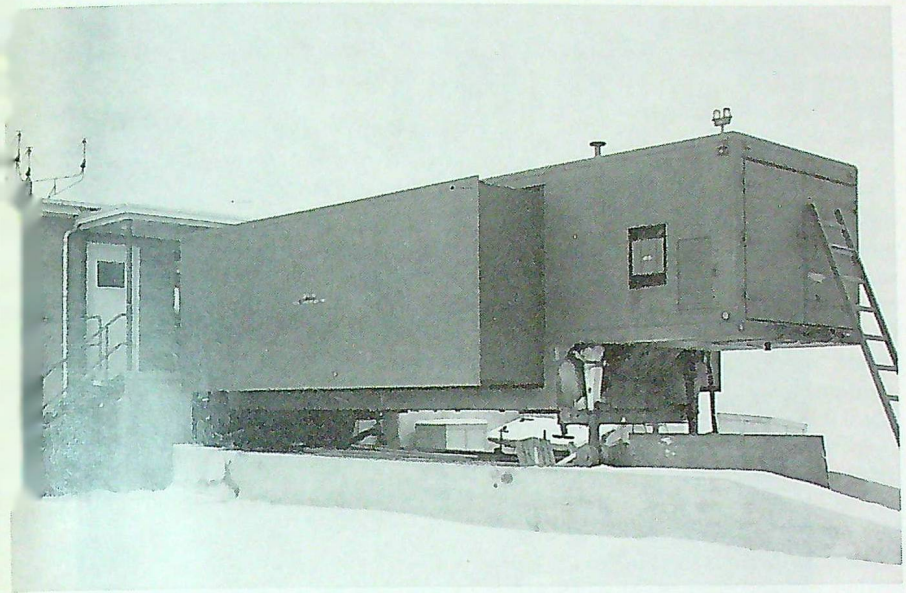
"Rotatable" GCA unit overseas, mounted on circular rail track turntable.

RATCON

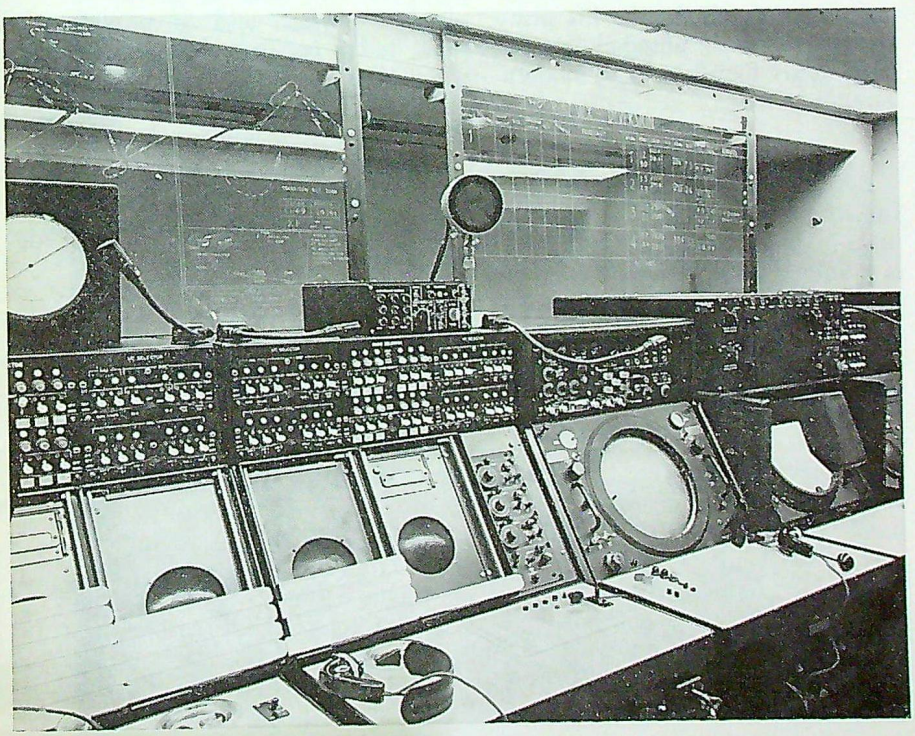
Four new Radar Terminal Control (RATCON) units in Canada are located at RCAF Stations St. Hubert, Comox, Portage la Prairie and Bagotville and represent the latest advancement in RCAF air traffic control operations. A RATCON unit is the combination of radar with conventional terminal control facilities. Radar is today the primary facility used in air traffic control in the area of a terminal; however, at the majority of RCAF flying stations it is physically separate from conventional traffic control facilities. Radar control is usually provided from a Ground Controlled Approach (GCA) unit located beside the main runway of an aerodrome and terminal control is located in the control tower. The amalgamation of these two facilities in one place as a RATCON produces improved co-ordination and, consequently, greater efficiency in controlling air traffic. A further advantage gained from RATCON is that aircraft in the air need not be spaced as far

Stn. St. Hubert RATCON centre in action: (l. to r.) F/L P. Catellier, Sgt. R. J. Cormier, Cpl. J. R. Brien, Cpl. K. Currie.





Exterior and interior views of mobile RATCON installation used at No. 1 Air Div. bases in Europe.



apart from each other since there is more positive control of air traffic by radar surveillance. As a result, more aircraft can be handled in any given period than before. In addition, radar surveillance of all air traffic in a terminal control area increases the safety factor.

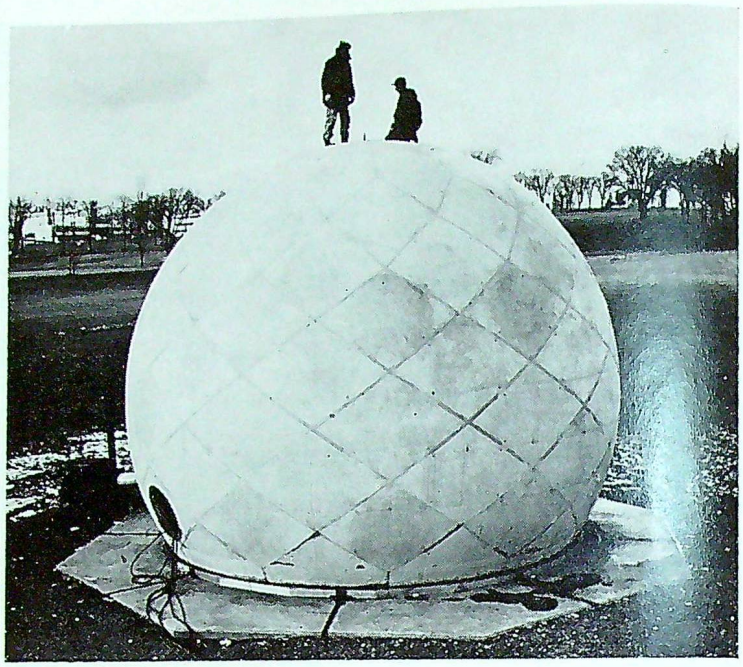
An outstanding capability of RCAF radar that should be mentioned here is Selective Identification Feature (SIF), often referred to as secondary radar. By means of special electronic equipment installed in aircraft and ground radar units, it is possible to identify aircraft positively by position and range on a radar indicator. This facility is essential for a high safety factor and efficient control of the aircraft.

The four new Canadian RATCONs are housed in permanent buildings and are similar to the first RATCON ever operated by the RCAF, installed in 1956 at Goose Bay. Radar data in the RATCON is relayed there by coaxial cable from the GCA site. Three additional general surveillance radar indicators and one precision radar indicator are combined with the other equipment to complete the RATCON. Communications facilities are provided by installing a number of the new control tower consoles.

Each of the four RATCONs at RCAF bases in Europe is manufactured as a self-contained mobile vehicle with a built-in side wall extension to provide the space needed for the main operating area. The chassis is wheel-mounted and can be moved to another location if necessary. However, when in operation as a RATCON, this mobile unit becomes a semi-permanent building. As in the Canadian RATCONs, two complete bays of radar equipment are remoted*

* Remoted, not merely moved, because the radar antennas remain at their original site on the field.

from the GCA unit. This equipment is supplemented by the addition of a surveillance indicator. Communications consoles for the mobile RATCONs are installed at the time of manufacture. The operational requirement for RATCON operation in No. 1 Air Division is to provide a well co-ordinated air traffic control service in support of RCAF and NATO military operations. The mobile RATCONs with improved radar have a greater flexibility to meet this requirement, in addition to improving air traffic control as described for Canada.



Polyurethane foam radome was developed by NRC to protect quadradar antennas.

ROTATABILITY

Another facility improvement in the "new look" program is GCA rotatability. GCA units are designed to guide an aircraft in reduced visibility to a safe landing on an all-weather runway. Normally a GCA unit is situated adjacent to an all-weather runway on an aerodrome and positioned to give a precision approach to the prevailing wind end of the runway. Over the years operational experience has shown that at certain aerodromes there was a requirement to have a precision approach for both ends of the runway because of changes in wind direction. To satisfy this requirement, rotatability was investigated and found to be a logical and practical solution to the problem.

In actual practice, rotatability is achieved by permanently mounting a GCA unit on a turntable to permit it to be rotated into position so that a precision radar approach service can be made available to either end of the runway. To date, five GCA units have been made rotatable. Four of these are overseas in No. 1 Air Div. and the other is at RCAF Station Trenton.

The mechanical method employed to rotate the units at the Air Division is the rail track principle, used to turn railway engines at a roundhouse. The Trenton unit is rotated by the hydraulic lift principle similar to the automobile servicing hoists found in most modern garages.

QUADRADAR

Besides the original GCA units, the RCAF has some 17 quadradar units in operational use. Quadradar is a light weight, compact piece of equipment that can be relocated with a minimum of difficulty. The main components are an antenna assembly and a combined radar indicator and communications package. Operationally, these units have the capability of four individual radar functions; hence the name "quadradar". These functions are: as a backup or supplement to GCA units, to provide a precision approach service at some Department of Transport aerodromes where RCAF operations are involved, for deployment in support of operations such as arctic resupply at Alert, and to provide some radar capability at stations where the small amount of low visibility flying does not warrant the use of a GCA unit.

The quadradar antennas are normally exposed to the elements and this situation creates operating difficulties in conditions of high wind. In addition, servicing the antennas in the open can be extremely uncomfortable for technical personnel. As a solution to this problem, the National Research Council developed a radome, constructed of polyurethane foam material. It resembles an Eskimo igloo when erected and is the first of its kind in the world. A unique property of the radome is the non-interference quality of the polyurethane foam. This permits unrestricted reception of signals by the quadradar antennas through a wide range of frequencies. Radomes

can be seen on many aerodromes including those at Summerside, Churchill, Winnipeg, Torbay and Rivers.

Radio transmissions between pilots and controllers are recorded by air traffic control units to provide a means of assisting in the investigation of aircraft accidents or emergencies. These transmissions are also used to check control procedures and personnel proficiency. Recording equipment currently in use in the RCAF is only capable of recording four frequencies. The introduction of Ultra High Frequency, plus the existing Very High Frequency range, has created a demand for equipment with a greater capacity. The equipment selected by the RCAF to meet this need is the German-built Assman recorder, which can record 20 radio transmissions or landline communications on a single tape. Fifteen of these units will be installed shortly at selected stations which have a special need for this facility.

TRAINING

The efficiency of any organization is dependent to a large degree on the proficiency of its personnel* which in turn is inseparable from an effective training program.

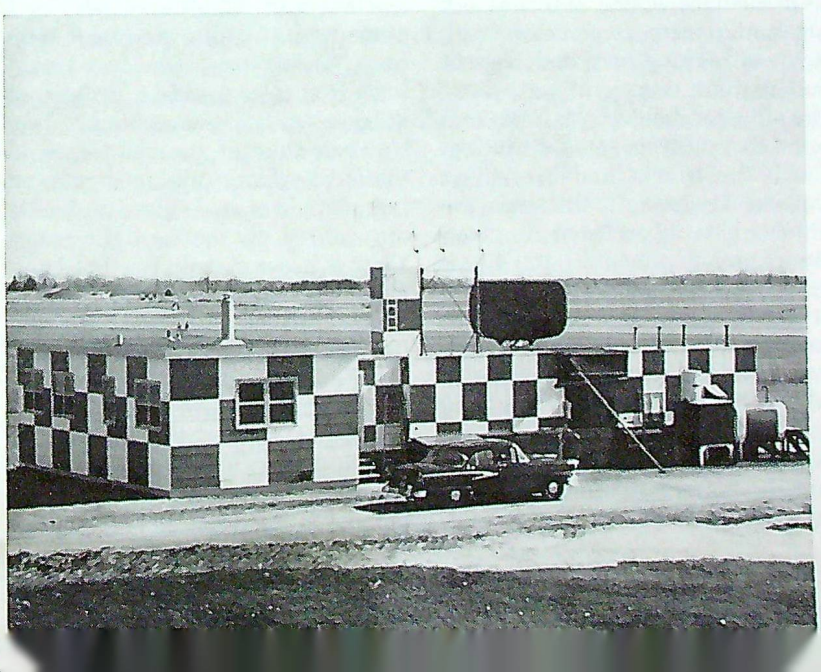
The Air Traffic Control School, located at RCAF Station Camp Borden, is responsible for training officers and airmen at various stages in their careers. Basic courses are conducted to provide a grounding in the fundamentals of air traffic control regulations and procedures. Graduates from the basic course are normally transferred to a flying unit for several years of operational experience and then return to the school for advanced training. At this stage air traffic control officers are given a terminal control course including the use of radar, while airmen of corporal rank and above receive training to qualify them as radar controllers. From these courses, both officers and airmen are normally transferred to a station with a complex air traffic control environment requiring better qualified and more experienced personnel. Examples of this type of unit are stations Goose Bay and Comox, and the Wings in No. 1 Air Division.

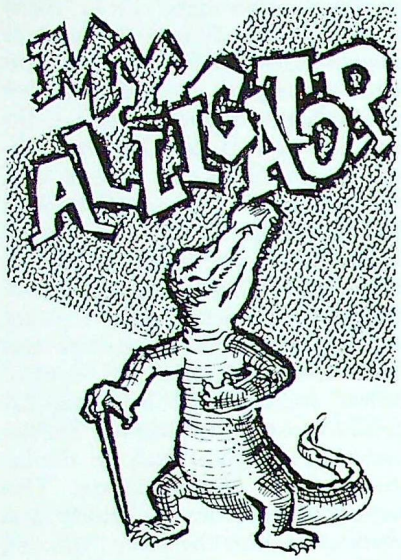
The "new look" program will also affect the Air Traffic Control School training facilities. Radar training equipment will be improved and both the RATCON and control tower trainers will be equipped with the new-style consoles. Trainer equipment layouts will be similar to those in operational use. This similarity provides continuity and standardization between training and operational conditions and makes it easier for the station to check out recently-graduated personnel on station equipment. Personnel standards for air traffic control have also been revised. The choice of personnel has become more selective, the medical category for active controllers has been upgraded, including an annual medical examination, and unit qualification procedures have been made more stringent. These revisions were considered necessary to ensure the responsibilities associated with modern air traffic control operations are assumed by highly competent personnel.

In April 1962 the existing RCAF Flying Control Branch was officially redesignated Air Traffic Control. This change in nomenclature was made to indicate more clearly the branch's function of controlling air traffic, not flying. The new name is also consistent with the terminology used by other countries. The ultimate goal of the "new look" in RCAF air traffic control is to produce a safer and more efficient service, to satisfy the operational needs of the RCAF and to stay abreast of the latest developments in civil air traffic control operations.

* RCAF establishment is currently 319 officers and 544 airmen in the air traffic control branch.

Typical "hardened" GCA site in Canada.





By FLIGHT LIEUTENANT Q. WIGHT

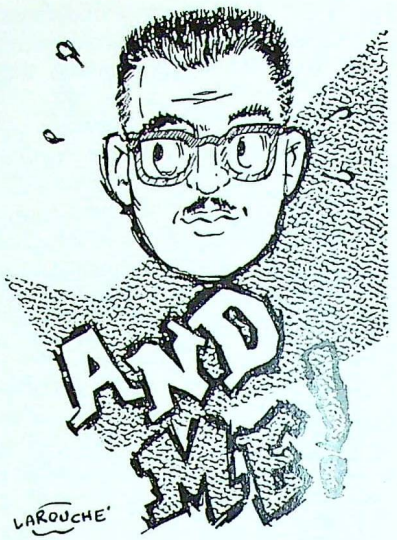
THIS story began over two years ago and about 3000 miles away. One day in April 1961, while searching the Comox Valley for odds and ends of interest, I came across the happy solution to a long standing problem — where to buy an alligator. These reptiles have always been among my favourite animals and I was most happy to find that Corporal Ted Pearson, a tropical fish fancier, could get me an alligator.

Alligators, if handled properly, can be fascinating pets. One of the main problems, however, is to make sure that you get the correct alligator. When speaking of alligators the usual tendency is to imagine the North American species, or *Alligator Mississippiensis*, a quiet, docile creature content to lie around all day and sunbathe. This type is timid and rarely attempts to bite humans. The alligator generally sold in pet shops is a South American variety *Caiman Sclerops*, metaphorically speaking, a horse of a different colour. This fellow, known vulgarly as the "Spectacled Caiman", because of a small ridge between his eyes which makes him look as if he were wearing glasses, also sits around and sunbathes all day — but with a different attitude altogether. Though appearing lethargic and lazy, he can move like lightning and would gladly take a leg off you if he got the chance. Fortunately, those sold for pets are rarely more than a foot long, and the bite is hardly strong enough to break the skin.

Luckily, the two species are fairly easy to tell apart. The Mississippi Alligator is black with yellow bands, and the Spectacled Caiman is yellow with black bands. Also, if anyone feels slightly confused in picking out which is body colour and which is banding, the Caiman has the specs. Another test is to poke it with your finger. If the finger is still whole when withdrawn it is probably a Mississippi Alligator.

The alligator provided by Ted Pearson was in fact the spectacled variety, which was fine with all concerned since I wanted a beast with a little spirit, and Mississippi alligators are almost impossible to come by anyway. Actually, "a little spirit" is an understatement. The new arrival was a real ball of fire, seemingly composed of half temper and half teeth.

On first inspection this was not apparent, since in common with others of his kind he spends a great deal of time dozing in the water. The alligator, however, is best compared to a rat trap, set and waiting. Touch the trigger and everything happens at once. In this case the animal initially refused to feed (they're temperamental) and I was forced to tease him with a worm. At first he ignored the entire proceedings, then he opened his mouth and hissed to show he was annoyed. When I persisted he suddenly erupted into motion, bit the worm clean in half, showered water all over the cage and scared the living daylights out of me.



Nowadays, to express disgust at being similarly disturbed, he seizes the worm by the nearest end and induces a steady sideways chomping motion. The overall impression is of ammunition feeding into a machine gun, and the worm spills out the other side of his mouth looking like a piece of used ticker tape. One can achieve the same effect by jumping on a garden hose while wearing track shoes.

Alligators require more sustenance than simply worms. A little calcium from bones is handy, so I attempted a small experiment with frogs. The first problem was catching a frog. This proved a little more difficult than anticipated. Two fruitless days of prowling around the local swamp produced nothing but a tangle of snakes and a terrible din caused by out-of-sight frogs. Thus it happened that a day later, when a mocking chirp sounded from the ditch in front of the station gate, several passers-by were treated to the sight of a team of officers in uniform chasing a minuscule tree frog through six inches of muddy water. (We caught it.)

Triumphantly bearing the beast home, I popped him in the alligator

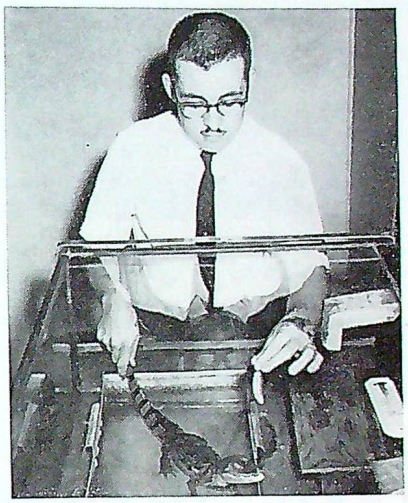
cage and sat back to await results. The suspense was unbearable. Alligator sees frog; frog sees alligator. Alligator stays still; frog swims over for a better look. Closer and closer came the frog, until at the eleventh hour the alligator lunged forward and grabbed it like a trap.

At this point all hell broke loose. My wife, who had been serving our evening meal, let out a piercing scream and ran for cover. The alligator visibly lost a year's growth and dropped the frog as though it were red hot, and I did my best to spread a forkful of spaghetti all over the ceiling. After the commotion had died almost everyone came back to normal with the exception of the alligator, who, having undergone such a traumatic experience, was completely cowed, and had to spend the rest of the evening suffering such occasional indignities as having a tree frog use his head as a convenient island on which to rest while swimming in the pool.

However, times change. During the following two years my alligator became more aggressive, in direct proportion to its added growth, and I have a few more scars to prove it. When the beast grew to a length of two feet she became capable of putting up a real fight, and I gave some thought to sending her out after her own food. I say "she" because a quick look showed more female characteristics than male — and a quick look is all one is liable to get when sexing alligators.

Then came the day when I heard I was being transferred from Station Comox to AFHQ. My wife and I had no alternative but to pack the beast in the back of the car along with a jar of snails for sustenance. This worked fine until we had to stop for the night. Ever try to carry a live alligator into a motel room under the manager's nose? Explaining that it's a do-it-yourself handbag doesn't really get you anywhere. Explaining to a gas station attendant that you've got plenty of water in the radiator, but you'd like some for the snails in the back seat is no easy job either.

The crucial point of the trip east came in Regina. All the motels were full, but a kindly manager called up the Hotel Saskatchewan and insisted that they give us a room. He must have had a real hold on them, for they gave a grudging OK although there was a convention in town and they were pretty full too. At any rate, the same old problem arose — how to get the alligator into the hotel? Motels were tough, but at least they had individual entrances.

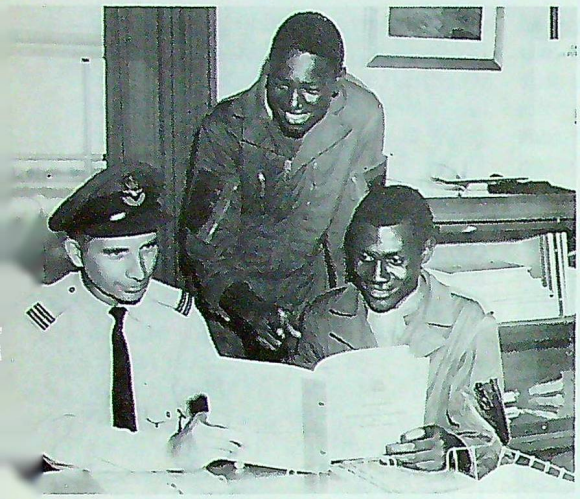


Author and friend

Eventually I crammed her into her travelling box, wrapped the whole thing in newspaper and made a grand entrance to the hotel bearing this enormous parcel under my arm. Being the only one in the hotel dressed in blue jeans, a "T" shirt, and an inch of dust was bad enough, but having to carry a giant parcel wrapped in torn newspaper and giving off fearsome scrabbling noises was petrifying. All I could do was paste a sickly grin on my face and hope I looked innocent. It worked. I now own one of the few alligators who can claim to have spent the night in a bathtub in the Hotel Saskatchewan.

With her increased girth has come a taste for frogs and fish. She can polish them off by dozens. No longer does she cower in the corner, but simply waits till a passing frog comes within reach and inhales same. It's an unequal contest really. The alligator knows that it's an alligator, but the existence of alligators is news to frogs — until it's too late. Fish just don't stay around long enough to worry about it. There used to be an old military dictum, "If it moves — salute it." For the alligator this becomes, "If it moves — eat it." This covers everything including me — and one documented assault on my mother-in-law's cat (a venerable maiden of some 15 years). Fortunately, the glass of the alligator's cage saved the cat from physical injury, but the damage to her equilibrium was tremendous. She'd never had a fish tank try to bite her before.

Two things seem to accompany alligator keeping — tooth-marked fingers and notoriety. The latter was demonstrated to us recently. When we first moved into our new house, in an Ottawa suburb, one of the contractor's maintenance men was working in the basement. He was somewhat taken back, to say the least, when I brought my pet downstairs and put her on the cellar floor. He didn't say anything at the time but he apparently had plenty to say to his fellow workers later. Then, the other day, the contractor sent three maintenance men to repair our furnace. One of them noticed the alligator cage and asked what the animal was. My wife replied that it was a Spectacled Caiman. A look of comprehension dawned. "Hey fellas", he yelled, "this is the place!"



Course director F/L J. S. Miller discusses training syllabus with two Nigerian student pilots.

Instructor F/O G. W. Coull gives st after his successful first solo . . . then

NIGERIANS TRAIN IN CANADA

Nigerian Air Force cadets at Centralia are introduced to *Chipmunk* by an RCAF instructor of Primary Flying School.

SIXTEEN carefully selected Nigerian aircrew candidates are training with the Royal Canadian Air Force. They were chosen from a large group of applicants tested about a year ago by a team of five RCAF officers who visited Nigeria at the request of the Nigerian government.

Arriving in Canada last February, they underwent a period of acclimatization in Ottawa and last month completed Primary Flying School training at Centralia. They are now at Flying Training School at Penhold. After a course at the School of Instructional Technique, Clinton, and the Flying Instructors'

det I. W. Aleyideino last-minute briefing . . . later F/O Coull congratulates the Nigerian classmates and instructors give Aleyideino traditional "dousing" on Centralia flight line.

Cadet G. Nwosu, in RCAF flying gear, and Cadet U. Jibrin, in traditional dress of the Hausa tribe of Northern Nigeria, pose on Centralia tarmac.

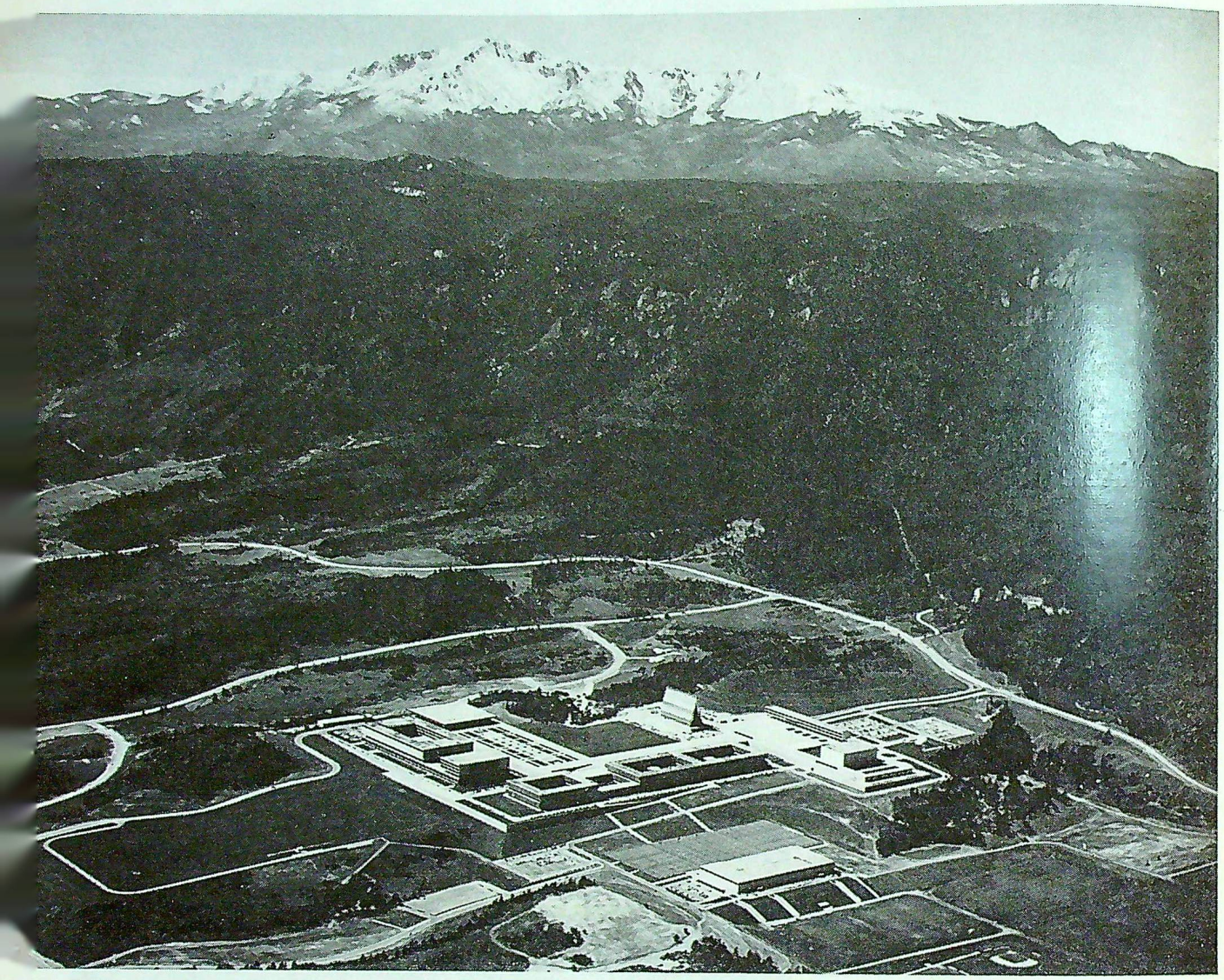
PHOTOSTORY FROM AIR TRANSPORT COMMAND
PUBLIC RELATIONS OFFICE

Canadian ice cream made a big hit with (l. to r.) Officer Cadets A. I. Shekarri, E. Ukejeh, A. Gbadamosi and A. D. H. Okpe.

School, Moose Jaw, the Nigerian flyers will return home to serve in their country's newly-formed air force.

While at Centralia, the students became popular by bolstering the station soccer team, visiting towns in the local area in their national dress and willingly singing the Nigerian national anthem:

Nigeria we hail thee,
Our own dear native land
Tho' tribes and tongues may differ,
In brotherhood we stand
Nigerians all proud to serve
Our sovereign mother land.



With snow-capped Pikes Peak towering in the distance, the United States Air Force Academy campus covers 17,000 acres north of Colorado Springs, Colo. From left to right, are Fairchild Hall (academic building), with the Aeronautics Laboratory and Mitchell Hall (cadet dining hall) behind it; Vandenberg Hall (cadet dormitory); Harmon Hall (administration building); Arnold Hall (cadet social centre); and the Planeterium (dome at right). The 17-spired Academy Chapel dominates the academic area; the parade ground stretches at left from Fairchild Hall; and the Cadet Gymnasium and athletic fields are at lower centre and right.

Photos courtesy USAF Academy

A CANADIAN AT THE USAF ACADEMY

By SQUADRON LEADER R. R. BARBER

The Last Salute takes place at the conclusion of the annual Graduation Parade. Members of the graduating class take their place on the sidelines and as the Cadet Wing passes the soon-to-be-commissioned second lieutenants take the salute of each squadron in turn.

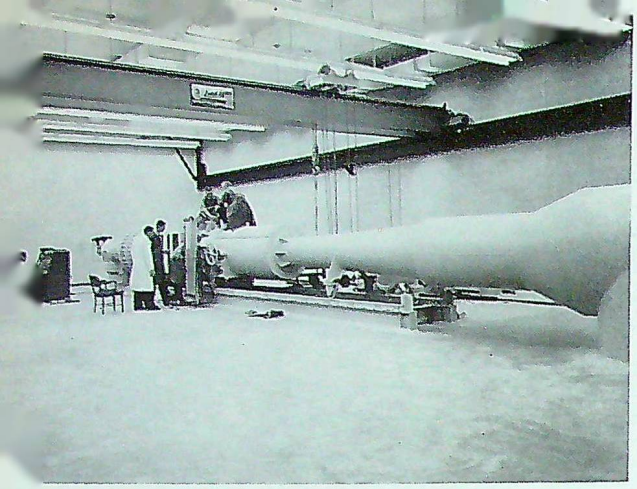
I WAS busy instructing a class at Central Navigation School, RCAF Station Winnipeg, when I received word of my transfer: an exchange posting at the United States Air Force Academy near Colorado Springs. It turned out to be a most fascinating and worthwhile two and a half year tour.

The USAF Academy is located on 17,000 acres of land literally at the foot of the towering snow-capped Rockies. In this breath-taking setting is a sprawling complex of buildings constructed of burnished aluminum, steel and glass. The Academy, which is "home" for some 3,000 cadet trainees (some of whom will become generals of the space age air force), is one of the most elaborate education centres in the USA. It consists of cadet dormitories, recreational facilities, dining hall, chapel and class-rooms. In addition, there is a staff headquarters building, two complete housing communities, maintenance and services buildings, a large well-appointed hospital, a 40,000-seat football stadium and an 18-hole golf course.

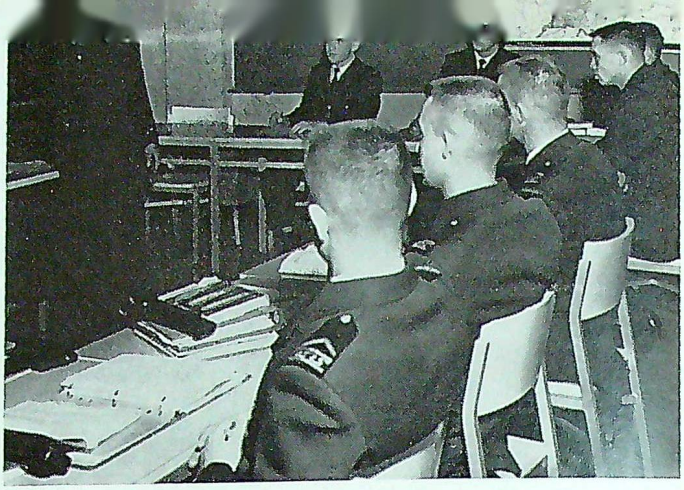
On arrival at Colorado Springs, 31 May 1959, my wife and I were taken to the house which had been assigned to us in one of the base housing areas. We encountered no problems in adapting to living conditions; because of our similarity in habits and speaking we were accepted as just another air force family. What did surprise us, however, was the absolute dearth of Canadian news in the large national papers. This is all the more surprising in the Colorado Springs area, considering the number of Canadians employed at nearby NORAD Headquarters.

At the Academy I was required to lecture on all subjects related to navigation. However, since the USAF navigation training conforms quite closely to that in the RCAF, this presented no particular problem. My other tasks included flying with the cadets on their exercises and also acting as an instructor in the dead-reckoning trainer and the navigation radar trainer. As the only Canadian officer at the Academy I was, quite naturally, expected to provide information about my country. Consequently, I gave lectures for the political science department to the entire cadet wing on topics related to Canada. These lectures included subjects such as Canadian government, Canada's defence policy, details concerning our forces and the role of the RCAF within NATO and NORAD.

Academy instructors are almost entirely drawn from the ranks of serving officers. A high percentage of the faculty instructors have masters degrees and approximately 20 percent hold Ph.D.s. In addition to the officers selected from the USAF, there are a number of officers on exchange from the US Navy, Army and Marine Corps and from allied nations. At the present time there are two RAF officers, one RCAF officer (F/L J. E. McFadden), one Belgian, one Peruvian and one German officer on the exchange program. These officers are employed in various departments throughout the faculty. By comparison with RCAF establishments, the staff seemed large and generously endowed with rank. Small departments such as the



Academy's aerodynamics laboratory has a wind tunnel for testing models at speeds varying from subsonic through the transonic range, up to five times the speed of sound.



A typical classroom scene at the Air Force Academy, whose curriculum is almost evenly balanced between the basic and applied sciences and the humanities and social sciences.

foreign language department, political science department and several others are headed by a colonel. It is not uncommon to find in a section of 15 to 20 officers only one or two below the rank of major.

The cadet area is located about three miles from the base housing. The dormitories are designed so that each room has an outside-facing window. The rooms are spacious and well-equipped, with two cadets assigned to each room. The cadets eat in one large dining hall, enclosed by glass on three sides with a view of the Rampart Range and Pikes Peak. All 3,000 cadets are fed at one sitting. They sit at designated tables, each headed by a senior cadet as well as cadets from each class year. The junior must serve the others (from mobile electric ovens brought to the tables by waiters); must answer questions, posed by any senior, according to a previously memorized ritual; and somehow manage to find time to eat his meal.

All classes are conducted in the academic building called Fairchild Hall. This building contains 168 classrooms, 45 science and electronic labs, five lecture halls, a three-storey library, and offices for the faculty members. Just south of this building is an engineering laboratory complete with wind tunnel testing facilities.

Also located in the same general area is the cadets' social centre, containing a 5,000-seat theatre, a ball room, recreational rooms and a cafeteria. In this building certain senior cadets are permitted to entertain friends and relatives. Next to the social centre is the cadet chapel, an impressive structure surmounted by 17 aluminum spires. The ends of the building are enclosed in coloured glass panels. The chapel has three floors and contains all the necessary service facilities for Protestant, Catholic and Jewish worshippers. Behind the social centre is a dome-shaped structure which houses the planetarium, used in the instruction of celestial navigation and astronomy. In addition, public showings are presented four times weekly, and are well attended by tourists and local people.

Probably one of the most impressive buildings in the entire cadet complex is the gymnasium, containing two swimming pools, basketball and volleyball courts, gymnastics rooms, rifle and pistol ranges, squash courts, handball courts and boxing and wrestling rooms. One swimming pool is so large that dividers can be moved electrically into position to form five normal-size pools. The gymnasium also provides complete shower and locker room facilities and office space for the physical education instructors. At certain times of the day these facilities are made available to servicemen and dependents located on the base.

The USAF Academy has its own headquarters formation, commanded by a two-star general, which selects cadet trainees and provides personnel to operate the training program. Cadets are recruited from several sources. Each congressman may nominate one candidate and five alternate candidates. The president of the United States may nominate a certain number of candidates — sons of members of the armed services or sons of retired or deceased service personnel. The U.S. vice-president may nominate up to three candidates. Sons of deceased veterans may apply directly for entry to the Academy as may members of the regular air force and army. From these and other sources, about 3,000 candidates are screened for admission. They are subjected to a fairly strict medical examination and must take a classification test

Cap tossing, traditional at service academies, takes place following the graduates' last order from the Air Force Academy's Commandant of Cadets: "Gentlemen, you are dismissed."

which is comparable to our own initial classification test. Through various processes of elimination, some 800 cadets are accepted into the Academy each year.

As is done at the Canadian Services Colleges, the cadets at the USAF Academy take four years schooling and upon successful completion of their training they graduate with a Bachelor of Science degree.* The academic portion of training is a heavier schedule than would be found in the majority of United States colleges. Along with the academic training the cadet undergoes a heavy schedule of physical training and sports. The cadet is also required to participate in a navigation flying training program unless he is medically restricted. During the four years of schooling he is taught many subjects associated with military studies and during the summer months of the second and third year the cadet travels to various countries, visits foreign military establishments and is employed in a variety of assignments on air force bases throughout the U.S.

Another similarity to Canada's Royal Roads, Royal Military College and College Militaire Royal is the matter of school discipline which is almost completely controlled by the cadet organization itself. Military training comes under the Commandant of Cadets who is of brigadier general rank. Certain service officers monitor the cadet organization but the planning and execution of discipline and military training are controlled by the senior cadets. The first year student must undergo a severe and strenuous basic training period. He has no privileges. He cannot receive visitors. All movements from classroom to dormitory, to sports areas, to the dining hall must be carried out in double time by the first year cadet. He stands and sits at attention and he eats his meal in a prescribed fashion. During the meal he must sit on the edge of the chair, keeping his eyes "caged" directly ahead; he must never address a senior cadet unless on some urgent matter and his conversation is limited in the main to three sentences — "No, sir", "Yes, sir" and "I don't know, sir". His routine is planned from the early morning rising at 0600 hrs. until he falls into bed exhausted at 2200 hrs. After an initial 12 weeks of this type of training the cadet then receives a few privileges and begins the first year academic training. Discipline and regulations gradually slacken until in the final year the cadet has few restrictions on his activities.

The entire cadet way of life is based upon a system they call the Honour Code. The honour code states: "We will not lie, cheat or steal or tolerate amongst us those who do". The cadets realize that the code is a bond between themselves and the military heritage of the USAF. Generally speaking, the honour code appears to work quite well but in the opinion of the writer (an opinion shared by many of the USAF staff instructors) the honour code would be just as effective if it stated simply: "We will not lie, cheat or steal".

On completion of the four years training, the cadet would normally be granted a commission in the USAF but, in certain instances, he may be commissioned in one of the other services. The newly-commissioned second lieutenant will then proceed to aircrew training or to a post-graduate school where he will further his education in fields associated with space technology.

Our two and a half years spent at the Air Force Academy went all too quickly, and it seemed no time at all until we were heading back to Canada. During our stay we had the opportunity to meet many fine American families and we became acquainted with a good number of air force cadets. The cadet group is an impressive cross-section of American youth and the officer instructors are truly dedicated to the service of their country. The training provided at the Academy is producing a well motivated, highly skilled career officer for the USAF. The United States is justifiably proud of the Air Force Academy.

* During the four years at the Academy the cadet is paid $111.15 per month out of which he must purchase his texts, uniforms and miscellaneous personal goods. Food, quarters and medical care are provided.

S/L J. N. Nalty, JPIC commanding officer, watches Major C. I. Taggart, chief interpreter, compare aerial photo with map of same area.

JOINT PHOTOGRAPHIC INTELLIGENCE CENTRE

By FLIGHT LIEUTENANT R. G. M. WARNER

With the launching of the weather satellite Tiros IV from Cape Canaveral in February 1962, members of the Joint Photographic Intelligence Centre (JPIC) had a wonderful opportunity to apply the art of photographic interpretation to pictures relayed to earth by television from an orbiting satellite 450 miles high and travelling at approximately 17,000 miles an hour. This was a new application of an art which had its beginning in 1839 when the first photographs were taken using the Daguerrotype process.

Between 1858 and 1860 the French conducted experiments using aerial photographs taken from balloons to produce topographic maps. Aerial photographs were used during the American Civil War and again during the Franco-Prussian War in the era 1860 to 1870. By 1870, the Prussians had developed a mobile field processing unit to produce the photographs which they were obtaining from photographic equipment carried by balloons. The value of aerial photography was evident in those early days but the cumbersome apparatus combined with the fact that the only means of air travel was by balloon rendered the practical application of air photography somewhat difficult.

During World War I the rapid development of military aircraft and more portable photographic equipment made the air photograph easier to obtain. Aerial photography rapidly assumed a place of great importance in the gathering of information on enemy movements. Static trench warfare had turned the landscape into a quagmire obliterating all landmarks, so that existing maps became useless. Air photographs became the only means available for mapping the intricate systems of trenches, barbed wire and gun positions which sprang up in the forward areas. From the study of these photographs taken over the Western Front the art of photographic interpretation was born.

When the war ended, the application of this art to mapping became obvious. Canada, with its vast tracts of inaccessible terrain, provided an ideal region in which to apply it. Much of the early history of the RCAF is therefore connected with the aerial photography

F/L R. G. Warner, author of this article, points to area on map covered by TIROS photograph. Model of TIROS satellite is overhead.

which was carried out between the two world wars as part of the program of accurately mapping Canada.

World War II saw photographic reconnaissance and interpretation assume a new importance. High speed, high altitude aircraft combined with vastly improved aerial cameras and photographic processing equipment provided photography of a quality and quantity heretofore unknown. At the same time, the character of the war, the heavy emphasis on bombing, the German control of continental Europe, and the importance of industry and other activities in the rear areas rendered aerial photography frequently the only means of obtaining rapid and reliable intelligence. Photo interpreters found themselves engaged in applying the art in two fields: strategically, they were concerned with the assessment of the main enemy bastion; tactically, they played a key role in planning assaults on the enemy by sea, land and air.

The years immediately following World War II saw an enormous increase in aerial survey work by the RCAF, although the requirements for military photographic interpretation were limited. However, as the armed forces assumed their peacetime role, there were a number of developments toward a permanent photographic interpretation capability in the Canadian Armed Forces. In May 1949 a Joint Air Photographic Interpretation School (JAPIS) was formed at the Canadian Joint Air Training Centre (CJATC) at Rivers, Manitoba. In 1951 a photographic interpretation section was formed within 408 (P) Sqn. This section eventually formed a separate unit – the RCAF Air Photographic Intelligence Centre (APIC). In 1953 No. 1 Army Photographic Interpretation Section (APIS) was formed. The RCAF APIC and the Army APIS were both located in the same building at RCAF Station Rockcliffe and worked together on many projects.

World War I aerial photography: (above) oblique of Western Europe near the front lines; (below) vertical of German and Allied trenches. Both photos were taken in July 1917.

It became evident that it would be of great advantage if all military photographic interpretation activities, other than field activities, could be amalgamated into one centre. This led to the formation, in June 1960, of the Joint Photographic Intelligence Centre (JPIC). The unit was located at RCAF Station Rockcliffe because of the proximity to National Defence Headquarters, the Photographic Establishment and 408 (R) Sqn. The staff of JPIC is comprised of members of all three of the Canadian Armed Forces.

Although JPIC is a relatively small unit, it covers all aspects of photographic interpretation from training to the detailed analysis of photographs. It serves as a consulting authority for the Department of National Defence on matters relating to photographic interpretation. Close liaison is maintained with the Department of National Defence as well as other Government agencies and various civilian organizations and societies.

While not engaged directly in photographic interpretation, the Operational Print Library is one of

the unit's key elements. It contains some 200,000 prints of all military aerial photography taken in the post-war years, not including the survey photography taken by the RCAF. This total is being increased at the rate of approximately 20,000 prints each year. The Operational Print Library is a focal point for unit activities as most interpretation jobs utilize positive prints made from the negatives held in the vaults of the Photographic Establishment. All orders for prints and transparencies required by the various sections of JPIC are handled by the library, which also acts as an order office for aerial photographs required by the Department of National Defence and screens all requests to determine if the requirement could be filled from existing photography.

Without proper indexing and filing, the management of the large number of prints held by the library could become a veritable nightmare. Unlike letters, photographs cannot be filed by title but must be indexed by geographical location. This requires that each and every photograph be examined and the area which it covers plotted on a map. The prints are then filed in special boxes according to a library reference number. This filing system enables the library staff to locate all aerial photography of a particular area in a matter of minutes. The photographs kept at JPIC are used extensively by members of the JPIC staff as well as by many outside users of aerial photographs. To enable the library staff to plot the photographs and to assist other sections in the use of photographs, a map room containing some 40,000 map sheets is maintained by the Operational Print Library.

The General Interpretation Section of JPIC performs work which does not fall into the specific field of the unit's other sections. One of its major activities is the construction of mosaics. A mosaic is composed of two or more photographs which have been cut and fitted together so that details of the earth are matched. The mosaic then becomes a photographic record of a section of the earth's surface which is larger than the area covered by a single photograph. The completed mosaic is then photographed by the copying section of the Photographic Establishment and enlarged prints produced to the required size. The negative of the mosaic is stored in the film vaults of the Photographic Establishment so that additional copies can be produced when required. During a one year period the General Interpretation Section constructed 130 mosaics composed of an average of 100 prints each.

Members of this section worked with scientists of the Defence Research Board in a study of the Ward-Hunt ice shelf. This ice shelf was a permanent accumulation of ice attached to the north shore of Ellesmere Island and extending seaward. During the winter of 1961-62 a large portion of it broke away from Ellesmere Island. The first indication of this breakaway was when the navigator of a No. 408 Sqn. *Lancaster* observed that the position of a small trailer left behind by a scientific party did not agree with his calculations of the aircraft position. Subsequent flights and photography ascertained the new position of this enormous mass of 178 square miles of ice. The General Interpretation Section prepared a report in which the ice islands formed by the breakup of the shelf were plotted, their areas determined and compared with maps showing the original shape and position of the ice shelf. One of the ice islands so formed since drifted eastward and southward into Kennedy Channel where it lodged between Ellesmere Island and Hann Island. Last July it was observed that this island had dis-

F/L M. Fikowski and Pte. B. A. Boyce complete photo mosaic of Ottawa.

integrated. Pieces had presumably floated out into the Atlantic.

The JPIC Brochures Section maintains up-to-date files on military installations in Canada as well as most installations of the Department of Transport and the Department of Northern Affairs which are of interest to the Department of National Defence. These brochures contain photographic information on a great variety of locations. The information is listed on file cards which can be reproduced by a thermofax copier to provide users outside JPIC with a complete listing of all data held in the file. As new photography or other information becomes available the brochures are amended. Approximately 5,000 photographs were used during the past year in amending existing files or in compiling new ones. Extensive use of the Brochures Section is made by the Directorate of Construction Engineering when making plans for runway extension, installation of navigation aids, preparation of photographic site plans, etc. Air Materiel Command used the information contained in the Brochures Section when selecting sites for navigation aids such as TACAN.

The Arctic Studies Section of JPIC is primarily concerned with the investigation of ice, snow, permafrost and muskeg from air photographs. Interpretation of the TIROS weather satellite pictures and the thousands of conventional photographs obtained during Project TIREC* has been an extensive project carried out by the Arctic Studies section. Photographic coverage of approximately 395,000 square miles over the Gulf of St. Lawrence was obtained by No. 408 Sqn. *Lancasters* and a CEPE CF-100 during Project TIREC. In addition, Maritime Air Command provided an *Argus* aircraft to take radar pictures of the ice formations in the Gulf of St. Lawrence. To provide further data for comparison with the TIROS pictures, Department of Transport ice observers flew in RCAF and chartered civilian aircraft. Photographs, mosaics and ice charts of the visual observations were compared with the satellite pictures to determine just what could be learned from them. This study has indicated that satellite pictures can be used to determine ice boundaries, large leads and floes, snow covered terrain, and the location of cloud cover. The accuracy of this method of ice surveillance is dependent on the camera installed in the satellite, the amount of cloud cover and the altitude of the satellite with respect to the earth's surface.

Other studies using the data collected during Project TIREC involve the usefulness of satellite pictures in the determination of snow cover and in spotting forest fires. During the autumn of 1962 a small forest fire burning over a 350 acre area in Algonquin Park was detected on pictures received from Tiros V. Confirmation of the location and extent of this fire was received from the Ontario Department of Lands and Forests.

The increase in flying in the Canadian arctic during the past few years has resulted in a requirement for landing strips for use in emergencies and for search and rescue operations. To assess the suitability of a number of sites for the construction of landing strips with a minimum of work, the Arctic Studies Section has prepared a number of reports to amplify previous studies made from small scale photographs. The JPIC studies were made from additional large scale photographs taken by No. 408 Sqn. during normal operations. Additional sites will be investigated as suitable photography becomes available.

JPIC has been assigned responsibility for conducting all photographic interpretation training

* ROUNDEL, Apr. '62.

In JPIC print library, Sgt. Reynolds and F/L W. Robinson plot aerial photos.

RCN Lt. A. R. McClung and Army Capt. W. H. Furk at work in JPIC laboratory.

Capt. M. W. Robinson instructs tri-service class in photo interpretation.

within the Canadian Armed Forces. The training provided varies from a brief introduction to photo interpretation to specialized training in aspects of the art not normally encountered in routine interpretation work. Training includes formal lectures, tutorial exercises where the student receives assistance from the instructor and exercises where the student works on his own. In addition to the photo interpretation training given to personnel to be employed in interpretation work, special training is given to artillery personnel at Camp Shilo, ground liaison officers at Rivers, senior engineering students at RMC, the Army Staff College at Kingston and personnel of No. 408 Sqn. at Rockcliffe. Training material is also provided for the Canadian Army (Militia).

The Training Section maintains a print library in addition to the Operational Print Library. Much of the material contained in this library consists of World War II photographs and photographs obtained specially for training exercises. The World War II photography is of historical value, as much of the coverage is of the area where the Canadian forces were operating in Europe. In many cases the historical prints held by the JPIC Training Section are the only copies still in existence. Copies can only be made by making duplicate negatives from these prints as the original negatives have been destroyed.

Much of the work performed at JPIC could not be done without the excellent co-operation of the staff of the Photographic Establishment in producing the many thousands of photographic items required by JPIC. Assistance is also received from the Department of Mines and Technical Surveys, Army Survey Establishment, Department of Forestry and many others.

JPIC is in a position to supply an increasing number of services in the photographic interpretation field to other branches of the Canadian Armed Forces. Although the origins of photographic interpretation go back many years, the subject is far from static and the last decade has seen a number of new horizons open up. It has been possible to produce images from infra red radiations well beyond the area of the spectrum previously utilized by infra red sensitive film. Improved radars give representations of the terrain which contain vastly more detail than the World War II radars.

Similarly, all equipment concerned with the art of interpretation, from the aircraft to the viewer, has been greatly improved. The platforms, whether aircraft or satellites, have far increased performance both in regard to height and speed. Modern aerial cameras and modern high resolution film produce photographs of astonishing clarity and detail. The simple stereoscope, once the only tool of the interpreter, has been supplemented by a wide range of computers and viewers. Whatever the future might bring to the increasing field of interpretation, conventional photography will continue to provide most of the answers which the interpreter will be called upon to supply.

BEYOND THE CALL . . .

LAC R. G. Cole

Cpl. C. H. R. Nelson

LAC R. W. McLaughlan

In the dead of night last year a fire broke out on the third floor of an apartment in the RCAF PMQs located at St. Avold, near Grostenquin, France. A 12-year-old boy and three infants owed their lives that night to the courageous efforts of LAC R. G. Cole, Cpl. C. H. R. Nelson and LAC R. W. McLaughlan – three airmen stationed at No. 2 Wing.

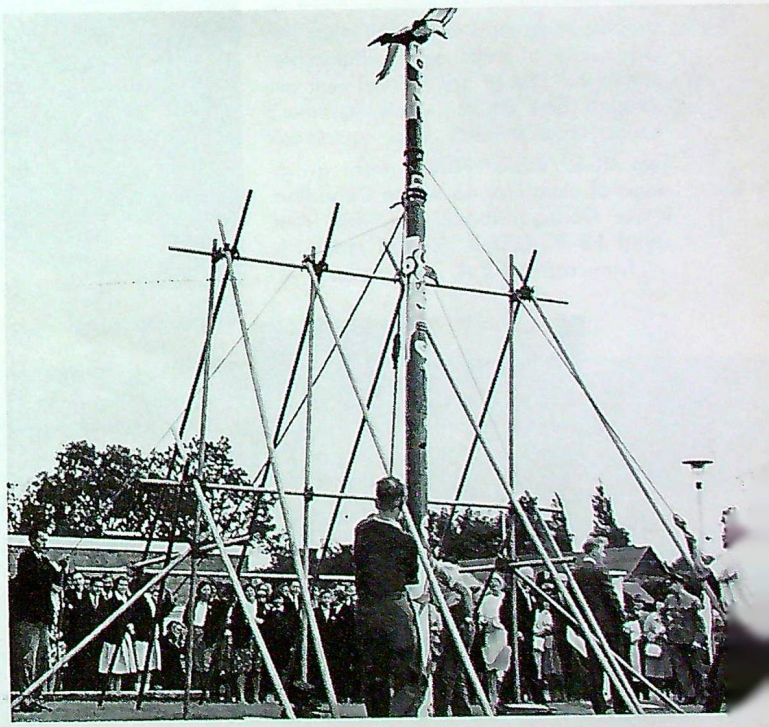
LAC Cole, who lived in a neighboring building, rushed to the scene with a fire extinguisher and without a moment's hesitation or regard for his own safety dashed into the building. He crawled on his hands and knees, searching every penetrable area and succeeded in locating three children, each under two years of age. He passed them for evacuation to Cpl. Nelson and LAC McLaughlan who had followed him into the apartment. After LAC McLaughlan had made his way at great personal risk along a narrow ledge outside the fourth floor of the building, the three airmen helped to evacuate eight persons trapped on that floor.

Despite the intense heat and acrid smoke they had responded immediately with assistance above and beyond the call of duty. For his actions LAC Cole was awarded the British Empire Medal for Gallantry, and for their assistance Cpl. Nelson and LAC McLaughlan received the Queen's Commendation for Brave Conduct.

CANADIAN TOTEM FOR BRITISH SCHOOL

A totem pole at Radcliffe County Secondary School, Nottingham, will remind students for years to come of the close ties which have linked English and Canadian children, whose fathers were based at nearby RCAF Stn. Langar, since 1956. Soon the Canadians will be leaving the area, as Langar is being phased out of service.

Seventeen-year old Tim Barton, from Estevan, Sask., carved the totem and helped erect it during a ceremony presided over by Dr. J. V. Fisher, agent-general for B.C. in Britain.



SCARLET AND BLUE

PROFESSIONAL education never ends. In some cases, education of a specialized nature must be acquired by air force personnel outside RCAF resources. Because of this requirement each year a number of RCAF security officers and senior NCOs of the Air Force Police trade, train with Canada's national police force, the Royal Canadian Mounted Police.

Officers are sent to the RCMP Depot at Regina where the Canadian Police College is located. Senior NCOs go either to Regina or the RCMP Depot at Rockcliffe,

Inspector G. MacKay of the RCMP describes the painting "Beyond the Law" to three students at Canadian Police College (l. to r.): Capt. J. Gibbons, US Army; Capt. G. Huskerson, US Army and F/L T. B. Kelly, RCAF.

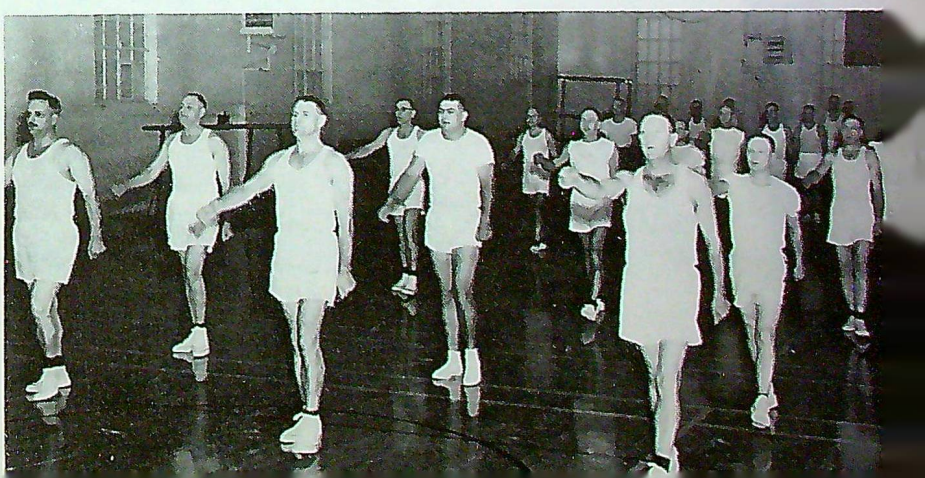
Two RCAF senior NCO's were graduates of class No. 46 of the Canadian Police College: (back row, 3rd from right) FS R. O'Dell, (centre row, 5th from right) FS A. W. Lawless.

near Ottawa. At both depots the course is 10 weeks long and consists of a wide variety of subjects pertaining to police business. Most of the lectures are given by RCMP personnel but, in certain specialties, they are delivered by civilians highly qualified in their field.

During the latest course held at Regina, the air force students presented a plaque to the RCMP as a token of appreciation for the valuable assistance rendered to the air force by the "mounties".

As a token of RCAF appreciation for RCMP assistance, a plaque is presented to the RCMP at Regina. (L. to r.): F/L T. B. Kelly, F/L G. H. E. Moore, Insp. H. Robertson, Insp. C. W. Mortimer and Supt. H. C. Forbes.

At the Canadian Police College there are representatives from both military and civilian police. Here, in the lounge, are members of the RCMP, US Army, Canadian Army, RCAF and Regina, Vancouver and Point Claire police forces.



Physical fitness is a "must" for policemen who spend many strenuous hours in the college gymnasium.

ROYAL CANADIAN AIR CADETS

This section of ROUNDEL *is prepared by National Headquarters, Air Cadet League of Canada, 424 Metcalfe St., Ottawa 4, Ontario.*

LAST month more than 360 air cadet squadrons from coast to coast made preparations for the opening of the 23rd year of training offered by the Air Cadet League of Canada in conjunction with the Royal Canadian Air Force. Over 7,000 voluntary workers of the League put into motion a program of aviation and citizenship training for 28,000 Canadian boys between the ages of 14 and 18.

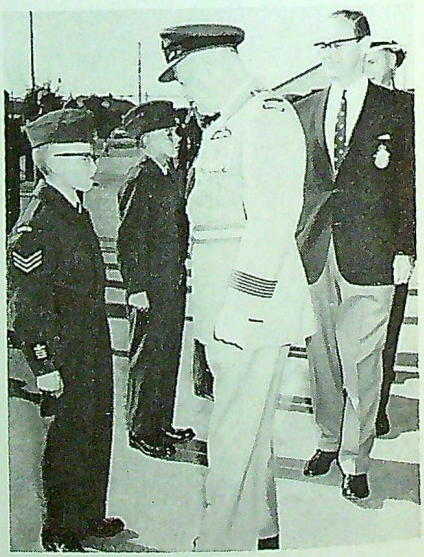
With more air cadet squadrons in action than in any previous year, and with cadet enrolments at an all-time high, a brief review of the reasons why we have such a program in Canada is appropriate at this time.

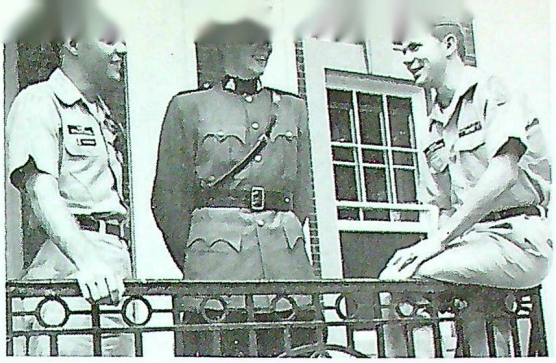
"Why Air Cadets?" is a frequently asked question. In attempting to supply an answer we suggest that it is generally agreed there are three main forces directing a boy's life: the home, the school and the church. These forces, however, do not always make provision for the wide range of interest and unlimited energy one invariably finds in this age group. In many communities, the local air cadet squadron — with a training program that naturally appeals to boys in the high school age bracket — has become a most important factor in moulding the character and development of young men.

In order to fully appreciate the impact of air cadet training, one should visit the squadrons during the regular training sessions. Here one sees young men investing their time, not in idle pursuits but in useful activities — and while doing so, having the time of their lives. A real reward for those who operate air cadet squadrons is to see lonesome boys begin to enjoy themselves with new-found friends; unruly boys learning to respect discipline; frail boys becoming sturdier from PT, games and annual summer camps; and boys of every type finding companionship and new outlet for the very best that's in them.

Air Cadet R. C. McNeill of No. 51 (Ottawa Optimist) Sqn. accepts the H. L. Garner Trophy, presented to the outstanding cadet on the Senior Leaders' Course held at RCAF Stn. Camp Borden, from the donor Mr. H. L. Garner, a past president of the Air Cadet League of Canada.

Wing Commander T. J. MacKinnon, CO of RCAF Stn. Vancouver, pauses in the inspection of the final summer camp held at his station to chat with the most diminutive sergeant at that camp, 4 ft. 10 in. Sgt. G. Baker of No. 221 (Watrous) Sqn., Saskatchewan. Mr. Jim Ewart, chairman of the B.C. Provincial Committee, ACL, looks on.





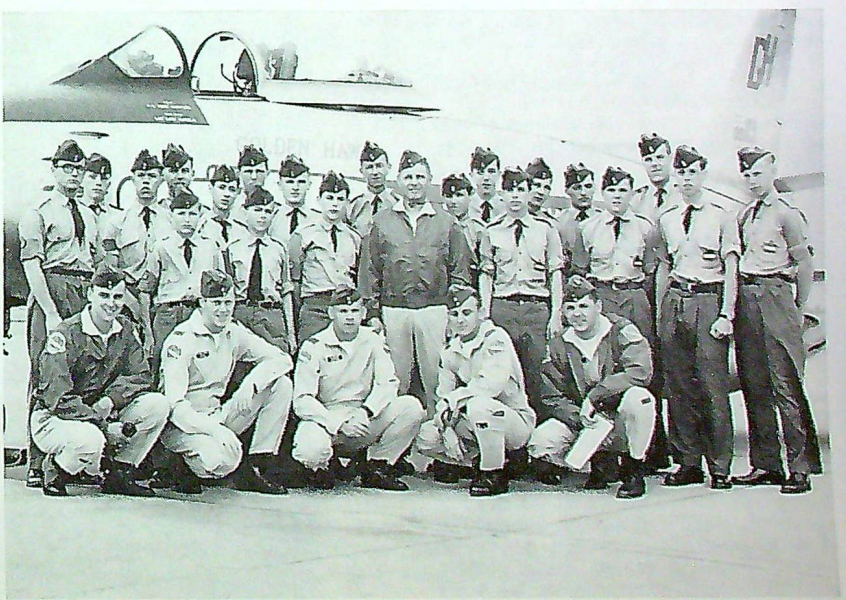
Two United States Civil Air Patrol cadets make friends with a member of the Royal Canadian Mounted Police while on a tour of Charlottetown, P.E.I. Walter Patterson of Montgomery, Albama, left, and Clarence Stephens of Fort Pierce, Florida, right, were members of the American cadet party that toured Canada this past summer. The "mountie", by the way, is an ex-air cadet.

Blayne Michael Murphy, of No. 85 (Port Arthur) Sqn., was one of 26 Canadian air cadets who travelled to the United Kingdom this summer under the Air Cadet Exchange Visits Scheme. At Brighton by the Sea he donned a "bowler and brassie" to become typically British.

All teen-aged boys need extra-curricular activity and many find what they have been looking for in the Royal Canadian Air Cadets. In a local squadron they get a chance to do the kind of things they like in the company of people they respect. By the time a cadet graduates, he finds that he has received a mighty good education in the process.

The air cadet syllabus, while it stresses aeronautical subjects, has been designed to supplement the boys' school work. The cadet who does well in school, attends air cadets regularly and develops a flair for the program, can qualify for a host of scholarships and special training awards that might well guarantee a bright and successful future for him. During the past summer, more than 8,000 cadets participated in these special reward activities.

What the air cadet movement means to Canada is the turning out each year a group of enlightened and well motivated young men. Although these boys may not flock to the services in large numbers, their training fits them for such a career if they desire, but perhaps even more important, it makes them better and more useful citizens of Canada.



Highlight of a recent tour by air cadets from the Saint-Jean summer camp to RCAF Stn. St. Hubert was the unique opportunity afforded to them of meeting with members of the Golden Hawks team, pictured here with the boys prior to their aerobatic display.

Letters to the Editor

M.R.E.S. ANNUAL RE-UNION

Dear Sir:

The 15th annual re-union of officers of the Missing Research and Enquiry Services of the Commonwealth Air Forces will be held at the Eccleston Hotel, London, Eng., on 26 October.

As we have had Canadians who served with us at many previous re-unions, I would be grateful if you could publish this announcement. Last year two of our guests of honour were Canadians: A/C D. S. Blaine, then air member, C.J.S. London, and Brig. D. R. Agnew, regional director of the Commonwealth War Graves Commission in the UK.

P. E. Laughton Bramley,
'Haldon', Nightingale Ave.,
West Horsley, Surrey, Eng.

EX-GRIZZLIES RE-UNION

Dear Sir:

A re-union of the officers, NCOs and aircraftmen who served with No. 411 Sqn. during World War II is being held in Toronto on 26 and 27 Oct.

ROUNDEL readers who are not on our mailing list please contact the undersigned for further details.

K. L. Pivnick,
Sutton West, Ont.

ROUNDEL REPRINTS

Dear Sir:

We shall be grateful if you could grant us a standing permission to reproduce material from ROUNDEL in the Indian Air Force Quarterly, a non-priced non-commercial journal of the IAF. This would enable us to reprint important articles or excerpts without getting involved in long correspondence on every occasion, with consequent loss of topicality.

S/L P. C. Chaturvedis,
Editor, Indian Air Force Quarterly,
New Delhi, India.

(Editors of this and similar journals are at liberty to reprint material from this publication without prior permission. A credit line would be appreciated.

— Editor.)

DROWNPROOFING

Dear Sir:

I read with considerable interest your paragraph on "drownproofing" in the "On the Break" page of the Jul.-Aug. edition of ROUNDEL.

As a Red Cross Water Safety Instructor and Royal Life Saving Society Instructor, I have taught drownproofing for several years here at RCAF Station Rockcliffe. In the method that I am familiar with, the swimmer is completely submerged during the travel stroke and the head is above the water only at the completion of each stroke.

Your statement that the "floater propels himself forward while keeping his head well above water" makes me wonder whether there is an alternate method of performing the travel stroke.

FS J. J. Bunting,
RCAF Stn. Rockcliffe, Ont.

(Instructor Bunting caught us with our info "all wet". Prof. E. Lanoeu, author of the book "Drownproofing" (pub. Prentice-Hall, Inc.) states that "during propulsion it is most *important that the head be held down horizontally with no wrinkles in the back of the neck."*

— Editor.)

PHOTO CREDIT

Dear Sir:

We note with great interest and pleasure the excellent use you have made of an official NATO photo on the cover of the Jul.-Aug. issue of ROUNDEL. Unfortunately this photo does not carry our credit line: NATO PHOTO by Dominique Berretty. The picture in question is part of a whole series of photos making a feature on the RCAF in Europe.

Marc A. Nicolas,
Photo Officer,
Information Service,
NATO HQ., Paris, France.

BOOKS FOR MOOSONEE

Dear Sir:

Could we appeal to your readers for assistance to build a station library for personnel and their dependents at RCAF Stn. Moosonee, Ont.?

At the present time, we have limited reading material and would be most grateful for any donations. We noted the wonderful response other stations received to similar appeals through ROUNDEL.

Cpl. D. E. Cleland,
Secretary, Stn. Library Committee,
RCAF Stn. Moosonee, Ont.

AUSSIE PEN PALS

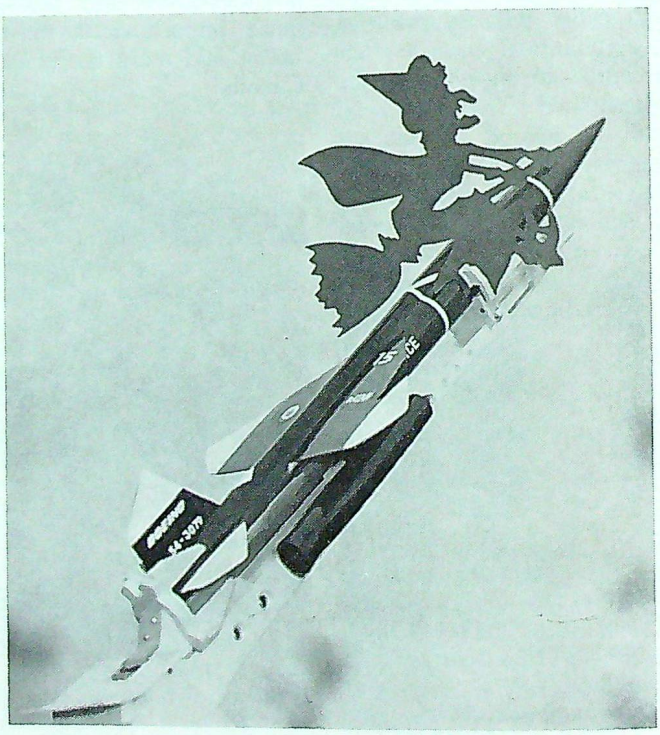
Dear Sir:

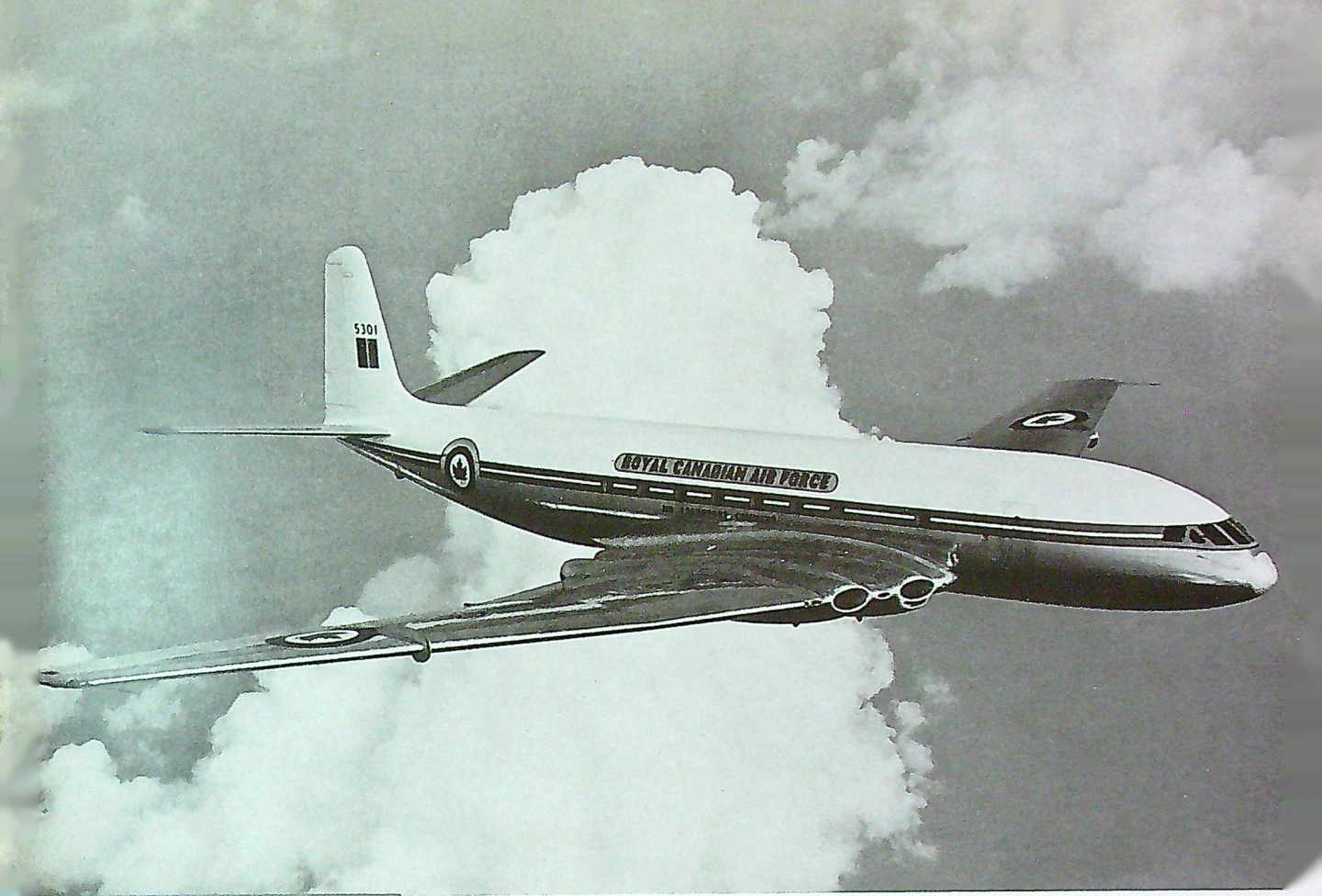
We are members of the Women's Royal Australian Air Force, aged 22 and 24 years, who after finishing our initial engagements here in a couple of years intend coming to Canada to try and join the RCAF.

In the meantime, we would like to be put in touch with RCAF members (male and female) who would like to correspond with us.

Cpl. J. Hammond,
LACW N. J. Kuiper,
% No. 1 Stores Depot,
RAAF Tottenham, Victoria,
Australia.

Happy Halloween!





Aircraft ALBUM:

De Havilland Comet

THE De Havilland *Comet*, pride of the RCAF's Air Transport Command, has retired from the service. During their seven years on active duty, the RCAF's two *Comets* established "firsts" and set records as a matter of routine. When they came into service early in 1953, the *Comets* gave the RCAF the distinction of being the first air force in the world to operate jet transports. On their delivery flights they established speed records from London to Ottawa. Later, when they went into squadron service, the *Comets* made the RCAF the first organization to operate scheduled jet trans-Atlantic flights.

A series of accidents to commercially-operated *Comets* overseas caused the RCAF *Comets* to be grounded in January 1954. In August 1956 the two aircraft were flown to Britain for modification. The following month they returned to Canada and resumed operational flying. In service with No. 412 Sqn., the two *Comets* flew across Canada and around the world on a variety of assignments.

Flying above the weather from 35,000 to 40,000 feet, they could carry a 12,000-lb. payload or 40 passengers at 455 m.p.h. But, after logging more than 5,000 flying hours each, the airframes became time-expired and at the end of September they were relieved of further RCAF duties.

Roger Duhamel

The Queen's Printer — L'Imprimeur de la Reine

OTTAWA

ROYAL CANADIAN AIR FORCE