The ROUNDEL

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APRIL 1954

ROYAL CANADIAN AIR FORCE

The Roundel

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THE CHIEF OF THE AIR STAFF
Royal Canadian Air Force

Vol. 6, No. 4

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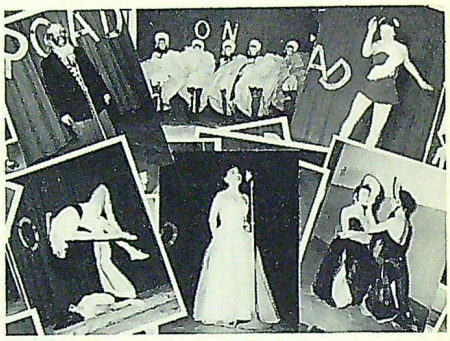
This Month's Cover



Rockcliffe's all-airwoman show, "On the Road," is described in this month's "Feminine Gen." Shown on our cover are can-can dancers Terry Erickson, Marlene Wambolt, Fern Smith, Carmel LeBlanc, and Betty Smith; singer Kitty Catton, Uncle Remus Rhona Rowdon; tap-dancer Carmel LeBlanc; and tumblers Eleanor Richmond and Marie May.

EDITORIAL OFFICES:
R.C.A.F., Victoria Island,
Ottawa, Ont.

SGT. SHATTERPROOF ENLISTS THE OPERA

Sir:

I need hardly tell you that a Shatterproof is seldom a mystic. Swordplay and statecraft have left the men of my family little leisure in which to establish a beach-head in the unseen world. Nevertheless, a few days ago, as I sat beneath my bust of Caesar pondering the problems of recruiting and morale, the solution came to me with a suddenness that smacked of the supernatural. I cannot help feeling that the spirit of my uncle Fortissimo Shatterproof (known to opera-lovers of the '90s as "The Caruso of Catfish Creek") had more than a casual hand in the matter.

If opera, Sir, is used as a medium for the sale of soap, why can we not enlist its aid in selling the Air Force?

The idea is, I realize, somewhat revolutionary; but I would ask that it be given the most serious consideration by the Minister and the C.A.S. As an example of what I have in mind, I have prepared the script for the opening broadcast. The task of finding a sponsor can safely be entrusted to the Directorate of Public Relations, nor should it be difficult to arrange with the C.B.C. for fifteen minutes each evening — preferably during the pre-prandial hour, when the nation's manhood is in its most receptive mood.

* * *

The programme opens with a chorus of manly voices singing (to the accompaniment of a mouth-organ) the grand old song from which the opera takes its name—"This Side of the Ocean." As the voices fade away on the words "So cheer up, my lads, bless 'em all!", we hear the announcer:

With such brave songs on their lips do the men and women of the Royal Canadian Air Force stand watch on the ramparts of civilization. Who — looking upon their stern young faces, all turned towards the stars — who, I say, will dare to question our country's future? Who can doubt what the outcome would be were the Totalitarian Titan to come in arms against the Colossus that is Canada?

But, as we gaze upon this devoted company, let us not forget that the quenchless flame of their self-confidence springs from no miraculous source. Kindled by faith, it has been fed by the twigs of their myriad small hopes and heartbreaks, their triumphs and their failures, their virtues and their faults.

And now Squeaky Creakies, the breakfast-food of Air Vice-Marshals, takes you to R.C.A.F. Station Moose Pelvis. With this as our starting-point, we shall follow the fortunes of one of those gallant young singers to whom we were listening only a few moments ago. Squeaky Creakies brings you the story of Corporal Cruiser, C.D., as he voyages bravely on across the stormy seas of his Service destiny. Will Corporal Cruiser find promotion — THIS SIDE OF THE OCEAN?

As the last word fades, we hear two typewriters clicking away busily.

A man's voice (muttering as he types): . . . "and it is therefore requested that this matter be taken under immediate advisement and that the recommended implementation be initiated without delay."

One typewriter stops.

Same voice: Hey — Shapely!

Second typerwriter stops.

A girl's voice: How many times must I remind you, Corporal Cruiser, that my name is not Shapely — in the office, that is. It's Legge.

Five seconds of dramatic silence follow, during which Cpl. Cruiser struggles with himself.

Cpl. Cruiser (sighing): You're right, L.A.W. Legge. I am weak.

L.A.W. Legge: We must be strong, Corporal. Remember our bargain.

Cpl. Cruiser (bitterly): But how long can we go on like this? If we wait until I'm the Chief of the Air Staff —

L.A.W. Legge: Hush, dearest — I mean, Corporal Cruiser. We are young. All our lives lie ahead of us.

Cpl. Cruiser: Not quite all. I'm thirty-eight tomorrow.

L.A.W. Legge: Chin up, Corporal Cruiser! Look down at that ribbon and those stripes. Think how far you have come in a mere twelve years! Who knows what another twelve may bring? Courage —

Cpl. Cruiser (urgently): Hold it, Shapely! Here's old Armageddon!

Both typewriters spring to life as measured footsteps approach. Cpl. Cruiser (muttering nervously as he types): "Sub-para (a). The occasion of the request stated in para. 1(a)(iii) above is the impending inspection by SASO /SO3-5 of the facilities for activation of —"

The footsteps stop.

A harsh voice: So! At it again, eh, you two?

Both typewriters stop.

Cpl. Cruiser (innocently): Why, Warrant Officer Doom! This *is* a surprise, Sir!

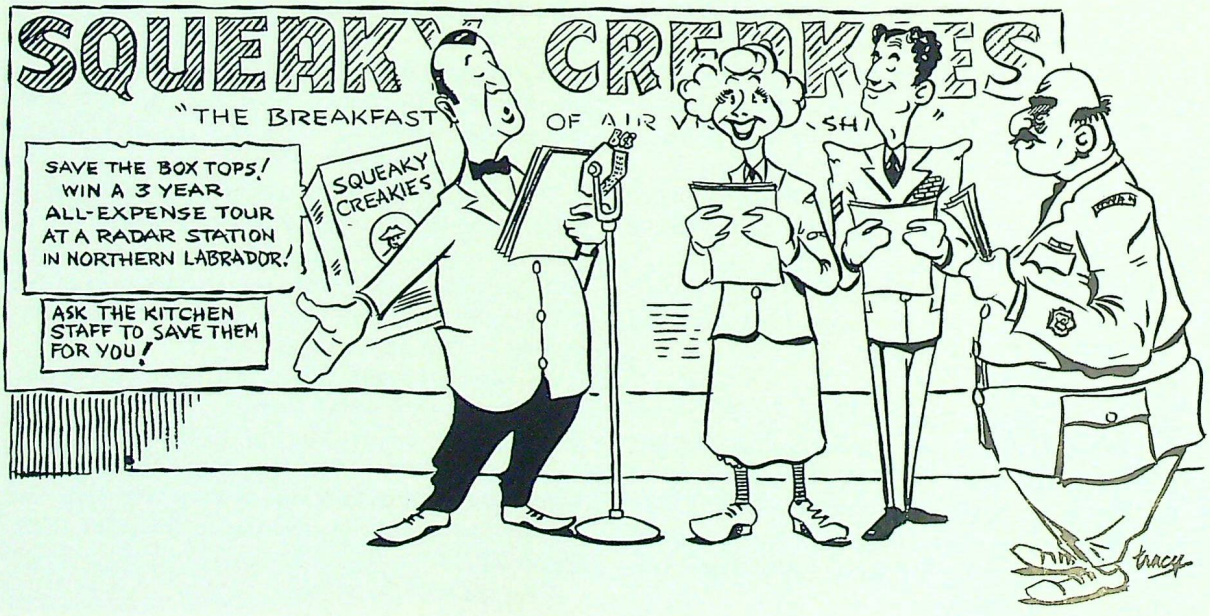
W.O. Doom: What do you two think this place is?— A Venusberg?

L.A.W. Legge (coyly): A Venusberg? I like that! I don't see any Venuses round here, do you? *Do* you, Mr. Doom? Eh? *Do* you?— Oh, dear, I've got a run! Look!

Silence, except for the accelerated rhythm of Warrant Officer Doom's breathing as he looks. Then a chair scrapes loudly on the floor.

Cpl. Cruiser: You, Sir, are a cad! L.A.W. Shapely's legs — I mean, L.A.W. Legge's shapelies — that is —

W.O. Doom (calm and deadly): Insubordination, Corporal? I was waiting for this. I shall ex-



pect you in my office at 0830 hours in the morning.

Warrant Officer Doom's footsteps are heard retreating. A door bangs.

L.A.W. Legge: Oh, what have I done to you?

Cpl. Cruiser: Got me on the carpet again, that's all. Why can't you stop flirting with that old walrus?

L.A.W. Legge (after a moment's hesitation): Flirting? Yes, I suppose it does look like that.— Well, I guess I'd better tell you. Corporal Cruiser, I suspect Warrant Officer Doom of subversive thinking, and nothing — not even the honour of an L.A.W.— shall prevent me from ferreting out the truth and, if necessary, exposing him for what he is!

As she finishes speaking, the theme song rises and fades once more, as at the beginning of the programme.

Announcer: What underlies this strange triangle? Has the unspoilt instinct of an airwoman detected the sinister purpose beneath a Warrant Officer's philanderings? Will Corporal Cruiser become C.A.S.? Don't fail to be with us tomorrow when Squeaky Creakies, the breakfast-food of Air Vice-Marshals, will again take us to R.C.A.F. Station Moose Pelvis. Many things can happen — THIS SIDE OF THE OCEAN!

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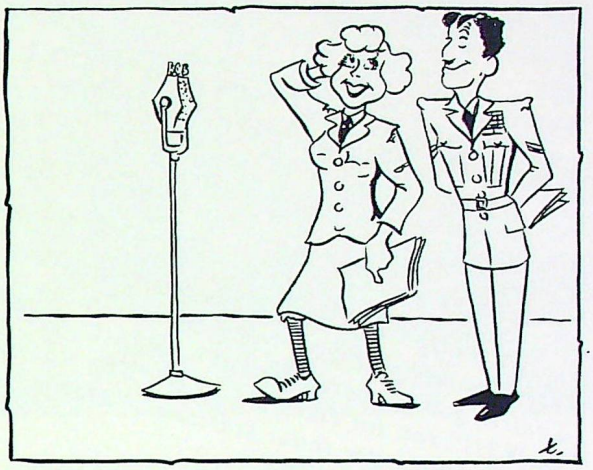
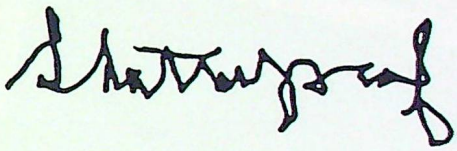


Even you, Sir, cannot fail to appreciate the gripping quality of such a programme. The elements of drama are all there — Love, a Good Woman, Ambition, Duty, Sex, and a hint of Treason. From such ingredients as these we can make a cake that no red-blooded Canadian will be able to resist.



WINGS OVER CLINTON

A formation of storks recently put on a remarkable exhibition of precision dropping at R.C.A.F. Station Clinton. Having singled out their small target from the rest of that busy Service city, they all delivered their loads with unerring accuracy on No. 12 Exam. Unit. The lucky recipients are shown here congratulating each other. Left to right: Sgt. W. Eckert, Cpl. N. Harrison, and Sgt. P. Cooper — a boy (6 lbs. 2 oz.), a girl (6 lbs. 9 oz.), and a boy (7 lbs. 4 oz.), respectively.

AIRCRAFT CONTROL and WARNING in the R.C.A.F.

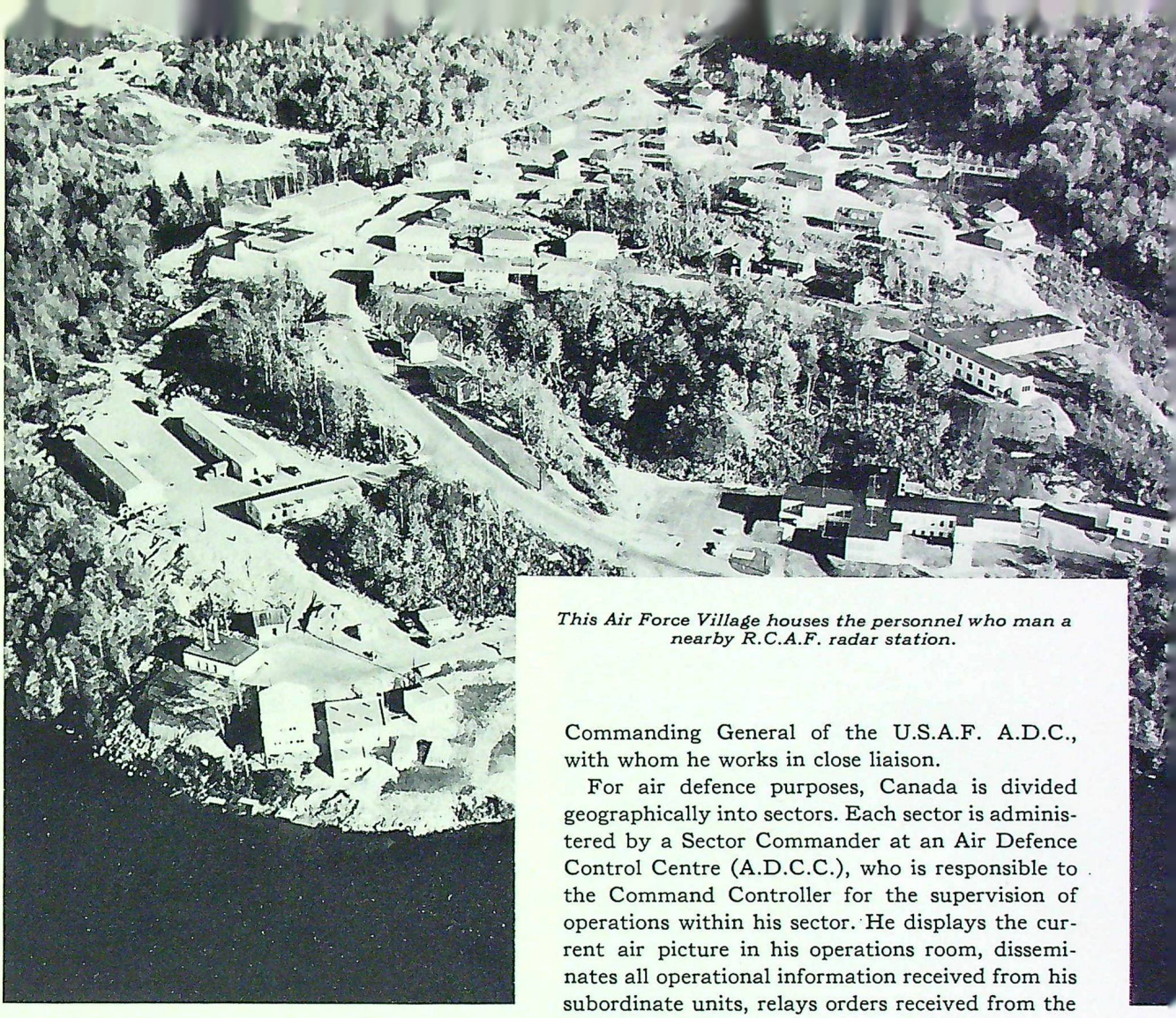
By Squadron Leader J. E. Mahoney

(Although the need for security precludes our being very specific on the subject of Aircraft Control and Warning activities in the R.C.A.F., the following article will give our readers a fairly good general idea of what A.C. & W. is all about. Sqn. Ldr. Mahoney, whose "Stalag Luft III" ran for eight issues of "The Roundel" in 1949 and 1950, is now Senior Controller at one of our larger radar stations.— EDITOR.)

IMMEDIATELY after the last war, Canada decided to make the R.C.A.F. primarily a fighter force. In modern air warfare, the provision of fighter aircraft to attack and destroy the enemy is only half the battle; the other half is in knowing where the enemy aircraft are and directing the fighters until they are in a position to intercept them. This latter function is carried out by the Aircraft Control and Warning System.

The A.C. & W. System is a part of Air Defence Command's organization. It consists of an elaborate network of radar stations, located in strategic positions across Canada, and entails the provision of vast quantities of expensive radar and communications equipment and the training of thousands of operating personnel. It must be capable of displaying the location of all airborne aircraft at all times, of controlling the fighters, and of passing all pertinent information to the A.O.C. for his guidance in defence planning and the conduct of the air battle.

In the plotting-room. L.A.W. L. M. Mazur (left) and L.A.W. M. L. Bezler.



This Air Force Village houses the personnel who man a nearby R.C.A.F. radar station.

The top level of operation is the Combat Operations Centre (C.O.C.), which is responsible for the efficient operation of all air defence facilities. The senior officer at the C.O.C. is the A.O.C.'s direct representative, and is known as the Command Controller.

The C.O.C. receives information on all hostile, fighter, or unidentified aircraft, and on aircraft in distress, and it presents a picture of the movement of those aircraft in the form of arrows on a large horizontal map in the operations room. The status of all aircraft, weapons, and A.C. & W. facilities is displayed on special large boards. It is from here that the Command Controller makes his decisions. In addition, he has direct communication with the Commanding General of the U.S.A.F. A.D.C., with whom he works in close liaison.

For air defence purposes, Canada is divided geographically into sectors. Each sector is administered by a Sector Commander at an Air Defence Control Centre (A.D.C.C.), who is responsible to the Command Controller for the supervision of operations within his sector. He displays the current air picture in his operations room, disseminates all operational information received from his subordinate units, relays orders received from the C.O.C., and carries out liaison with the adjacent sectors and U.S.A.F. counterparts.

Sectors are further divided into sub-sectors. Each sub-sector is the responsibility of the Chief Controller at an Aircraft Control and Warning Squadron (A.C. & W. Sqn.) or Ground Control Intercept station (G.C.I.). This unit is the counterpart of a fighter squadron, and works in close liaison with the squadron or squadrons assigned to it for operational control.

The function of an A.C. & W. Squadron is to detect and identify all aircraft within its area of radar coverage. When it has identified an aircraft as unknown or hostile, it then "scrambles" fighters to intercept it, and controls them by radio telephony until the fighters are in sight of their target.

Detection of aircraft is accomplished by means of radar. Each G.C.I. is equipped with a radar transmitter and receiver which enable the position of aircraft in flight to be read from radar scopes indicating the bearing and range from the station, and the altitude. These aircraft, so detected, are kept under observation, and their position in space is passed to the Surveillance Section in the same building.

In the Surveillance Section, the track of the aircraft is plotted on a huge plotting table. The identification personnel, watching this map constantly, compare the track with the information they have on friendly aircraft movements, received from the Department of Transport Air Traffic Control Centre or from R.C.A.F. aerodromes.

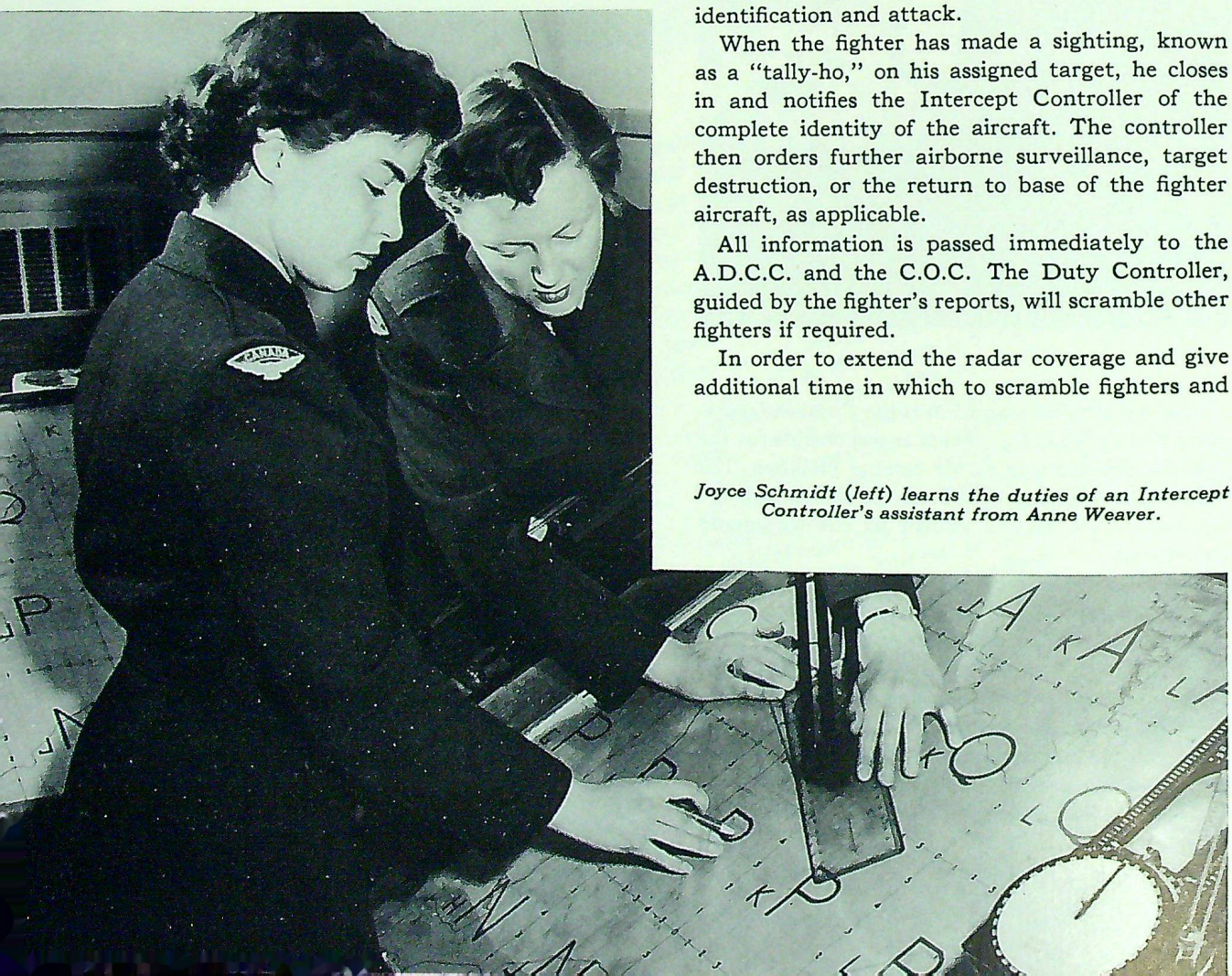
If the track can be correlated as to position, speed, and altitude, it is identified as friendly; if it cannot, it is called "unknown," and fighters must be scrambled to intercept and investigate it. As a suspected aircraft travels at the rate of five or six miles a minute, every effort is made to reduce the identification time to a minimum. Sometimes, because of delays and human error, unknown aircraft are really friendly. For this reason, standard procedures for the approach to and identification of all intercepted aircraft have been laid down, to prevent undue interference with, and anxiety to, pilots and passengers.

While the fighters are closing on the target aircraft, the Intercept Controller keeps them fully informed as to the height and airspeed of the target, together with its position. Meanwhile he is manoeuvering the fighter into the best position for identification and attack.

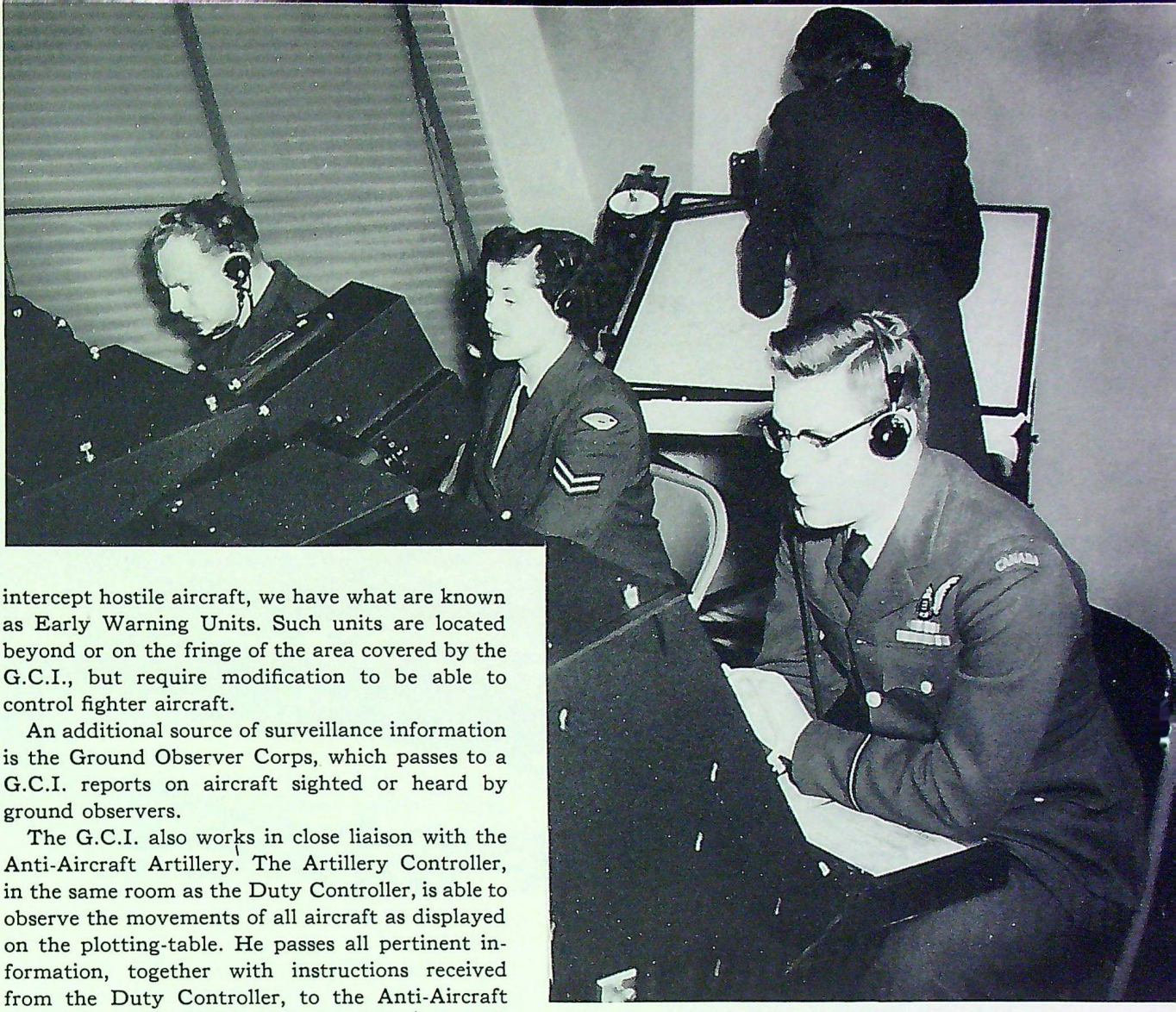
When the fighter has made a sighting, known as a "tally-ho," on his assigned target, he closes in and notifies the Intercept Controller of the complete identity of the aircraft. The controller then orders further airborne surveillance, target destruction, or the return to base of the fighter aircraft, as applicable.

All information is passed immediately to the A.D.C.C. and the C.O.C. The Duty Controller, guided by the fighter's reports, will scramble other fighters if required.

In order to extend the radar coverage and give additional time in which to scramble fighters and



Joyce Schmidt (left) learns the duties of an Intercept Controller's assistant from Anne Weaver.



Radar controllers at work. Left to right: Flying Officer L. D. Roche, Cpl. R. M. Twissell, Flying Officer R. A. Henry.

intercept hostile aircraft, we have what are known as Early Warning Units. Such units are located beyond or on the fringe of the area covered by the G.C.I., but require modification to be able to control fighter aircraft.

An additional source of surveillance information is the Ground Observer Corps, which passes to a G.C.I. reports on aircraft sighted or heard by ground observers.

The G.C.I. also works in close liaison with the Anti-Aircraft Artillery. The Artillery Controller, in the same room as the Duty Controller, is able to observe the movements of all aircraft as displayed on the plotting-table. He passes all pertinent information, together with instructions received from the Duty Controller, to the Anti-Aircraft Operations Centre. In this way, anti-aircraft weapons may be brought to bear against hostile aircraft flying over gun-defended areas.

Secondary objects of the A.C. & W. System are to aid aircraft in distress by directing them when lost or by pin-pointing their position, and to notify Civil Defence authorities in the event of approaching enemy aircraft, so that they may sound an air raid warning.

Perhaps the best way to indicate the method of operation of the system may be to describe an imaginary visit to a G.C.I.

* * *

Imagine, then, a huge operations building, standing majestically on a hill-top, just as pictured in our artist's sketch. An imposing "radome," adjacent to the Operations Building, houses the radar antenna, and appears as a gigantic observatory. As we enter the building, a security guard carefully checks our identity and issues us with a pass-button.

Going into the Surveillance Room, we find our attention drawn immediately to the plotting-table, around which are numerous plotters wearing headsets, intently listening to reports of aircraft, and plotting them on the table by means of plaques and arrows.

Against the far wall is a huge display board, on which is displayed all information concerning the

Drawing by W.O.1 C. S. Roy.

tracks on the table — the track number, the time it appeared, the altitude, the quantity of aircraft, the speed and identification. We cannot see them, but behind the board are a number of "Fighter Cops" (Fighter Control Operators) who are listening to the same information as the plotter.

At the other end of the room is a long dais, behind which are seated the Surveillance Controller and his assistants. They are constantly watching the plotting-table and display boards, and comparing the information displayed with that of known flights, as received from control towers at R.C.A.F. aerodromes and the Department of Transport Air Traffic Control Centre. Above the main dais is another dais, at which are seated "tellers," who are relaying to the A.D.C.C. the information displayed.

We next visit the Reporting Room. At first we see very little, for this room is almost completely dark. It is here that the radar scopes are located. As our eyes gradually become accustomed to the darkness, however, we see a number of "scope reporters" seated at the scopes, intently watching them for the blips which indicate the paths of aircraft through the sky. A constant mumble of voices is heard, as the scope reporters relay the information to the plotters and display-board operators in the Surveillance Room.

After leaving the reporting room, we enter the Control Section. Here we meet the mainstay of the G.C.I., the Duty Controller, and his assistants, the Operations Controller and Operations "B". From his vantage point, strategically located so that he can view the plotting-table and the display boards, the Duty Controller directs operations. In front of him is a miniature switchboard, to provide

him with direct communications to all operational positions in the building. His chief concern is to order aircraft to states of preparedness as required, to scramble them after unknown and hostile tracks, to allot missions to Intercept Controllers, and generally to supervise the conduct of the air battle.

He has direct control over the Intercept Controllers, who are located at radar scopes in rooms adjacent to the control section. It is they who actually control the fighters when they become airborne and give them directions which will enable them to intercept the target aircraft.

And now let us imagine, from what we know of the A.C. & W. system, what would happen if an enemy aircraft were to invade our country.

In the reporting room, the first inkling of it would be a tiny blip appearing, just like hundreds of others, on a radar scope.

"Initial plot at Able Baker 5132," states the scope reporter.*

In a few seconds word comes back from the plotter: "Track 49." The scope reporter marks "49" on his or her scope, and follows its progress carefully across the scope, passing its position each minute.

Meanwhile, in the Surveillance Room, the plotter has placed a round disc on the plotting-table, with a small black plaque beside it, indicating the track number "49".

The Identification Officer is hard at work, checking the pre-plot board on which known flights are pre-plotted, and scanning through his flight plans. Nothing on it. Soon as arrow appears on the table. Heading south. One minute has passed since the initial plot appeared. He looks on the display board opposite Track 49. No height yet. Again he checks his flight plans, then turns to his assistant:

"Contact A.T.C. centre on track 49."

A minute later his assistant tells him: "Negative."

He picks up his 'phone and cuts in on the plotting line: "Track 49 identified unknown."

The plotter places a red marker on the plaque on the table, which indicates that it is unknown and requires interception.

Up in the Control Section, the Duty Controller sees this. He looks at the aircraft status board, then gives an order to the Operations Controller:

"Scramble Whiskey Red section. Vector 360, angels thirty. Bring Whiskey White to stand-by."

At the aerodrome, jet engines are turning over almost as soon as the order has been received from the G.C.I.

The Operations Controller, immediately after giving the scramble order, calls an Intercept Controller on the 'phone:

"Whiskey Red section scrambled, vector 360, angels 30. Track 49. Channel C Charlie."

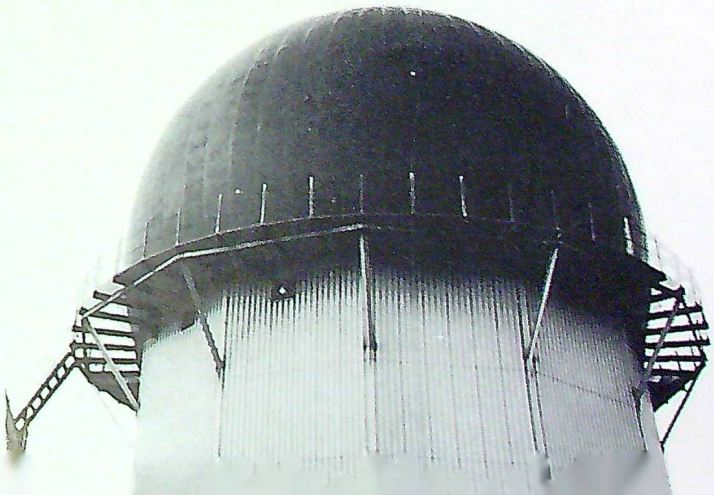
The Intercept Controller, huddled over his scope, marks this information on his Intercept Report form. Checking the plotting table, he locates the position of track 49, and finds it on his scope. Then turning to his assistant, he advises the position and asks for an altitude. Though intently watching the progress of the unknown track, he checks the vicinity of the aerodrome from time to time to look for his fighters, and anxiously awaits their call.

Before long he sees a blip. Seconds later he receives a call:

"Hello, Sausage — this is Whiskey Red."

"Hello, Whiskey Red, this is Sausage. Vector 350 for bogey. Angels 30. Over."

Inside the radar dome, perched on a northern hill-top, an antenna rotates and sends out its signals into the surrounding skies.



*For security reasons, all figures used in the following dialogue are fictitious and the R/T phraseology only approximates the standard procedures and code words.

Whiskey Red acknowledges; then, a minute later, he says:

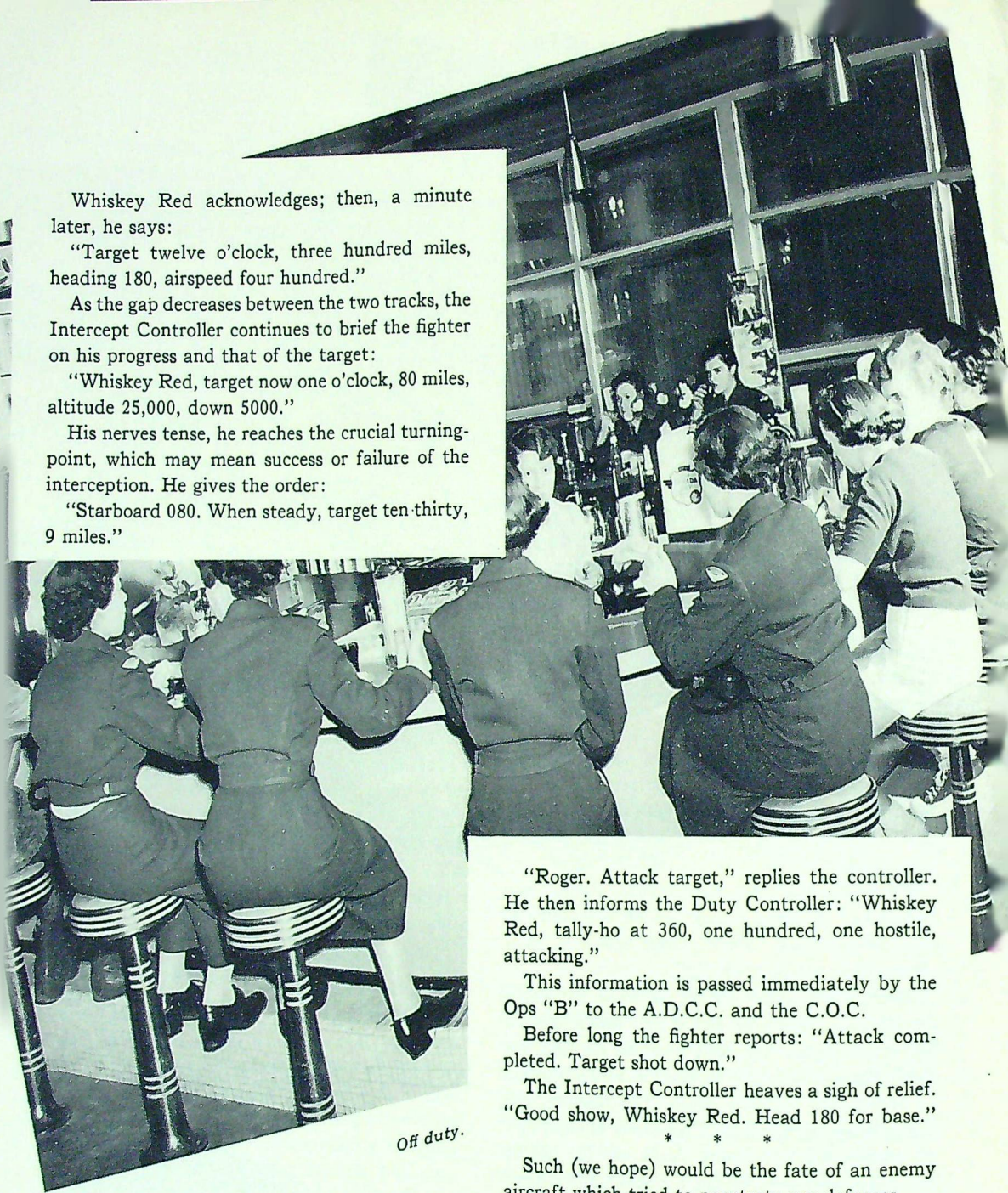
"Target twelve o'clock, three hundred miles, heading 180, airspeed four hundred."

As the gap decreases between the two tracks, the Intercept Controller continues to brief the fighter on his progress and that of the target:

"Whiskey Red, target now one o'clock, 80 miles, altitude 25,000, down 5000."

His nerves tense, he reaches the crucial turning-point, which may mean success or failure of the interception. He gives the order:

"Starboard 080. When steady, target ten-thirty, 9 miles."



Off duty.

He watches closely. Nice. The fighter is closing quickly on the target. "Target eleven o'clock, five miles," he advises.

"Whiskey Red, tally-ho," comes back.

"Roger. Investigate target."

Seconds later, the fighter reports:

"Target one hostile, twenty-four thousand."

"Roger. Attack target," replies the controller. He then informs the Duty Controller: "Whiskey Red, tally-ho at 360, one hundred, one hostile, attacking."

This information is passed immediately by the Ops "B" to the A.D.C.C. and the C.O.C.

Before long the fighter reports: "Attack completed. Target shot down."

The Intercept Controller heaves a sigh of relief. "Good show, Whiskey Red. Head 180 for base."

* * *

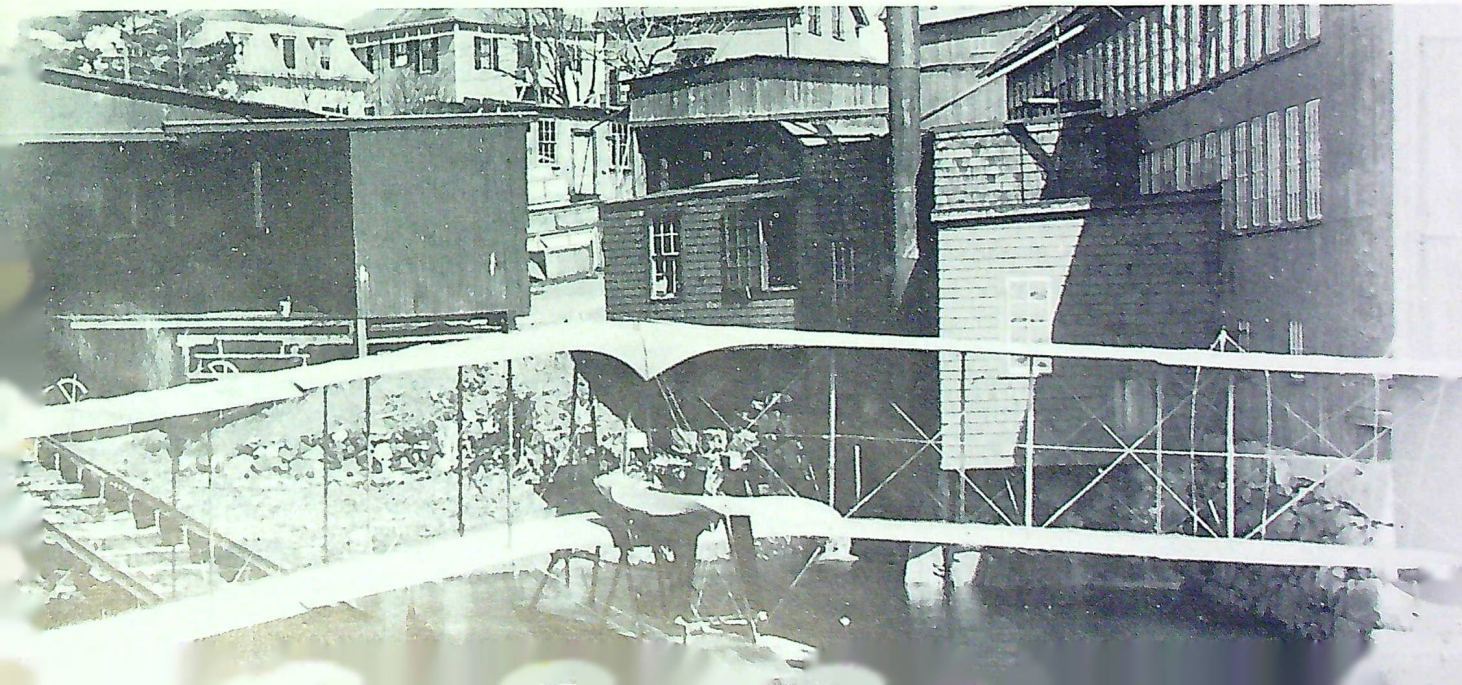
Such (we hope) would be the fate of an enemy aircraft which tried to penetrate our defences.

The Fighter Control personnel are keenly aware of their responsibilities. No one who has ever visited a radar station can help but be impressed with the air of serious expectancy which prevails. Our airmen and airwomen know that we are living in the world with an enemy who may strike without warning. They know that an unknown track is a thing to be feared. For them there is no "peace."

Pin-Points in the Past

SHOWN marching along Portage Avenue, Winnipeg, on 1 July 1932, are the personnel of Winnipeg Air Station. Leading the flight is Flt. Lt. C. R. Slemon, the present Chief of the Air Staff. Behind him is Flt. Lt. R. E. McBurney (Air Vice-Marshal, C.B.E., retired). Among the airmen, the nearest to the camera is Flt. Sgt. F. B. Fulford (Sqn. Ldr., ret.), and L.A.C. George Tough (Flt. Lt.) is immediately behind him. The two other visible members of the first file are L.A.C. R. V. Yates (W.O.1), on the left, and Cpl. A. B. Adams (Sqn. Ldr., ret.). Also identifiable are Sgt. J. M. Ready (Flt. Lt., ret.), Sgt. "Doc" Craig, Cpl. W. H. Workman (Flt. Lt., ret.), Sgt. Hopkins, Cpl. C. Geddes, Cpl. Johnny Walker, and Sgt. R. I. Thomas (Wing Cdr.). W. O.1 R. V. Yates, who was kind enough to send us the photograph, tells us that the temperature that day was 98.7° F. and that a "fine evening was held later at the 'Old Guards Club'— which, incidentally, is still in operation."

Our other photograph shows the first military aircraft purchased by Canada, in 1914. A Burgess-Dunne biplane, it cost $5,000, and was never used operationally.



THE PARTY LINE

TELECOMMUNICATIONS IN THE R.C.A.F.: PART TWO

By Wing Commander D. Gooderham, O.B.E.

RADIO NAVIGATIONAL AIDS

It is doubtful if telecom will ever provide a navigational aid as dependable as the prairie grain elevator clearly marked with the name of the town; but the back-room boys are still trying. Some indication of the success that has crowned their efforts is given by the eminently sensible reluctance to fly which is displayed by aircrew when any of the radio nav aids in an aircraft are unserviceable.

There is nothing peculiar about Radio Navigational Aids (R.N.A.) considered from a technical viewpoint; the use of electronic equipment as radio nav aids is influenced by the same considerations that have been discussed under COMMUNICATIONS, i.e. frequency, power, noise, space, weight, simplicity of controls, etc. The operational facilities afforded by R.N.A. can best be explained by examining in turn the two main classes: flight aids and landing aids. The meaning of the first is fairly obvious; the second, landing aids, refers to aids to the final approach and touch-down, and, in addition, to devices that assist in controlling aircraft in the immediate vicinity of airfields.

Control of air traffic in the vicinity of airfields and the guidance of aircraft into "let-down patterns" can be greatly facilitated by radio nav aids of the radar type. Most of the world's major airports are today served by such aids, termed "airport surveillance radars."

Ground Controlled Approach

Airport surveillance radars are required to give coverage over all airways approaches to the field, at all altitudes at which aircraft may approach or will be "held" while awaiting clearance to land. Their inherent accuracy, therefore, is usually limited. To facilitate final approach runs under conditions of low visibility, a separate high-precision radar is used which concentrates on the final approach run and gives very accurate information on an aircraft's position and altitude, thereby enabling ground controllers to "talk" it down the ideal glide path. This is known as Ground Controlled Approach (G.C.A.). To achieve maximum landing rate, aircraft must be "fed" at the optimum rate into the final approach run. Thus, it is common practice to integrate surveillance and precision radars. Certain equipments, such as the MPN-1 and CPN-4 G.C.A.s used by the R.C.A.F., incorporate both equipments into a single mobile unit.

Instrument Landing System

Another type of landing aid in current use is known as the Instrument Landing System (I.L.S.). In this system, equipment on the ground provides an electronic glide path down which aircraft should fly, while complementary equipment in the aircraft tells the pilot whether he is "on" beam, above or below, to left or to right. Ground beacons called "fan markers" provide indication of position along the beam and hence the distance from de-

sired point of touchdown. This system, unlike G.C.A., requires special equipment in aircraft. On the other hand, it does not require controllers on the ground. The R.C.A.F. does not employ I.L.S. at its own airfields, but it does equip with the necessary gear those aircraft that are required to land at airfields equipped with I.L.S. but not with G.C.A., e.g., transport 'planes flying into civil airports.

Either G.C.A. or I.L.S. provides a very useful service. Possibly their greatest weakness today is their inability to handle really large numbers of high-speed low-endurance aircraft, such as jet fighters. Developments on both systems, aimed at making certain processes automatic rather than manual, are now under way, and handling capacity should be markedly improved. As usual, there will be a price to pay — in this case, extra weight in the aircraft and extra problems in maintenance.

Radio Beacons

To afford maximum combat time and radius of activity, let-down from high altitude must be done in a minimum of time, and hence, of manoeuvres. To this end the R.C.A.F. uses a Rapid Let-down System. The elements of this system are the aircraft's radio compass (of which more will be said) and two radio beacons situated on the extension of the runway, some eight and thirty miles, respectively, from the touch-down end (the ideal distances depend on the flight characteristics of the aircraft).

Radio beacons, similar to those used by rapid let-down systems, find widespread application as "homers." Homers are usually simple radio transmitters working in the L.F. or M.F. bands, which radiate power in all directions (omni-directional). Each beacon periodically transmits an identifying call sign. Essentially they are electronic lighthouses, available to anyone who desires to know in which direction to steer in order to get to a known point. Just as eyes are required to get any benefit from a lighthouse, so aircraft must have a device, such as a radio compass, to get any benefit from radio beacons.

Radio compasses, which are fitted in nearly all R.C.A.F. aircraft, are essentially radio receivers equipped with ancillary devices which determine (and indicate) the direction from which a radio signal is being received. Messages or identifying codes transmitted by a radio beacon are heard on ordinary ear-phones. Use is also made of the receiver portion of a radio compass in "flying the beam." Radio beacon transmitters, connected to special aerial systems, radiate coded energy in such a way as to cause aircraft to hear a steady note if they are flying on a beam, or "leg"— a letter A (dot dash) if on one side of the leg, and a letter N (dash dot) if on the other. This system, called Radio Range, is widely used by civil aeronautical control agencies. The Department of Transport has many such ranges located all across the settled areas of Canada. The R.C.A.F. makes use of this facility but does not of itself set up the ground equipments involved.

Ground Direction-Finding

Ground Direction-Finding (D.F.) equipments perform essentially in the same manner as do radio compasses in aircraft. They depend for their functioning on radio signals transmitted by the aircraft. It follows that ground D.F. equipment must be capable of operating on the frequencies used by the communications radio in the aircraft. In so far as the R.C.A.F. is concerned, the results to be achieved do not justify the effort involved in working D.F. on H.F., and our ground D.F. equipment is currently all V.H.F. Coincident with the move of aircraft control communications from the V.H.F. to the U.H.F. band (as already discussed in COMMUNICATIONS), ground D.F. stations will be equipped with U.H.F. D.F. gear.

Bear in mind that the normal D.F. system, unlike the radio compass system, presents information to someone on the ground rather than to the pilot. The information obtained must be passed to the pilot by radio. This system, therefore, involves personnel on the ground, which the radio compass system does not. However, the job on the ground can usually be handled by men established for other duties, e.g. control tower operators. Additionally, the D.F. system can provide aircraft with a "fix" (bearings taken simultaneously by two or more ground D.F. stations) with-

out distraction of aircrew from other duties. Finally, it enjoys the advantage (previously noted for G.C.A.) of operating without special equipment in the aeroplane.

Before leaving D.F. systems, mention must be made of an airborne D.F. equipment used mainly by search and rescue aircraft for "homing" on downed flyers equipped with V.H.F. or U.H.F. radios. Usually this gear takes the form of D.F. attachments — that is, ancillary equipment applied to standard V.H.F. or U.H.F. airborne communications radios — which afford an indication of the direction from which signals are being received.

Distance-Measuring Equipment

It is always useful, and sometimes essential, for aircrew to know the exact distance from their aircraft to some reference point on the ground. The degree of accuracy required, or the time available for computations, often precludes use of conventional navigational methods, and resort must be made to some electronic device such as Distance-Measuring Equipment (D.M.E.) which affords aircrew a direct and relatively precise measurement of the distance between the aircraft and a beacon on the ground. This system utilizes radar technique. Short bursts of radio energy, sent out by a transmitter in an aircraft, are received by a suitable receiver on the ground and used to "trigger off" pulses from a ground transmitter. The pulses are, in turn, received by a receiver in the aircraft. Associated with the aircraft gear is an electronic clock which measures the time between despatch of a short burst of energy (a pulse) and receipt of the resultant pulse from the ground. This time interval is a measure of the distance between aircraft and beacon. The aircraft equipment which asks "how far?" is called an "interrogator," and the ground equipment which answers, a "transponder."

D.M.E. in aircraft is usually complemented by direction-finding devices which use as reference the same ground transmitter as does D.M.E. Most current equipments provide D.F. information of an elementary kind, affording only an indication of whether the ground transmitter is dead ahead or to the left or right of the aircraft heading. The best known of such systems is probably one which was widely used in the Second World War for supply- and troop-dropping operations. It involved the use of an airborne equipment called "Rebecca" and a ground transponder called "Eureka." Small versions of the latter were of a size suitable for use by paratroopers. This gear was extensively employed in "Overlord" and in support of Wingate's operations in Burma. The R.C.A.F. currently uses it both as a homing aid at bases inadequately served by other facilities and in tactical operations with the Army.

LORAN and SHORAN

Turning to black boxes which afford fixes at ranges greater than line-of-sight, mention should be made of LORAN (Long-Range Navigation Aid). Aircraft equipped with a LORAN receiver can establish themselves on a line-of-position relevant to two ground stations: given a second line of position, determined by using another pair of ground stations, the aircraft has a fix. A line of position is established by measuring the *difference* in the distance from the aircraft to one ground station and that from the aircraft to a second ground station. This is done by making the ground stations pulse in synchronism and by measuring the interval of time between receipt, by the aircraft, of signals from each station.

Standard LORAN equipment works in the H.F. band, and the results obtained reflect the peculiarities of propagation in that band. Without going into technicalities, it can be stated that current equipments can produce fixes over water at distances of up to 500 miles by day and 1,000 miles by night.

SHORAN is operationally a short-range version of LORAN. Its coverage is limited to line-of-sight ranges but its accuracy is high, lending itself, in peace, to photo and geodetic survey work, and in war, to precision bombing. Technically it resembles Rebecca-Eureka rather than LORAN in that the ground transmitters pulse only when they receive a pulse from a SHORAN transmitter in the aircraft. Current R.C.A.F. usage of this device is solely in survey work for the Department of

Mines and Resources. This involves frequent moves of ground equipment and poses some very interesting logistic problems in which the arctic mosquito is a factor of some import.

Search Radar

A radio nav aid of particular importance to long-range aircraft is airborne search radar. This equipment provides a radar map of the terrain over which the aircraft is flying. The border of the map is roughly the optical horizon; the detail, depicted on a cathode ray tube, comprises areas of black and white representing areas giving weak or strong reflection of radar signals. Large buildings, steep cliffs, and mountains, give strong reflections, whereas sea and flat fields reflect relatively little energy. As a result, shore-lines, rivers, lakes, mountains, and urban areas, show on the radar scope as areas of differing intensity of light. This facility affords a most useful ancillary to other navigation aids, since it is free from the limitations inherent in systems requiring complementary equipment on the ground. Additionally, search radars in aircraft can be used as "cloud and collision warning" devices. Heavy clouds, particularly those of a nature constituting hazard to aircraft, can be detected at ranges enabling detour action to be taken. The R.C.A.F. has only a few aircraft fitted with search radar solely for nav aid purposes, but equipment now on order will be fitted on all North Stars and C-119s, and on such Lancs as are engaged on area reconnaissance.

Altimeters

All of the preceding paragraphs on radio navigational aids relate to equipment and systems devoted to locating the aircraft in plan position. There are also devices to tell aircrew their height relative to the terrain below (as distinct from height above sea level or other datum). Such devices have applications in photographic work and in supply-dropping, in addition to the obvious rôle of assisting safe flight at low altitudes over unknown terrain. The R.C.A.F. uses equipment of this sort, known as radio altimeters and radar altimeters, in transport and Lancaster aircraft.

* * *

There are other radio nav aid devices on the horizon. For the present, however, let us assume that the few gadgets outlined above have been adequate to the task and that our airmen have been homed safely to their favourite milk bar. Let us leave them there for the moment while we take a look at divers ways of putting electrons to less friendly work — to wit, radio warfare.

RADIO WARFARE

The term Radio Warfare, as employed by the R.C.A.F., covers electronic systems used specifically for tactical operations against an enemy. The popular concept of such a system is ground radar, so widely publicized for its rôle in the Battle of Britain. Such systems still occupy a prominent, and expensive, place in our radio warfare activities, but there are others which are assuming appreciable importance. To avoid security classification, information given in the following paragraphs will be of a general nature, concerned principally with the requirement. Mention of specific equipments will be limited to those whose existence is common knowledge.

The primary function of electronic equipment in radio warfare is to ascertain the whereabouts of aircraft, missiles, or ships. A second rôle is to obtain information concerning these objects or of the electronic equipment within them. Concerning the objects themselves, the thing of interest is identity. As regards electronic equipment in the objects, interest centres about such technical features as frequency, pulse recurrence frequency, beam rotation rate, etc., in order that counter-measures may be applied.

Electronic Counter-measures

That branch of radio warfare which seeks to confound the radio warfare facilities of the enemy is called "Electronic Counter-Measures" (E.C.M.). It takes two forms: active and passive. Active E.C.M. seeks to deny the enemy the use of his radio warfare facilities; passive E.C.M. seeks to use, for our own ends, transmissions made by enemy electronic facilities. E.C.M. is a broad field deserving a chapter of its own, but coverage given there can only be very general and will appear as

notes corollary to statements on basic radio warfare topics.

In Part One of this article it was noted that there is an exception to the statement that, in the R.C.A.F., the use of the electron in delivering bombs, etc., constitutes an art called "Telecommunications." The exception appears today as the search and ranging radars fitted to fighters. At one time airborne radars were fitted to fighters primarily to supplement the pilot's eyes when carrying out interceptions under conditions of low visibility. This equipment, called A.I. (airborne controlled interception), was classified as Signals equipment. However, as the capabilities of A.I. gear improved, it took over an ever-increasing part of the "aiming and firing" work and eventually became an integral part of the aircraft's armament system. Maintenance of the system appeared to require a knowledge of radar, gun sights, and firing mechanisms. A decision was accordingly made to classify as Armament Systems all those electronic boxes directly connected (with no human link) with weapons. A further word on this matter appears later under the section entitled "The Crystal Ball."

Moving Target Indicators

Most readers are familiar with the basic principles of radar, but two technical factors are worth noting at this point. One is that conventional radars are effectively limited in range to the optical horizon. The second is that radar responses from aircraft can be badly masked by responses from fixed objects, such as mountains. To combat this, circuitry is used called "Moving Target Indicator"(M.T.I.), which effectively removes all responses from fixed objects.

Height-Finding

Conventional height-finding radars are of two types: nodding (or beaver-tail) and V-Beam. The latter type involves the use of vertical sails and slant sails, neither of which would give joy to a yachtsman. I shall not attempt here to explain how each works, or to compare their relative efficiency. It is of note that they have one thing in common — both usually fall short of what the user desires.

Aircraft Identification

Identification of all aircraft plotted is today more vital to air defence than ever before. It has always been essential to economy of defence effort; today, because visual identification is rapidly disappearing as a part of interception procedures, it is needed also to protect friendly forces from one another. Assistance to the more obvious methods, such as requiring all friendly aircraft to file flight plans and to perform identification manoeuvres, can be obtained from electronic systems known as Identification, Friend or Foe (I.F.F.). These consist basically of interrogators and transponders. Interrogators are used by all radars that wish to "ask" the identity of any target seen on their scopes. Transponders are the black boxes which reply to the interrogator. They are therefore carried by all aircraft and ships. Early I.F.F. systems afforded limited means of identifying one type of friendly aircraft from another, plus a special "reply" for aircraft in distress. The security of the system depended on the enemy *not* having transponders similar to ours. Obviously, compromise was only a question of time.

Ground radar stations gather information regarding friendly and hostile aircraft. To use such information, a rather complex sorting system is needed capable of accepting a large mass of information and presenting in orderly fashion such extracts as are necessary to intelligent deployment of fighter aircraft. You have heard of filter rooms and ops rooms, and possibly of the large numbers of plotters, tellers, trackers, controllers, and so forth, that reside therein. Such activities have always used a certain amount of telecommunications gear, principally telephonic. This use is on the increase and the telecom equipment required in the brain-box of an air defence system threatens to assume formidable proportions. The cause is the speed of modern aircraft, which brooks no delay between receipt of information and the taking of appropriate measures. Many tasks formerly done in a few seconds by highly skilled people must now be done in a fraction of a second.

Jamming

No other type of air force activity employs communications as extensively as does air defence. Air-ground-air (A/G/A) communication is particularly vital to air defence. Without it, ground radars would serve only conventional anti-aircraft batteries and civil defence. So it is not surprising that a great deal of the E. C. M. programme of any armed service is concerned with communications. If you can deny the enemy the use of his A/G/A communications, it may not be necessary to jam his defensive radar.

To be effective, jamming of either radar or communications usually must be done from aircraft flying either with or near the force to be defended from the enemy's air defence. "Jammer" aircraft are vulnerable, since fighters equipped with suitable receiving and direction-finding equipment can home on them without help from ground facilities. If bomber forces equip only a few of their aircraft with jamming equipment, the life expectancy of the jammer aircraft crews can be very poor. To go to the other extreme and equip all bomber aircraft with jamming gear would be materially to reduce the payload of the bomber force. Furthermore, to do so consistently would be to play into the hands of an enemy who supplements his search radar with a passive detection net.

* * *

Many more examples could be cited to illustrate that E.C.M. is very much a cat-and-mouse game in which intelligence and flexibility are essential. Unfortunately, many rather expensive electronic equipments are involved too. Most are of the black-box variety, but use is still made of a widely publicized E.C.M. device, Window (or Chaff), consisting of pieces of tin foil which, when released from aircraft, produce responses on radar similar to those produced by aircraft.

Maritime reconnaissance aircraft use airborne search radars to assist in locating convoys and surfaced submarines. Note that "surfaced" may mean only that a schnorkel is above the water, thereby presenting a radar-reflecting surface of relatively small dimensions. Is the sea is rough, the radar returns from waves may well be equal to those from a schnorkel, making detection of the latter most difficult. The designers of maritime search radar have the further problem of producing long ranges without sacrifice of the precision necessary for the final stages of attack.

This brief look at radio warfare completes the coverage of specific operational problems faced by telecommunications. Before dealing with general operational factors and with the Crystal Ball, a word should be said on the strictly hardware side of the business.

(To be concluded)

BRITISH JUSTICE

You must not miss Whitehall. At one end you will find a statue of one of our kings who was beheaded; at the other, the monument of the man who did it. This is just an example of our attempts to be fair to everybody. (*Sir Edward Appleton*).

Personnel Movements ★ ★ ★

OFFICERS: JANUARY

S/L J. C. Anstead — RCAF Stn Moose Jaw to RCAF Stn Camp Borden.
W/C J. R. D. Braham, DSO, DFC, AFC — ADCHQ, St. Hubert, to 3 (AW) OTU, North Bay.
S/L C. E. Elliott — 2 TTS, Camp Borden, to MAC, Halifax.
S/L R. F. Hatton, DFC — RCAF Stn MacDonald to 445 (AW) Sqn, Uplands.
W/C D. G. Malloy, DFC — 4 FWgHQ, Germany, to 1 Air Div HQ, France.
S/L E. L. Olson — CJS London to AAFCE HQ, France.
S/L L. P. Valiquet — Air Attaché, Paris, to AFHQ.

OFFICERS: FEBRUARY

S/L D. J. Bullock — 1 (F) OTU, Chatham, to RCAF Stn Camp Borden.
W/C B. E. Christmas — RCAF Stn Bagotville to 1 Air Div HQ, France.
S/L W. A. Collis — CJS London to RCAF Stn Comox.
S/L J. R. Fraser — RCAF Stn Saskatoon to RCAF Stn Chatham.
S/L V. E. Gagné — RCAF Stn Winnipeg to 14 TrgGp, Winnipeg.
S/L W. Grayson — AMCHQ, Ottawa, to 1 Air Div HQ, France.
S/L L. R. Haas — RCAF Stn Portage la Prairie to RCAF Stn Gimli.
S/L S. C. Hawkins — 1 Rq Unit, Dayton, to AMCHQ, Ottawa.
S/L G. R. Hodgins — 14 TrgGp, Winnipeg, to 1 TTS, Aylmer.
S/L J. R. F. Johnson, DFC, AFC — 1 (F) OTU, Chatham, to 2 FWgHQ, France.
W/C E. L. Kenny — AMCHQ, Ottawa, to CJS London.
S/L A. MacMillan, DFC — 2 KTS, Aylmer, to TCHQ, Trenton.
S/L J. F. Murphy — 1 GpHQ (Res), Montreal, to AMCHQ, Ottawa.
W/C H. C. Stewart, AFC — 3 (AW) OTU, North Bay, to RCAF Stn Trenton.
S/L A. J. Wilcock, DFC — CNS, Summerside, to 435 (T) Sqn, Edmonton.

OFFICERS: MARCH

S/L A. W. Fisher — 1 (F) OTU, Chatham, to 1 FWgHQ, U.K.
S/L R. B. Fraser, DFC — 418 (LB) Sqn (Aux), Edmonton, to 1 TAC, Edmonton.
S/L J. B. Lawrence — 1 (F) OTU, Chatham, to 3 FWgHQ, Germany.

WARRANT OFFICERS: JANUARY

WO2 C. H. Bourne — RCAF Stn Chatham to 7 SD, Namao.
WO2 W. O. Cannings — 413 (F) Sqn, Germany, to 3 FWgHQ, Germany.
WO1 G. R. Hibberd — CNS, Summerside, to RCAF Stn Penhold.
WO1 S. J. Laturney — 2 FWgHQ, France, to 416 (F) Sqn, France.
WO1 H. E. A. Legris — RCAF Stn Lachine to RCAF Stn St. Johns.
WO2 W. F. Longley — 4 FwgHQ, Germany, to 1 Air Div HQ, France.
WO2 L. D. McTavish — 2 FWgHQ, France, to RCAF Stn Rockcliffe.
WO2 J. A. Ramsay — 413 (F) Sqn, Germany, to 3 FWgHQ, Germany.
WO2 R. H. Rynard — ADCHQ, St. Hubert, to 2 TTS, Camp Borden.
WO1 H. E. Sparrow — 430 (F) Sqn, France, to 3 FWgHQ, Germany.
WO2 C. J. Waroway — 1 Base Maintenance Unit, Portage la Prairie, to RCAF Stn Portage la Prairie.

WARRANT OFFICERS: FEBRUARY

WO1 M. S. Arbuckle — 4 FWgHQ, Germany, to 312 SD, U.K.
WO2 J. B. Calver — 1 TTS, Aylmer, to 3 FWgHQ, Germany.
WO2 F. K. Fisher — 11 TSU, Montreal, to 30 AMB, U.K.
WO2 O. B. Groskorth — AMCHQ, Ottawa, to 3 FWgHQ, Germany.
WO2 A. G. Horton — TCHQ, Trenton, to 3 FWgHQ, Germany.
WO2 M. G. O'Brien — AMCHQ, Ottawa, to 1 Rq Unit, Dayton.
WO2 T. G. W. Picton — 12 TSU, Weston, to 1 FWgHQ, U.K.
WO1 F. G. Sacho — AMCHQ, Ottawa, to AFHQ.
WO1 J. F. Schultz — AMCHQ, Ottawa, to 1 Air Div HQ, France.
WO2 S. Smith — ATCHQ, Lachine, to 1 R&CS, Clinton.
WO2 W. Urquhart — 10 ExU, Camp Borden, to RCAF Stn Gimli.
WO1 W. G. Watt — 1 Air Div HQ, France, to 11 TSU, Montreal.
WO2 W. J. Yeo — RCAF Stn North Bay to 3000 TTU (Aux), Toronto.

WARRANT OFFICERS: MARCH

WO2 A. Bordeau — 3 FWgHQ, Germany, to AMCHQ, Ottawa.
WO2 W. O. Hamilton — ATCHQ, Lachine, to 3 FWgHQ, Germany.

KEY TO ABBREVIATIONS

AAFCE	— Allied Air Forces Central Europe
ADCHQ	— Air Defence Command Headquarters
ADGpHQ	— Air Defence Group Headquarters
AMB	— Air Materiel Base
AMCHQ	— Air Materiel Command Headquarters
(AW)	— All Weather
CJS	— Canadian Joint Staff
CNS	— Central Navigation School
ExU	— Examination Unit
(F)	— Fighter
FWgHQ	— Fighter Wing Headquarters
GpHQ	— Group Headquarters
KTS	— Composite Training School
(LB)	— Light Bomber
MAC	— Maritime Air Command
OTU	— Operational Training Unit
R&CS	— Radar and Communications School
Rq Unit	— Requirements Unit
SD	— Supply Depot
(T)	— Transport
TAC	— Tactical Air Command
TCHQ	— Training Command Headquarters
TrGp	— Training Group
TSU	— Technical Service Unit
TTS	— Technical Training School
TTU	— Technical Training Unit

BOOK REVIEWS

Radar War

A Book Review by Wing Commander F. H. Hitchins, Air Historian.

Air Commodore R. A. Chisholm's book* throws some light on a phase of the war in the air which was waged under "cover of darkness." It was a twofold struggle of defence and attack — first the night defence of Britain against enemy bombers, and then, as the reverse side of the coin, an offensive against the enemy's night fighters in support of our own bombers in their assault on Germany. On both these complementary campaigns Air Commodore Chisholm writes with the authority of long experience. For more than three years he was a night-fighter pilot and became a thrice-decorated "ace"; then he was transferred to Bomber Command and, as Senior Air Staff Officer in a special radio counter-measures Group, played a leading part in the development of the radar campaign against the enemy's night defences.

When the war began, "Rory" Chisholm was in Persia, engaged in the oil business. A flying officer on the Reserve of the Auxiliary Air Force, with which he had served from 1930 to 1935, he asked to return to his old squadron (No. 604: County of Middlesex), and came home to England early in 1940. On reporting to Air Ministry he learned that he would have to go back to school for refresher training on twin-engined aircraft before he could rejoin his unit. The prospect of starting right from the beginning again and spending four months in Flying Training School was dismaying: the war seemed to be receding.

His progress at first was slow. He had an inferiority complex, and it was some time before his confidence returned. Fortunately he had "a mature and even-tempered instructor, a real master of a rare art," who helped him through crises that might otherwise have ended in a "ceased training." Writing feelingly from his own experience, the author emphasizes the "need for sympathetic understanding" between pupil and instructor in training (and likewise between pilot and controller in operations). "Pilots when flying should be treated as children . . . (I) wonder how many new pupil pilots are made into failures by incorrect psychological handling during their training . . . Good flying instruction must cater for all types. It is a great and rare art."

After going solo "with trepidation" on an Oxford, he passed on to his first solo at night ("a greater adventure than the first daylight solo") and finally to his first cross-country at night ("the most hazardous step in flying experience"). In Chisholm's case the cross-country was quite unpremeditated, as he simply lost his bearings while waiting for his turn to land after doing local "circuits and bumps."

*Roderick Chisholm, C.B.E., D.S.O., D.F.C.: "Cover of Darkness." With a forward by Air Chief Marshal Sir William Elliot, K.C.B., K.B.E., D.F.C. Clarke, Irwin & Company Limited, Toronto; 1953. Pp. 222; illustrated. $2.65.

On completion of his course in June 1940, Flying Officer Chisholm at last got "back in the fold" with this old squadron at Northolt. No. 694 was flying Blenheims on the night defence of Britain, but there was at that time little enemy activity and the squadron was becoming discouraged at the "fruitless monotony" of standing patrols in the empty night skies. The rudimentary state of night-fighting in those early months of the war is indicated by the fact that the crews learned the principles of fighter control and interception by pedalling tricycles across a sports field; one pilot took the part of the fighter, another that of the bomber, and a third, acting as controller, gave course directions to bring about an "interception." A new era, however, was beginning to dawn. When Chisholm joined No. 604, some of its Blenheims were being fitted with equipment that was cryptically described as "magic mirrors"— the first airborne radar, or A.I. "There was promise of an interesting future in night-fighting, but we did not know it . . . we were sceptical." Five years later the junior sceptic had become a brass-hatted prophet.

Chisholm began operations in August, when the squadron moved to Middle Wallop, a new station in Hampshire, where it was twice attacked in daylight by enemy bombers. His first night-patrol he described as "a mixture of nervous tension and great exhilaration": there were many German aircraft about, making a blitz on Bristol, but he was too fully occupied flying his Blenheim to go looking for any bandits. He was still unconvinced of the feasibility of interception at night: "as night-fighters, we were wholly ineffective."

The Blenheim was too slow, its radar unreliable, and the operators were still inexperienced. Then, late in October 1940, the squadron received its first Beaufighter, a precious aircraft which only the C.O. and John Cunningham were allowed to fly, and both pilots quickly electrified their comrades by destroying two enemy raiders. "The bombers . . . were really there . . . the cover of darkness was no longer complete."

By the end of the year the squadron had been fully equipped with Beaufighters; and Chisholm, flying routine patrols over the Channel, gradually learned the new technique of "electrical vision" and gained more assurance until flying became mechanical. The proof came on the night of 13 March 1941, when "the unexpected happened" and Chisholm with his radar operator, W. G. Ripley, destroyed two Heinkel 111 bombers over the Channel. This "luck unbounded" brought the author the D.F.C.— although he modestly makes no mention of it; only on the title page do his decorations appear.

Five more victories followed in quick succession. He had come "a long way from the timid flying at the training school." The enemy bombers were now using routine evasive action, but their tactics were of little avail against a skilful radar operator: "night was slowly being turned into day."

In August 1941, when John Cunningham stepped up to the command of No. 604, Rory Chisholm succeeded him as flight commander. The blitz was over now; there was little to do, and one night was very like another in its monotonous routine. Chisholm realised he was becoming operationally tired, and in January 1942 he completed his tour, receiving a Bar to his D.F.C., with a citation that commended "his exceptional skill (which) has been largely responsible for the high standard of efficiency shown by his flight."

For a few weeks Squadron Leader Chisholm had the "instructive, chastening" experience of being a fighter-controller at Middle Wallop before he became a staff officer at Group headquarters charged with organizing the training of new night-fighter crews. In June 1942 he was posted to command of a small night-fighter development unit at Ford, where he remained for almost eighteen months. Great progress had been made since the Fighter Interception Unit was first formed in 1940 to test new equipment and tactics. The night-fighter's radar had been greatly improved in perception and range, the system of ground control likewise had made remarkable advances, and now an amazing new aircraft was coming into use as an all-purpose defensive and offensive night-fighter. An aircraft of superlative design, the Mosquito had everything — speed, manoeuvrability, dura-

tion (over six hours), a knock-out punch (four 20 mm. cannons), and powerful radar equipment. In the next three years it won "among enemy night-fighter crews an almost legendary reputation."

Under Wing Cdr. Chisholm's direction, the F.I.U. worked in co-operation with a bomber development unit to test equipment for bomber defence and to evolve evasive tactics. Between them the two units developed the corkscrew manoeuvre for bombers, which proved to be wholly effective — as German night-fighter pilots themselves testified. The F.I.U. also studied the problem of identification of aircraft at night. Chisholm himself had had one unpleasant experience of that when he shot down an an aircraft that proved to be one of our own Beaufighters. Experiments were made with infra-red tail lights which, though cumbersome, proved effective; nevertheless "night identification was to remain one of the biggest problems of the night air war."

In the months that Wing Cdr. Chisholm commanded the unit at Ford the emphasis in the night-fighter's war gradually changed from defence to attack. There was indeed very little "trade" now for the night-fighters defending Britain, and they began to feel useless, being inactive amid so much other air activity. They were no longer the *prima donnas* in the spotlight. Chisholm's own morale received a great stimulus one evening in July 1943 when he was up on a routine practice patrol with his observer, Flying Officer N. L. Bamford. Control gave them a "customer," whom they followed through a long chase at low level until the Mosquito overhauled the "bandit" and finally blew it up over the sea.

That night, however, was the exception, and, with so little to do on the defensive side, Wing Cdr. Chisholm's unit laid plans to join in our mounting bomber offensive by waging a campaign against the enemy's night-fighters. For some time such a campaign had been carried on by "intruders" (who used the enemy's navigation lights to guide them in their interceptions and attacks) and by a squadron* of Beaufighters fitted with early types of radar (who used the enemy's radar transmissions for homing). Now the Mosquito night-fighters proposed to join in, using the latest equipment (e.g. rearward-searching radar) and employing tactics that did not depend upon enemy "co-operation." At first the authorities refused to allow them to fly over enemy territory because of the security risk, but eventually they relented and training began with the few aircraft available.

Orders for posting to a staff job came through before Wing Cdr. Chisholm had an opportunity to put his ideas to a real test. Just before the handing-over was completed, however, he was able to make one final sortie in support of a bomber attack on Mannheim. With his observer, Flight Lieutenant F. C. Clarke, he set out to patrol one of the German radio beacons. Failing to find any activity there, they flew on to the target, where the attackers had already passed, leaving "a city on fire." Clarke soon picked up a contact on an enemy aircraft behind the Mosquito, obviously stalking it. Chisholm turned the tables, came around on the tail of the German, an Me.110, and destroyed it with two bursts. It was a most gratifying "swan song." As a sequel, Chisholm received the D.S.O. for completing "an extremely large number" of sorties at night, during which he had shot down nine enemy aircraft.

From Fighter Command, Wing Cdr. Chisholm was posted in November 1943 to Bomber Command, where he donned a brass hat as Senior Air Staff Officer in a new Special Duties Group (No. 100) that was being set up to develop and expand radio counter-measures in the night bomber offensive against Germany. There he remained for "eighteen engrossing and vivid months." Group Captain Chisholm came to his new post with a feeling of great admiration for the bomber crews who operated in weather that would have grounded the night-fighters, and who faced perils greater than they realized. From his own experience, Chisholm knew just how vulnerable the big bomber was to a night-fighter once it was seen — and it could be seen at ranges of a mile to a mile and a half.

Radio warfare had started early in the war, and the author sketches some of its developments, from "bending the beam," in 1940-41, down to

*Commanded by Wing Cdr. J. R. D. Braham, D.S.O., D.F.C., A.F.C., now a member of the R.C.A.F.

various "spoof" tactics such as giving bogus instructions, weather reports, and orders, to the bewildered German fighter-pilots. It was an unrelaxing struggle between measure and countermeasure and eventually became so complicated that a special R.C.M. organization was required to direct "this new and highly scientific kind of warfare."

Setting up headquarters at West Raynham in Norfolk, the Group began operations in December 1943 with "a mixed bag of units" and a handful of five or six operational aircraft. By the end of the war it had grown into a force of six heavy bomber and six fighter squadrons, plus various flights, capable of putting up over 100 aircraft on operations; and it had developed a truly incredible "bag of tricks" for giving special treatment to every link in the whole Luftwaffe defence system, from the latter's early-warning radar, controller radar, fighter radar, and air-ground radio communication, through to the very fighters themselves.

Radar-equipped fighter support of our bomber forces started with a few Beaufighters and Mosquitoes, flown by experienced crews who had learned their trade in Fighter Command before going over to the offensive with Bomber Command, and they soon began to pay good dividends in enemy aircraft destroyed. Better equipment was developed and installed, particularly the low-altitude, ultra-short-wave radar, until at the end of the war the Mosquito was carrying 25 radar "boxes" with no less than 140 tubes! In "eighteen hectic months" fighters of the Group destroyed more than 250 enemy aircraft, probably destroyed a dozen, and damaged 120. So successful was this "general harassing effort" against the Luftwaffe's aircraft and airfields that "among enemy night-fighter crews the ubiquitous Mosquitoes had earned an almost mythical reputation and almost every crash was attributed to them."

Direct offensive operations against the enemy's fighters were only a part of the Group's elaborate radio warfare technique. Equally important were its "jamming" and "spoof" operations to blind and deceive the enemy as to the Command's target for the night. Specially equipped aircraft were sent out in advance of the bombers to jam the German early-warning radar and, in effect, to erect a screen behind which the heavies could approach unseen; or, alternatively, the jammers could be used to trick the enemy into believing that a raid was on its way. In the earlier period, one squadron of Defiants had sufficed for this work, but the effort involved steadily increased until, at the end of the war, two squadrons of Halifaxes were insufficient and at least ten out of every 100 aircraft in a bomber force were supporters, not bomb-carriers. What might have happened in the jamming field had the war continued much longer is, in Air Commodore Chisholm's opinion, "an interesting subject for conjecture."

In addition to jamming, there were "spoof" or diversionary operations to mislead the enemy defences as to the real routes and target, and to lure his fighters away on a wild-goose chase. Originally this was done by a few aircraft scattering "window" to simulate the movement of a large bomber force; but, as time passed, the "spoofs" became more and more elaborate and varied in technique, even to the use of target indicators and bombs to convince the enemy controllers that the "raid" was genuine. Air Cdre. Chisholm pays high tribute to the crews engaged on this work, who took the "calculated risk" that, by drawing the whole enemy fighter defence upon themselves, they might be sacrificed to ensure that the main bomber stream got through to its objective unmolested. "These small 'spoof' forces (of twelve to twenty aircraft, as a rule) were the scapegoats for the bombing forces . . . Some of the least known, (they) were perhaps among the finest operations of the air war."

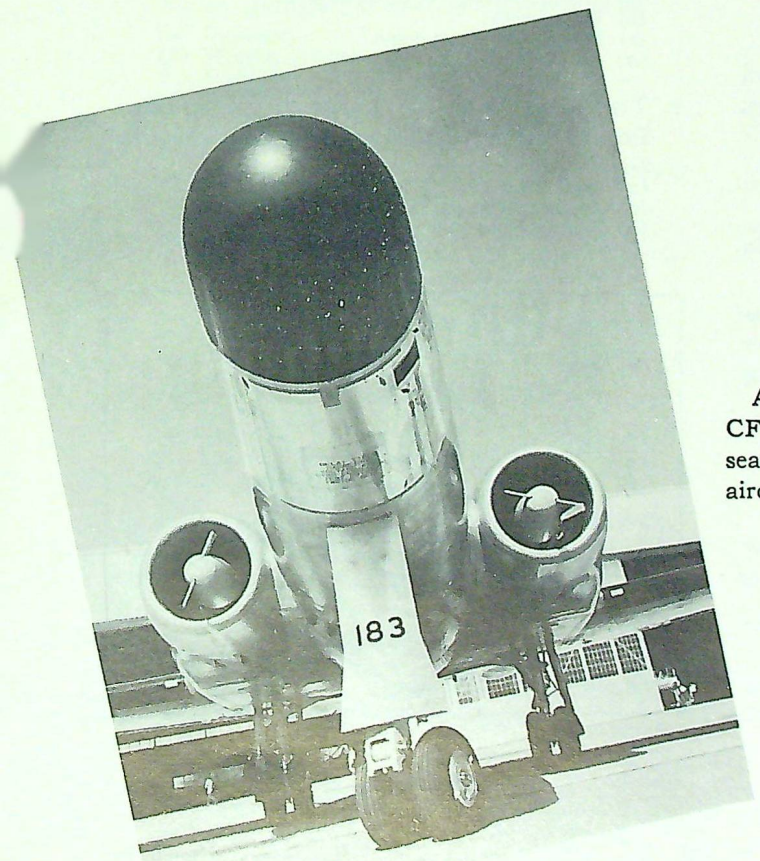
While operations were still in progress, the Group collected much encouraging evidence of the success of its varied activities — the losses inflicted upon the enemy's night-fighters, the intelligence assessments of the Command's raids, and the statistics of bomber losses. Once hostilities ended, there was an opportunity to conduct a "post-mortem" by interrogating the staff of Luftflotte Reich (the German home defence force) in its caravan camp at Schleswig. Air Cdre. Chisholm headed the team which questioned the

signals officers who "had been, in part, directly responsible for the radio and radar of Germany's air defence" and the air crew* who had flown on operations against our bombers. Their testimony gave the final confirmation to that which had been gathered during the war. They admitted "with a smile, (that) the R.A.F. in its jamming was always a little ahead of the German Air Force in its introduction of new equipment," that the corkscrew evasive action was most effective, and that the Mosquito was thoroughly feared. Further evidence was found in German files of raid plots which showed how usually (but not always) the controllers had been deceived by our "spoofs." "We were satisfied that the efforts of our crews had not been in vain."

The interrogators were also interested in German progress in radio counter-measures and learned that "there were some technical developments which, had enemy industry not been crippled by bombing, would have hit us hard." The Germans had developed a device for homing on the bomber's H2S radar transmissions, and were experimenting with equipment for infra-red homing on the heat radiated from an aircraft's engines. The latter had a range of five miles, but, fortunately for us, it still had some limitations, leading crews on vain attempts to intercept the moon or homing them on conflagrations that our bombers had started; "but it seemed that it had not a long way to go before becoming very lethal."

From Germany Air Cdre. Chisholm flew back to England, dreaming of a post-war frontierless Europe, only to have his vision shattered by an encounter with an inquisitive customs official. "Peace had broken out with a vengeance." On 1 January 1946 he was demobilized, and on the same day was appointed a Commander in the Order of the British Empire in recognition of his services in the radar war. Some months later he returned to Persia with his memories of "the great days" when he "had been living on the peaks." The road to Ispahan had turned full circle.

*One of them, a Major Schnaufer, claimed 124 bombers destroyed at night.



A NOSE FOR TROUBLE

An unusual view of the R.C.A.F.'s Mark 4 CF-100. The nose houses the automatic radar search and firing system that locates an enemy aircraft, "locks-on," and shoots it down.

(Avro Canada photo.)

WHAT'S THE SC

"We Shatterproofs," writes the old wardog after reading the following questionnaire, "have always frowned upon the abstract. When my ancestor Potiphar Shatterproof, the noted Egyptian architect, was required by the terms of his contract to make use of the newly-invented abacus in calculating the stresses involved in the Great Pyramid, he was heard to observe that no good would come of it. Nor did it. Had Potiphar been permitted to work by rule of thumb, the Great Pyramid would probably have fallen to pieces long ago and the world would have been saved a great ideal of prophesying and worry."

Frown or no frown, we feel that this month's "What's The Score?" is far from inappropriate to a Service that would never have been born but for the work of mathematicians. The members of the Editorial Committee, all of whom (we regret to say) answered the last question rightly, scored an average of 12. Correct answers appear on page 48.

1. The history of mathematics properly begins with:
   (*a*) Archimedes of Syracuse (3rd cent. B.C.)
   (*b*) Al-Khwarizmi of Khorassan (9th cent. A.D.)
   (*c*) Thales of Miletus (7th cent. B.C.)
   (*d*) Euclid of Megara (4th cent. B.C.)

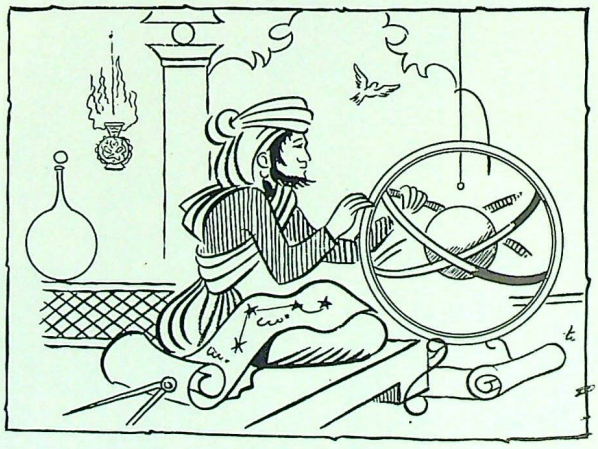
2. Pure mathematics, as opposed to applied mathematics, consists of several branches, of which the principal are:
   (*a*) Arithmetic, algebra, geometry, topology, analysis.
   (*b*) Arithmetic, quantum theory, algebra, trigonometry, calculus.
   (*c*) Mechanics, kinetics, geometry, arithmetic, algebra.
   (*d*) Calculus, relativity, thermodynamics, arithmetic, trigonometry.

3. The mathematician who celebrated his discovery of the principle of specific gravity by running around naked in the street, shouting "Eureka!", is also famous for:
   (*a*) Developing the quantum theory.
   (*b*) Inventing the first steam-engine.
   (*c*) His preoccupation with hypotenuses.
   (*d*) Anticipating the method of calculus.

4. The fact that the Greeks made very little progress in arithmetic may be attributed to:
   (*a*) Their interest in the drama.
   (*b*) Their adoption of the letters of the alphabet for their system of numbers.
   (*c*) Their use of Roman numerals.
   (*d*) The labour and time they had to spend in learning Greek.

5. The Hindu (or, as it is commonly called, the Arabic) system of numeration, which we now use, was introduced into Europe:
   (*a*) During the reign of Diocletian.
   (*b*) By Aristotle.
   (*c*) In the eleventh century.
   (*d*) Via China.

6. Translated from the works of an eminent Persian mathematician is a poem which begins:
   (*a*) Awake, Aeolian lyre, awake.
   (*b*) Awake! for morning in the bowl of night.
   (*c*) Awake, my heart, to be loved, awake, awake!
   (*d*) Busy, curious, thirsty fly!



ORE

7. *Not* famous primarily as the name of a mathematician is:
   (*a*) Albert Einstein.
   (*b*) A. N. Whitehead.
   (*c*) G. Birkhoff.
   (*d*) Henry Briggs.

8. One of the most famous books ever written by a mathematician is:
   (*a*) "The Chinese Room."
   (*b*) "Rasselas."
   (*c*) "Uncle Tom's Cabin."
   (*d*) "Alice in Wonderland."

9. The binomial theorem, which owes its origin to Sir Isaac Newton, is:
   (*a*) A mathematical theory on which the H-bomb is based.
   (*b*) Often incorrectly referred to as "Greshman's Law."
   (*c*) A method used in algebraic calculation.
   (*d*) Reported to have occurred to Sir Isaac when an apple dropped on his head.

10. Pythagoras, famous for his interest in right-angled triangles, is also remembered as a:
    (*a*) Musician.
    (*b*) Wrestler (all-in).
    (*c*) Dramatist.
    (*d*) Soldier.

11. The "standard yard" is:
    (*a*) The length of a certain gold bar kept in the Bank of England at freezing-point.
    (*b*) Confirmed yearly by Act of Parliament.
    (*c*) Not valid in Australia.
    (*d*) The distance between two gold plugs in a certain platinum bar kept at a temperature of 62° F.

12. If we could observe a yard rule moving lengthwise across our field of vision at the speed of light, it would appear to:
    (*a*) Be 3 ft. long.
    (*b*) Extend for about 1.7 miles.
    (*c*) Have no length at all.
    (*b*) Be half its normal length.

13. The Russian mathematician Lobachevsky, whose work helped to pave the way for Einstein's theory of relativity, is best remembered because he:
    (*a*) Wrote symphonic music.
    (*b*) Was a disciple of Marx.
    (*c*) Questioned the validity of Euclid's parallel postulate.
    (*d*) Predicted the discovery of the planet Pluto.

14. The first written indication that men had noted the existence of a relationship between the diameter and the circumference of a circle occurs in:
    (*a*) Homer's "Odyssey."
    (*b*) The First Book of Kings (Old Testament).
    (*c*) The Hindu "Ramayana."
    (*d*) An old Chinese Text.

15. The fundamental unit of the metric system is the metre. The "standard metre":
    (*a*) Is the length of a certain bar of iridium kept in the Paris archives.
    (*b*) Is one ten-millionth of the distance from the Poles to the Equator.
    (*c*) Was established by Descartes.
    (*d*) Is said by legend to have been the length of Charlemagne's left arm.

16. Algebra owes its early development primarily to the:
    (*a*) Hindus.
    (*b*) Arabs.
    (*c*) Chinese.
    (*d*) Egyptians.

17. If a tossed coin falls head-up ten times in succession, the theoretical probability that it will do so after the eleventh toss is:
    (*a*) 1/2
    (*b*) 1/10
    (*c*) 10/11
    (*d*) 1/10

18. If a man draws a ball at random from a bag containing six white and seven black balls, the probability of his drawing a black ball is:
    (*a*) 6/7
    (*b*) 1/13
    (*c*) 1/7
    (*d*) 7/13

19. If, in a race between a man and a boy (who runs half as fast as the man), the boy receives a 100-yard start, proof that the man will overtake the boy at the 150-yard-mark can be provided only by the use of:
    (*a*) Logarithms.
    (*b*) Calculus.
    (*c*) Geometry.
    (*d*) Binomial theorem.

20. In a game of crap, the probability of a "successful roll" is:
    (*a*) 1/5
    (*b*) 32/51
    (*c*) 244/495
    (*d*) 121/273

The Suggestion Box

The Chief of the Air Staff has written letters of thanks to the undermentioned officers and airmen for original suggestions that have been officially adopted by the R.C.A.F.

Flt. Sgt. F. T. Rootes, of No. 2 Technical Training School, put forward a suggestion that batteries which are no longer serviceable for use in aircraft or mobile equipment be shipped to R.C.A.F. Technical Training Schools for use in the training of electrical mechanics.

Flying Officer A. E. Harman, of No. 6 Repair Depot, developed a simplified and greatly improved first-aid kit for use by salvage parties in treating injuries and minor sickness. It utilizes plastic containers for liquids, employs English instead of Latin on the labels of its contents, and weighs 12 lbs.

Sgt. C. F. Goulding, of R.C.A.F. Station Moose Jaw, devised a new and considerably more efficient method of cleaning and lubricating the Teleflex controls fitted to 3-N Expeditor aircraft.

Sgt. J. J. Buchanan, of Air Materiel Command Headquarters, designed a template for use on the J-47 engine control setting, thus facilitating the maintenance of Sabre 2 aircraft.

Sqn. Ldr. F. E. Russell, of Central Experimental and Proving Establishment, devised a drive-system for the self-propelling of electrical ground power energizers. His device will save innumerable hours of work with towing-vehicles.

Flt. Sgt. H. L. Williams, of R.C.A.F. Station Chatham, designed a locking-device for the reset knob of the B-6 accelerometer which makes it impossible for the positive and negative pointers to be reset to "1" except by authorized Instrument Technicians.

Cpl. A. G. Adams, of R.C.A.F. Station Hamilton, suggested a modification to Service ski-caps that will reduce the risk of head injuries liable to be caused by metal badge fittings in the event of the cap being pressed or knocked against the wearer's forehead.

Cpl. J. L. Gallant, of No. 1 Group Headquarters (Aux.) drew up a new form to record issues of clothing to Air Cadets. His form effects considerable economy both of time and paper.

Flt. Sgt. R. W. Whelan, of No. 1 Fighter Wing Headquarters, designed a tool for compressing Sabre aircrafts' outer fuel tanks so that it is not necessary to remove them when replacing damaged mounting bolts for fuel level transmitter brackets.

Flt. Sgt. F. T. Rootes.

Flying Officer A. E. Harman.

Sgt. C. F. Goulding.

Sgt. J. J. Buchanan.

Sqn. Ldr. F. E. Russell.

Flt. Sgt. H. L. Williams.

Cpl. J. L. Gallant.

Cpl. A. G. Adams.

Flt. Sgt. R. W. Whelan.

ROYAL CANADIAN AIR FORCE Association

(This section is prepared by the R.C.A.F. Association and does not necessarily reflect the official views of the R.C.A.F.)

GROUP CONVENTIONS

Group Conventions were held during the month of February. These meetings were well attended, and constructive plans were made for the coming year.

The newly elected Group executives are as follows:

Maritime Group:

Immediate Past-President:	A. F. Wigglesworth	(Liverpool)
President:	E. B. Fitzgerald	(Saint John)
Secretary:	V. Carroll	(Saint John)
Treasurer:	G. Mulholland	(Summerside)
Vice-Pres. for N.S.:	A. Edgar	(Halifax)
Vice-Pres. for N.B.:	J. C. Tonner	(Fredericton)
Vice-Pres. for P.E.I.:	A. Carruthers	(Charlottetown)
W. D. Rep. (Eastern):	Ruth Sabourin	(Moncton)
Additional Representative to Nat. Executive Council:	S. McInnis	(Charlottetown)

Quebec Group:

Immediate Past-President:	R. A. Gauthier	(Montreal)
President:	G. Ellis	(Montreal)
Vice-President:	P. J. Haberlin	(Quebec)
Vice-President:	A. L. Schaeffer	(Drummondville)
Secretary:	Miss M. Pineo	(Point Claire)
Treasurer:	M. J. Simons	(Montreal)
W. D. Representative:	Miss J. Gower-Rees	(Montreal)
Members:	M. A. J. Boucher	(Montreal)
	A. R. Clibbon	(Montreal)
	Harold Hutchings	(Montreal)

Ontario Group:

Immediate Past-President:	Harry W. R. Sayers	(Richmond Hill)
President:	P. J. Frame	(Ottawa)
Vice-President:	L. N. Baldock	(Windsor)
Secretary:	W. H. Pridham	(Ottawa)
Treasurer:	E. A. Cain	(Kingston)
Northern Vice-Pres.:	R. M. Christie	(North Bay)
Eastern Vice-Pres.:	G. H. McGowan	(Ottawa)
Quinte Vice-Pres.:	W. L. Murphy	(Belleville)
Central Vice-Pres.:	S. Olszewski	(Dunnville)
Western Vice-Pres.:	J. Vankiekebelt	(Kitchener)
Border Vice-President:	A. R. Wicks	(St. Thomas)

1954 Executive of No. 408 (Toronto) Wing. Left to right: Mrs. Mona Pickup, Sec'y-Treas.; J. Clarke, 2nd Vice-Pres.; G. Dawber, 1st Vice-Pres.; F. J. Ellis, President.

Jan and Sandra, daughters of Flt. Lt. and Mrs. T. Spencer, receive farewell gifts from No. 250 (Saint John) Wing before sailing for England with their parents. Mayor E. W. Patterson is making the presentations. (C.P.R. photo.)

Manitoba-N.W. Ontario Group:

Immediate Past-President:	C. H. H. Moss	(Port Arthur)
President:	W. A. Mildren	(Winnipeg)
1st Vice-Pres.:	G. A. Phillips	(Brandon)
2nd Vice-Pres.:	Mrs. Vera Gough	(Fort William)
Sec'y-Treasurer:	E. A. Carlyle	(Winnipeg)
W. D. Representative:	Mrs. E. Headley	(Brandon)
Wing Representatives:	A. L. Littleford	(Winnipeg)
	R. G. Pickard	(Fort William)
	R. E. Rosenberg	(Brandon)

Saskatchewan Group:

Immediate Past-President:	S. T. Malach	(Regina)
President:	J. Turgood	(Moose Jaw)
1st Vice-Pres.:	F. Mann	(Prince Albert)
2nd Vice-Pres.:	J. Nodder	(Saskatoon)
3rd Vice-Pres.:	J. N. Park	(Yorkton)
Sec'y-Treasurer:	Marion Graham	(Saskatoon)
W. D. Representative:	Grace Tollefson	(Saskatoon)
Ben. Fund Representative:	E. Campbell	(Regina)

Alberta Group:

Immediate Past-President:	B. E. Crane	(Red Deer)
President:	C. Linn	(Lethbridge)
Secretary:	T. C. Segsworth	(Lethbridge)
Treasurer:	F. A. Sutherland	(Edmonton)
Directors:	A. Eden	(Edmonton)
	G. Macdonald	(Red Deer)
	H. Koentages	(Calgary)
	M. Moffatt	(Lethbridge)
	R. Bullough	(Medicine Hat)
Legal Adviser:	R. D. White	(Edmonton)

British Columbia Group:

List of B.C. executive has not been received at time of writing, but will be included in next issue of "The Roundel."

* * *

To the retiring Group executives we extend our sincere thanks for the splendid co-operation they have given to National Headquarters during the past year. We welcome the incoming 1954 Group executives and look forward with enthusiasm to working with them during their term of office.

MEMBERS-AT-LARGE

In the October issue of "The Roundel" a message was directed to all members-at-large. The purpose of this message was that we might become better acquainted with such members, and at the same time solicit their help in securing new members. Subsequently our National President sent a personal letter to all members-at-large on record, emphasizing the need for their assistance in bringing in new members.

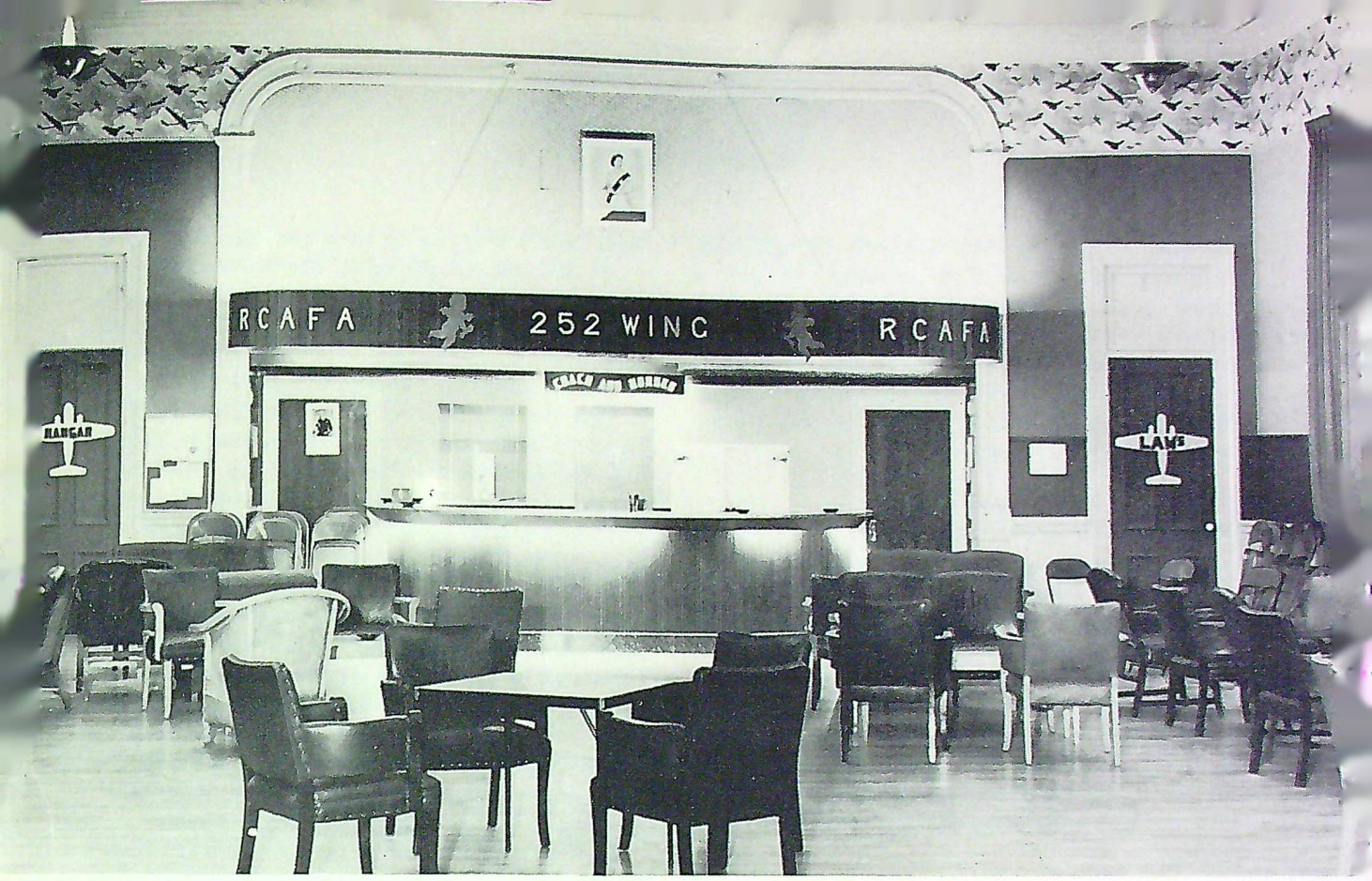
The response to this appeal could hardly be called a complete success. However, some members did do a splendid job, and in one instance ten new members-at-large were secured by this means due to the efforts of a single member. To all who helped in this manner, we extend our thanks. May we again ask all our members-at-large to assist in this drive for new members by securing at least one new member? Application blanks were enclosed with the National President's letter, and, if more are required, we will gladly forward same on request.

In the above-mentioned issue of "The Roundel" we also requested that members-at-large write to us expressing their views on the Association and giving constructive suggestions for the betterment of our organization. To date we have not received one letter, and we are therefore reiterating our request. The receipt of such letters would greatly assist our National Headquarters in an endeavour to find out how best we can improve our membership and retain it at full strength. May we count on your co-operation in this worth-while effort?

MALTA MEMORIAL

Her Majesty Queen Elizabeth will unveil a monument in Malta on May 3rd in memory of

Air Vice-Marshal G. E. Brookes, C.B., O.B.E., the R.C.A.F.A.'s National President, inspects No. 107 Air Cadet Squadron during a recent visit to Saskatoon.



No. 252 Wing's club-room. ("Gleaner" photo.)

Commonwealth airmen who laid down their lives in operations from bases in the Central Mediterranean area during the Second World War, and who have no known graves. This group includes 286 Canadians.

The Canadian branch of the Imperial War Graves Commission has extended an invitation to attend to the next-of-kin of all Canadians involved. A pilgrimage to the ceremony from England is being sponsored by the R.A.F. Association, who have asked the R.C.A.F. Association to assist in making arrangements for any next-of-kin from Canada who plan to attend. Approximately forty persons have indicated their intention to participate in the pilgrimage.

AIR CADET LEAGUE ANNUAL MEETING

Air Vice-Marshal G. E. Brookes, C.B., O.B.E., National President of the Association, attended the annual meeting of the Air Cadet League at the Seigniory Club on February 17th and 18th, where

An informal shot taken at January's reception in Ottawa for members of parliament who served in the Air Force in either of the World Wars. Left to right: Air Marshal C. R. Slemon, Chief of the Air Staff; the Hon. L. B. Pearson, Minister for External Affairs; and Air Cdre. J. M. Murray, the R.C.A.F.'s Director of Accounts and Finance. (Nat. Def. photo.)

he was invited by Mr. Darroch Macgillivray, President of the Air Cadet League, to address those present at the dinner. The National President expressed his appreciation of the invitation to attend the various functions of the League. In his remarks he emphasized that sponsorship of Air Cadet Squadrons by Wings of the Association was the latter's primary object.

WING NEWS

No. 404 (Kitchener-Waterloo) Wing

No. 80 Air Cadet Squadron, sponsored by No. 404 Wing, is now housed in its new quarters at Knollwood Park. Trumpets for the squadron band have been purchased at a cost of $1000.

No. 252 (Fredericton) Wing

On March 2nd the club-rooms of No. 252 Wing were officially reopened after having been completely redecorated. Our photograph gives some idea of the pleasant atmosphere created by the new *décor*.

NO. 900 (ARDUA) WING

30 March 1954

The General Secretary,

R.C.A.F.A. Headquarters.

Dear Sir:

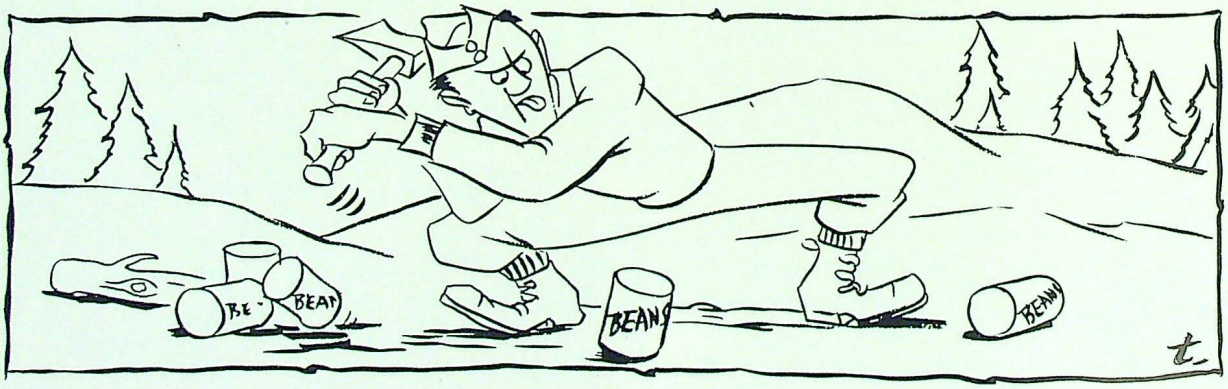
We of No. 900 (Ardua) Wing have always believed in giving full support to the Air Cadets, and, ever since the Wing was formed, one of our main objectives has been to help the local Squadron. We have aided in many of their projects and given every possible assistance to the movement as a whole.

With the thought in mind that the Wing could do still more, one of our members suggested at a recent meeting that a special committee be formed to take the lads on a bit of an outing. His feeling was that even a smattering of knowledge of the outdoors is of great value to every Canadian boy — that every young fellow should be able to tell a fir from a spruce, light a fire in the open, enjoy a can of beans scented with wood smoke, and appreciate other aspects of living in the woods. It was made clear that we did not intend to compete with the Boy Scouts, but we did feel that the experience of some of our members would serve to supplement any other training the lads might have had.

The Cadets were most enthusiastic about the whole proposition, and everyone was in exceedingly high spirits on the chosen Saturday morning.

All went well for the first part of the expedition. However, we struck out into heavy timber a mile or so from town, and the going became a bit rough — in fact, so rough that the chairman gasped out the order to stop for lunch before we had progressed very far. He then showed his powers of leadership by having the Cadets chop down trees, collect water, and get a fire started in no time flat.

When the fire was going well, the chairman jumped up from his bed of boughs beneath a tree and began to prepare a meal. It appeared that he had neglected to bring an opener, for he took at the cans with his hatchet. He was a bit out of practice



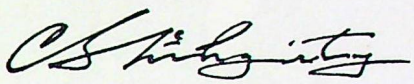
and struck too hard at three tins in a row, scattering beans all over the bush. He was just going after the fourth when he slipped and upset a can of water into the fire. Showing an understandable display of temper, he hurled his hatchet into the woods and went back to his retreat.

The Cadets were quite efficient considering their youth and inexperience. They started immediately to set things to rights, and before too long had prepared a reasonably good meal for us.

The chairman recovered his spirits somewhat with the food, and began pointing out bits of forest lore to the boys. He was doing quite well until, in a moment of zeal, he tried to leap over a fallen trunk, fell, and gave his ankle a nasty sprain. The Cadets then improvised a fairly good litter and carried him back to town.

We have heard since that the lads enjoyed their outing very much, and have even been asking when they could expect another. So far, we haven't given them an answer.

Yours, with Air Power,



Corresponding Secretary,
No. 900 (Ardua) Wing.

We would again remind all Wing members that the annual Wing dues of the Association are payable on April 1st. Continued receipt of "The Roundel" will be ensured by prompt payment.

OUR COUNTRY, RIGHT OR WRONG

Deep-rooted in man is love of the land of his birth. This is as true in the lands of tyrants as elsewhere. In fact, history has shown it to be one of the strongest supports of tyrants who in their aggressive designs invoke its influence to divert attention from their tyrannies. If communist-controlled regimes unleash war against us or our allies, we shall find this true. We shall be compelled, in order to attain victory, to break that control — and we shall not break it by threats alone.

England did not bow in 1940 to the threat of punishing blows from the air. Germany did not surrender in World War II, though her flag no longer flew at sea and her armies and people took the heaviest punishment of aerial bombardment ever known. Japan did not capitulate until her naval and air forces were destroyed, her armies decimated and isolated, her home islands wide open to the invasion of enemy armies which she no longer had hope of defeating.

The communist forces in Korea did not yield to threats, though the mastery of the seas around them and domination of the sky above them by United Nations forces were all but complete. Logistical supply continued, even increased in effectiveness. At armistice time our enemy there had greatly increased the offensive capability with which he began.

We learn lessons from these historical facts. They prove what all of military history to date has proved, and with ever-increasing clarity in modern times, that there is no magic in the successful conduct of campaigns — that sound planning and timely preparation of properly balanced military strength offer the only way by which we may expect successfully to defend ourselves.

Gen. Matthew Ridgeway

The ROYAL CANADIAN AIR CADETS

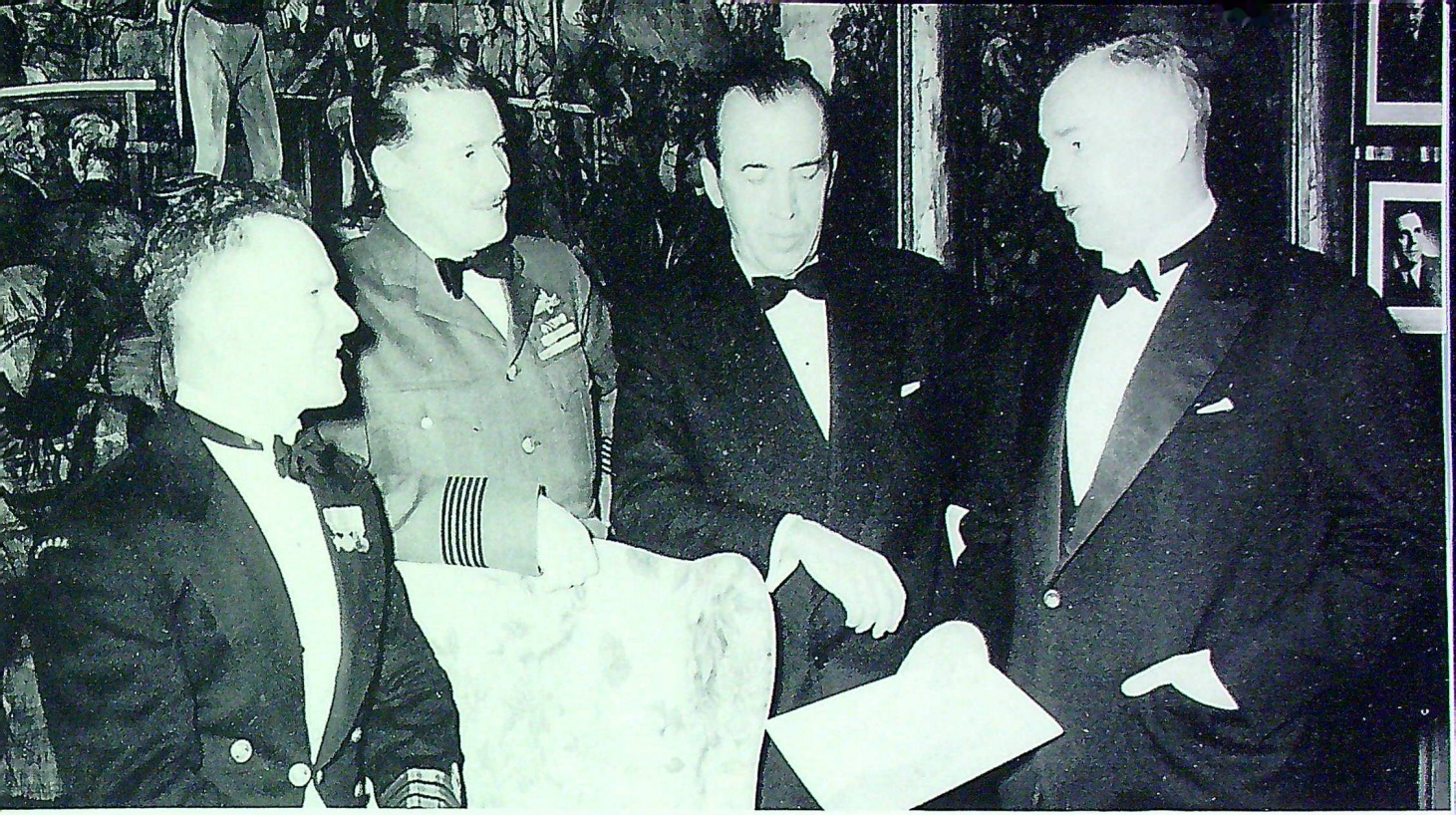
By Arthur Macdonald, Air Cadet League of Canada

ANNUAL MEETING HIGHLIGHTS

More than 70 League delegates from across Canada attended the Thirteenth Annual Meeting of the Air Cadet League of Canada held in mid-February at the Seigniory Club, P.Q. Highlights of the two-day gathering were:

- Re-election of H. Darroch Macgillivray of St. John's, Newfoundland, for a second term.
- Selection of Vice-President G. A. D. Will of Saskatchewan as Air Cadet League "man of the year" for 1953.
- The presence at the meeting, as guests of the League, of one outstanding sponsoring chairman from each province.
- An inspiring address by Defence Minister Brooke Claxton following the Thirteenth Annual Dinner.
- A fine talk by Air Cadet Alan Massey of Summerside, P.E.I., on his exchange-visit trip to the United Kingdom and Sweden.
- An announcement by Air Vice-Marshal F. G. Wait, C.B.E., Air Member for Personnel, that Grade 9 students would be permitted to enrol in Air Cadet squadrons regardless of age.

Air Marshal C. R. Slemon, C.B., C.B.E., presents illuminated scroll to League Vice-President G. A. D. Will in recognition of his notable services to the League. (Nat. Def. photo).



Cadet officials of Canada's three armed services. Left to right: Cdr. D. C. Elliott, Director of Sea Cadets; Wing Cdr. C. M. Black, D.F.C., Air Cadet Liaison Officer; Mr. G. M. Ross, Gen. Mgr. of the Air Cadet League; Lt.-Col. D. B. Buell, D.S.O., Director of Army Cadets. (Nat. Def. photo.)

The Province of Alberta played host at a reception preceding the meeting. Mr. W. Collie, Chairman of the Alberta Committee, is shown with Mrs. Collie welcoming delegates from Saskatchewan. Shaking hands with him is Mr. J. A. deRosenroll, while Mr. M. Elsdon and Mr. C. G. Langrill stand at left and right of photograph, respectively. (Capital Press photo.)

Left to right: League Hon. President C. D. Taylor, Air Cdre. D. N. Roberts (R.A.F.), League President H. D. Macgillivray, Col. J. L. Biggs (representing U.S. Civil Air Patrol). (Capital Press photo.)

- R.C.A.F. concurrence in a decision to continue such special Air Cadet projects as summer camps, flying training, senior leaders' course, exchange visits, and the International Drill Competition.
- The establishment of a National Drill Competition to be held in conjunction with the Senior Leaders' Course, the winning team to receive the "Larry Marsh Trophy," a new trophy to be awarded in memory of the late League Vice-President Lawrence S. Marsh of Montreal.
- Introduction of an annual series of awards to the outstanding squadron in each province or zone. From the 11 top squadrons so selected, one will be chosen as the most proficient unit in Canada and awarded the R.C.A.F. Association Trophy.

No one will give suck to a child that does not cry. (Turkish proverb.)

ABSOLUTE WORLD SPEED RECORDS

Established as Official by the Fédération Aéronautique Internationale.

Year	Name	Speed km/hr	Speed ml/hr	Aircraft	Mono-plane or Biplane	Straight or Swept Wing	U/cge Fixed or Retr	Engine	H P or Thrust (Kg)	Place
12 Nov 1906	Santos-Dumont	41.292	25.656	Santos-Dumont	B	U	F	Antoinette	50	France (Paris)
26 Oct 1907	Henri Farman	52.700	32.741	Voisin	B	U	F	Antoinette	50	France (Paris)
28 Aug 1909	Blériot	76.995	47.834	Blériot	M	U	F	E N V	25	France (Reims)
29 Oct 1910	Leblanc	109.756	68.195	Blériot	M	U	F	Gnôme	50	United States (New York)
21 June 1911	E Nieuport	133.136	82.722	Nieuport	M	U	F	Nieuport	100	France (Chalons)
9 Sept 1912	Jules Védrines	174.100	108.170	Deperdussin	M	U	F	Gnôme	140	United States (Chicago)
29 Sept 1913	Maurice Prévost	203.850	126.666	Deperdussin	M	U	F	Gnôme	160	France (Reims)
12 Dec 1920	Sadi-Lecointe	313.043	194.491	Nieuport-Delage	M	U	F	Hispano-Suiza	300	France (Buc)
26 Sept 1921	Sadi-Lecointe	330.275	205.219	Nieuport Delage	M	U	F	Hispano-Suiza	300	France (Etampes)
13 Oct 1922	W Mitchell	358.836	223.580	Curtiss	B	U	F	Curtiss	375	United States (Detroit)
4 Nov 1923	A S Williams	429.025	266.569	Curtiss-Racer	B	U	F	Curtiss	600	United States (Mineola, N.Y.)
11 Dec 1924	Adjt A Bonnet	448.171	278.383	Bernard Ferbois V2	M	U	F	Hispano-Suiza	450	France (Istres)
4 Nov 1927	De Bernardi	479.290	297.816	Macchi M-52	M	U	F(F)	Fiat	800	Italy (Venice)
30 Mch 1928	De Bernardi	512.776	318.612	Macchi M-52	M	U	F(F)	Fiat	800	Italy (Venice)
12 Sept 1929	A H Orlebar	575.700	357.740	Supermarine S-6	M	U	F(F)	Rolls-Royce 'R'	1 900	Great Britain (Calshot)
29 Sept 1931	G H Stainforth	655.000	406.990	Supermarine S6B	M	U	F(F)	Rolls-Royce 'R'	2 600	Great Britain (Lee-on-Solent)
10 April 1933	F Agello	682.078	423.778	Macchi 72	M	U	F(F)	Fiat AS-6	2 500	Italy (Desenzano)
23 Oct 1934	F Agello	709.209	440.675	Macchi 72	M	U	F(F)	Fiat AS-6	3 100	Italy (Desenzano)
26 April 1939	F Wendel	755.138	469.142	Messerschmitt Bf-109R	M	U	R	DB-601A	1 000	Germany (Augsburg)
7 Nov 1945	H Wilson	975.675	606.255	Gloster Meteor IV	M	U	R	Rolls-Royce Derwent	—	Great Britain (Herne Bay)
7 Sept 1946	E Donaldson	991.000	615.781	Gloster Meteor IV	M	U	R	Rolls-Royce Derwent 5	3 200	Great Britain (Littlehampton)
25 Aug 1947	M Carl	1 047.536	650.921	Douglas D558-1	M	U	R	GEC J-35	1 814	United States (Muroc)
15 Sept 1948	R Johnson	1 079.841	670.979	North American F-86A	M	S	R	GEC J-47	—	United States (Muroc)
19 Nov 1952	J Nash	1 124.137	698.500	North American F-86D	M	S	R	GEC J-47-17	—	United States (Salton)
16 July 1953	S Barns	1 151.883	715.746	North American F-86D	M	S	R	GEC J-47-17	—	United States (Salton, California)
7 Sept 1953	Neville Duke	1 171.000	727.627	Hawker Hunter	M	S	R	Rolls-Royce Avon RA-7R	4 300	Great Britain (Littlehampton)
28 Sept 1953	Subject to confirmation M J Lithgow	1 186.600	737.300	Supermarine Swift F4	M	S	R	Rolls-Royce Avon RA-7R	4 300	Castel Idris (Libya)
30 Oct 1953	J B Verdin	1 212.500	753.400	Douglas F-4D Skyray	M*	S	R	W J 40-WE-8	5 215	United States (Salton)

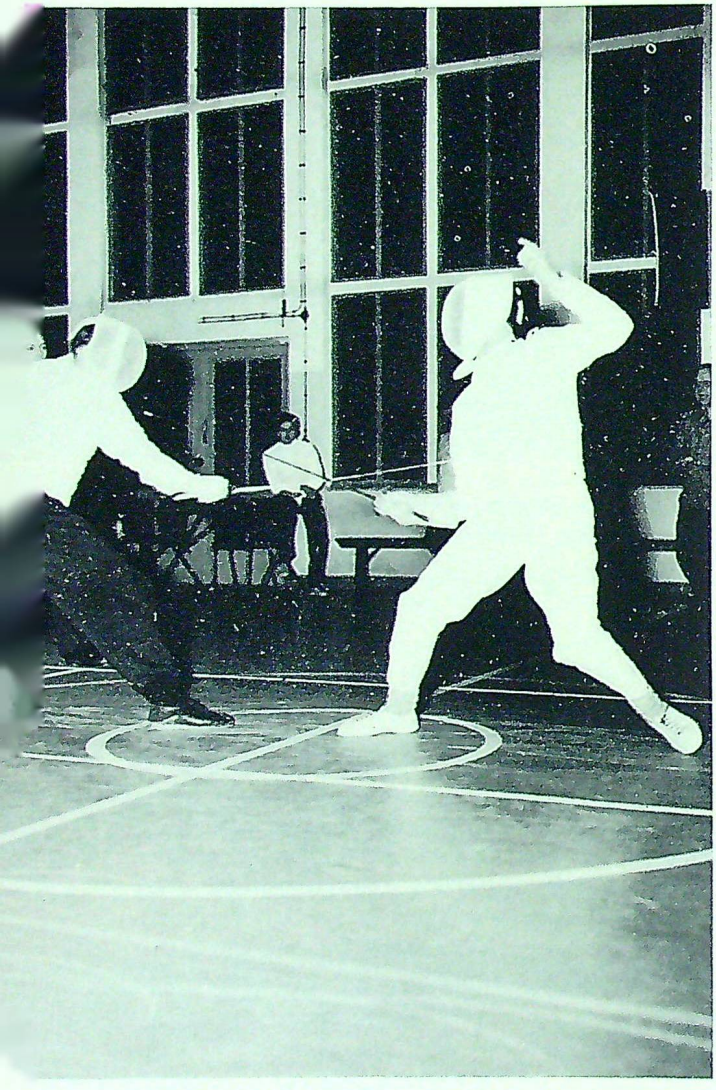
M = Monoplane. * = Delta wings. B = Biplane. S = Swept wings. U = Unswept wings. F = Fixed undercarriage. R = Retractable undercarriage. F(F) = Fixed (floats).

RETORT COURTEOUS

In a well-known bar somewhere East of Suez, a visiting aircrew were riled by a citizen of a country that shall be nameless. Gin-slung and tongue-loose, he was bellowing nasty things about Great Britain's politics, purposes and practices. The leader of the crew restrained his crew's proposed violence and surprisingly offered the decrier further drinks. Not surprisingly, the latter eventually passed out. The body was taken to an establishment down-town, then laid to rest in its hotel room. The lads moved on to other Far Eastern places, regretting they could not stop to find out what their friend said when he found on his chest a large Union Jack and beneath it the words "Rule Britannia!"— very colourfully tattooed.

("*The Aeroplane*": *U.K.*)

Assault-at-Arms, Zweibrücken



No. 3 (Fighter) Wing, Zweibrücken, Germany, was the host at a two-day rifleshoot and fencing meet. The events were organized by the recreation department and Ground Combat School of No. 3 Wing. Teams of French Army fencers stationed in Zweibrücken, German enthusiasts from the local fencing club, and a newly-formed Wing fencing team, vied for honours. The rifle teams were from the French Army units in Zweibrücken, Canadian teams from No. 2 (F.) Wing, No. 4 (F.) Wing, and Air Division.

The fencing competition was limited to foils, but exhibitions with sabre and épée were presented. The ability of the German entrants was apparent as they took top honours in the meet. No. 3 Wing's team, under the leadership of their captain and coach, Cpl. J. J. G. Despatie, took second place, and the French team finished third. Other members of the Canadian team included Cpl. R. Bélanger, L.A.C. J. LeCours, and L.A.C. B. Morrisette. The fencing competition was held in the Wing gymnasium under the supervision of Flying Officer B. F. Lynch and his recreation staff.

The rifle shoot, which was held at the Wattweiler range, was under the supervision of Flying Officer C. A. K. Scott. No. 3 Wing, captained by Cpl. H. E. Purdy, produced the top marksman of the meet, Cpl. L. E. Strachan, and walked off with first place. The other members of the winning team included Sgt. D. A. Shepherd, Flying Officer T. W. Gregory, L.A.C. D. J. Little, Sgt. C. C. Jewson, and L.A.C. Henderson. No. 2 Wing placed second, followed closely by the entry from No. 4 Wing. Air Division was fourth, and the French team placed fifth.

Cpl. R. Bélanger (left) in combat with a member of the French team.

No. 3 Wing's rifle-team in action.

Left to right: Sgt. Dureux, captain of the French team; Elmar Kleir, captain of the German team; Flying Officer B. F. Lynch, co-ordinator of the meet; Cpl. J. J. D. Despatie, captain of the Canadian team; Herr M. Patri, civilian judge.

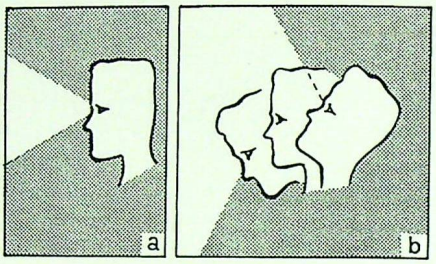
PRONE OR SUPINE?

By "Flight Lieutenant"

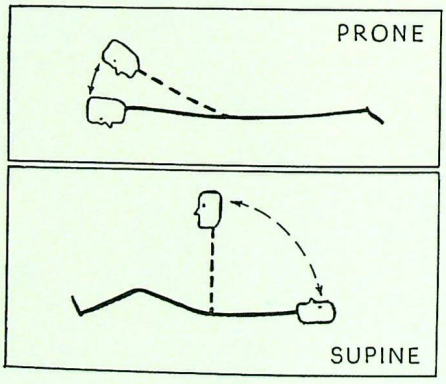
(Reprinted by courtesy of "Aeronautics": U.K.)

MUCH experimental work has already been done on the prone position for the pilot of single-seaters. Flight trials have taken place and lashings of tests have been carried out to decide the suitability of this stance — or should it be sitz? It is public knowledge that, on the whole, the results have been disappointing. The prone position has been found to present a great many difficulties in the provision of controls, but, more important, it has been found that the fatigue growth rate — some call it the tiredness ratio — is extremely high, however carefully the pilot's position is arranged.

My purpose in this article is to offer an alternative suggestion for pilot attitude. It is a study of the high-speed sedentary. My aim is to accommodate the pilot in such a way that his resistance to accelerations is as high as, or higher than, in the prone position and that the fatigue growth rate is diminished. At the same time he will be in an attitude which will enable the cross-sectional area of the fuselage to be cut down, should that be a requirement, and will allow the controls to be simply arranged and naturally operated.

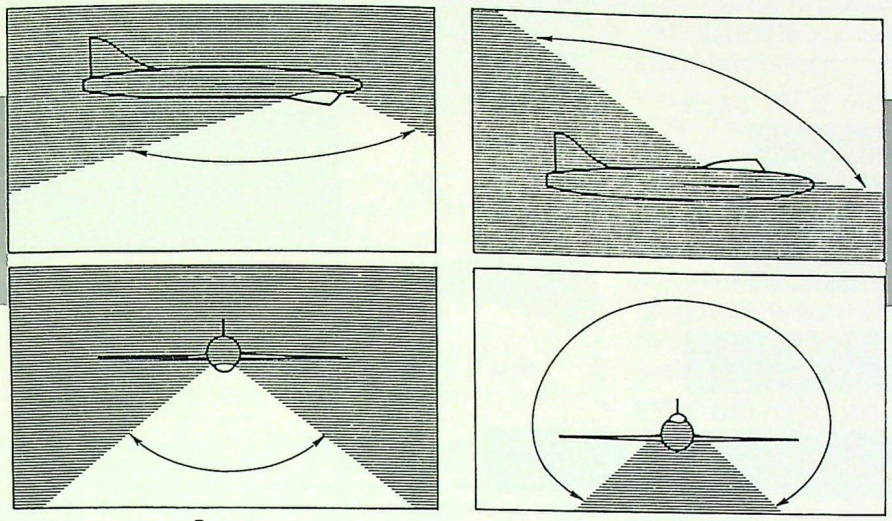


Basic facts about the arcs of view, a, with head stationary and b, with the full neck movement, are diagrammatised above, while below the relationship of head and trunk movements to the prone and supine positions are shown.



Drag and Acceleration

Two things have directed attention to the prone position during the past 15 years or so: the first, the need to reduce frontal area, the second, the need to accommodate the pilot in a position in which the body can stand high values of *g* without blacking out. The cross-sectional area argument is perhaps less forceful than it used to be because of the growth in size of power units. Nevertheless with turbojet engines in the higher power bracket having overall diameters of only about 100 centimeters, it is clear that, if there were no equipment to be considered, frontal area could be reduced by having the pilot in the lying-down attitude.



Normal arcs of vision as they might be in two hypothetical aircraft, the first, on the left, with the pilot lying prone, and the second, on the right, with the pilot supine.

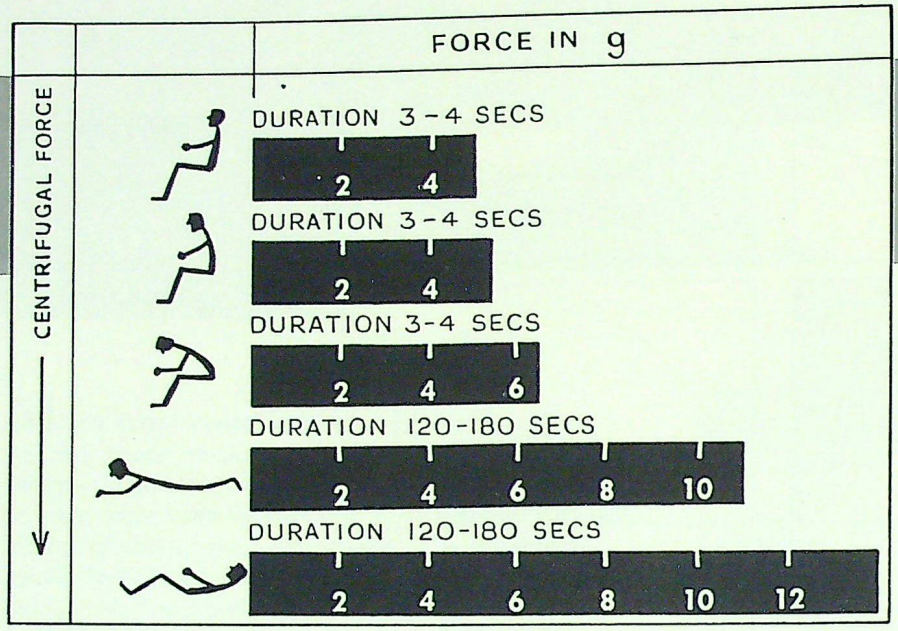
As for the other point, the resistance to *g*, work done on the Canadian centrifuge and by the Germans, all tends to confirm the fact that a human being can take a much higher acceleration without blacking out if he is lying down than in any other attitude. Almost the worst attitude is the very erect sitting position now favoured in most interceptor fighters.

The problem, therefore, clarifies itself in the following terms: how to accommodate the pilot so that he will fit into a fuselage of small cross-sectional area, and how, at the same time, to arrange him so that he can accept high values of *g*. Stated in this manner, the situation seems simple enough, and both prone and supine positions offer alternative solutions. But there is the complication of tactical outlook from the aircraft. On this subject a great deal of discussion has taken place in the Royal Air Force. It has not led to any final decision at high level, and it is difficult to find among those officers who have been engaged on this work an agreement as to the points which may be accepted.

Arcs of View

Those officers who have actually been engaged on operational work in single-seat fighters against an enemy are not often able or ready to state in precise terms which arcs of outlook they regard as being of primary importance. They want to "see all round" but will not say what direction they prefer to see in, if seeing all round is impossible. They will agree that a clear view above and to the rear is valuable for defence and that a clear view downward and forward is valuable for attack, but they will not specify distinct arcs and lay it down that one set is more important then another. There is a great variety of opinion about the view downwards and to the side, and the whole thing is complicated by the fact that it is so easy, by the slightest control stick movement, to vary the arc to a large extent. My own experience in aerial combat has not included any fighting in Korea, but we may suppose that the German pilots were at least as tactically competent as are the Communist pilots, and therefore I feel that my own experience may be of value.

I would prefer a reasonably good field of outlook upwards and to the rear than downwards



A diagram illustrating the differences in the physiological resistance to acceleration caused by the different attitude of the subject. The supine position gives by far the greatest resistance to large values of g.

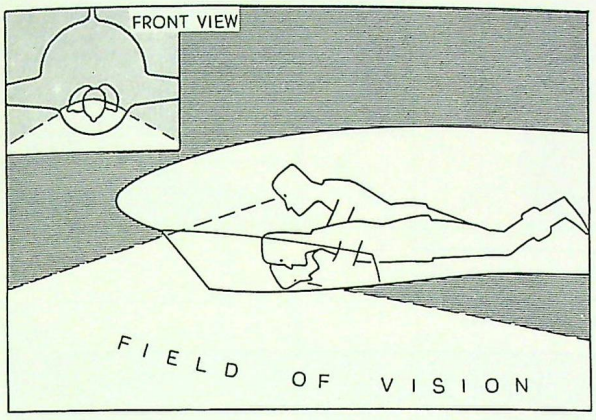
and forwards. I like to be sure I am not going to be bounced. The attack can always be initiated on a turn, the aircraft being brought round and down on to the approach line, and this means that there is no special problem about the view downwards and forwards. Again it is often useful to close with an enemy from underneath his aircraft — one of the oldest and best gambits in combat tactics — although the preliminary approach may have been made from above in order to put the closing speed up to the highest possible figure. If fire is to be opened from under another aircraft, the prone position is obviously ruled out. A crick in the neck is the least that the pilot would get if he sought to make his attack at close range. On the other hand, the supine position so much favoured by heavyweight boxers is almost ideal for this form of attack.

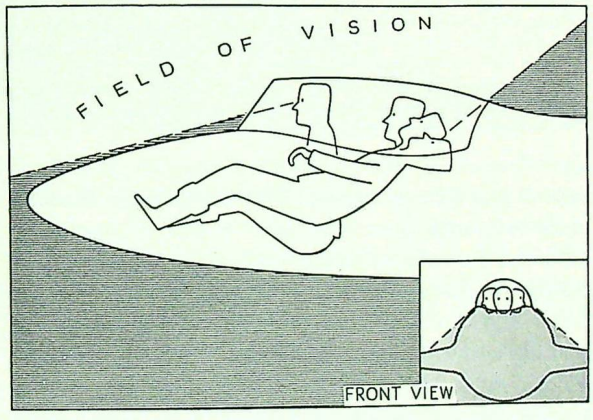
Another common tactical sequence — though here again I must emphasise that I have no experience of the Korean fighting where jet meets jet — is the circular chase, which supervenes when fighter attacks fighter and is detected in the process. The attacked aircraft turns just before the attacker's guns bear and the attacker must then turn in reply. The circular chase imposes enormous accelerations on the pilots. The pilot who can accept a higher acceleration without blacking out, even though the difference may be no more than a tenth of one *g*, will, in the end, gain the tactical advantage. If one supposes that a circular chase is taking place between two identical aircraft, piloted, one by a man lying prone and another by a man lying supine or nearly supine, the outcome would be a foregone conclusion. The man in the supine position could accept a much bigger *g*, could therefore turn on a smaller radius or on the same radius at a higher speed, and could, therefore, close and eventually bring fire to bear.

Nothing the other pilot could do would save him if he continued on a circular course. He would, therefore, be forced to switch into a dive or roll on to opposite bank, and it is well known to all fighter pilots that either manoeuvre is critically dangerous.

Practical Problems

Tactically there would seem, therefore, to be





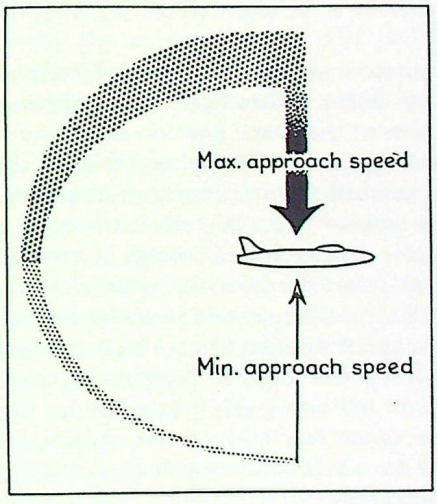
A further development of the points made in the previous diagrams. The field of vision of the prone pilot (above) is essentially downwards and forwards, whereas that of the supine pilot (below) is essentially upwards and forwards. Frontal outlook covers a larger arc if the pilot is supine. The sonic sofa also permits an easy change to the upright position for take-off and landing.

many things in favour of the sonic sofa. Many designers with whom I have discussed this matter, however, dismiss it almost immediately as being impracticable. They evidently forget that in about 1940 a certain sports car was on sale in which the driver was accommodated in a very nearly supine position. His feet were stretched out towards the pedals and he lay back in a semi-reclining attitude. There seemed to be nothing uncomfortable or peculiar about this position at the time, for several sports cars were favouring an attitude tending towards this one.

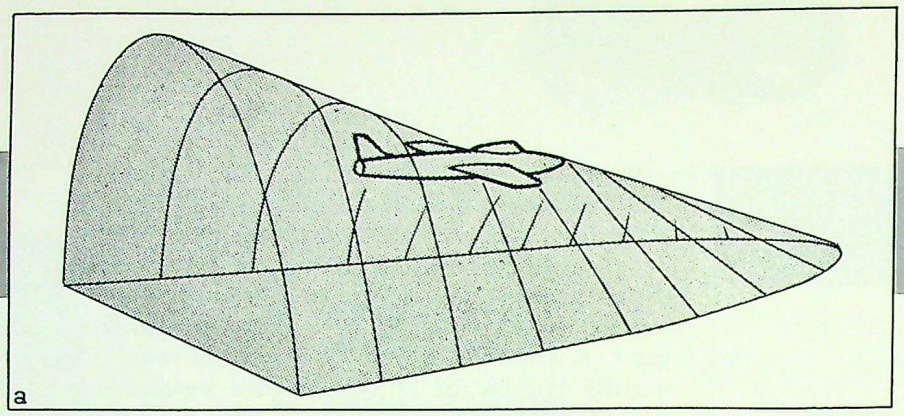
It will be noticed that if the pilot is accommodated in the supine position there is no difficulty about head support. One of the troubles we have met in seeking to develop a prone attitude is that of head support, and various rests for the forehead and the chin have been tried to meet this requirement. A whole battery of head and chin rests — vaguely reminiscent of the dentist's gadgets — was developed and tried. But the pilot is always awkwardly placed when prone. Control has to be done by some kind of twist grip or else by special forearm levers. These have been developed and patented and have proved workable, but no one can claim that they are as satisfactory as the more conventional stick. The working of the pedals is also a problem if the pilot is prone, the knees have a way of getting in the wrong place, whereas if he is supine there is no difficulty about it at all.

Tactical Outlook

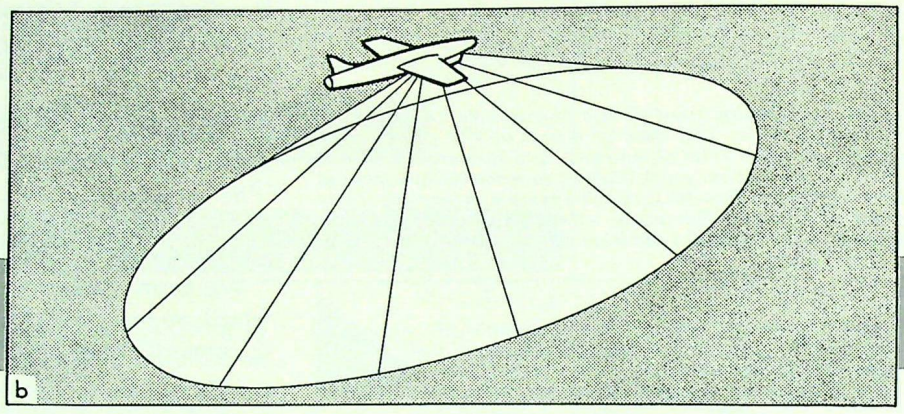
We have, therefore, a great number of points which appear to favour the supine position. It remains to be seen whether the angles of view are



A diagram of the tactical consequences of pilot attitude. The prone pilot is comparatively blind rearward and upward, whence attacking aircraft approach at the highest speeds. He has a better view downward, but from that direction approach speeds are generally lower. These conditions are reversed for the supine position, and therefore the general inference is that the supine pilot is less liable to a surprise attack.



Sketches which attempt to represent in three dimensional form the outlook ranges of (a) the supine pilot and (b) the prone pilot. Blind areas are shaded.

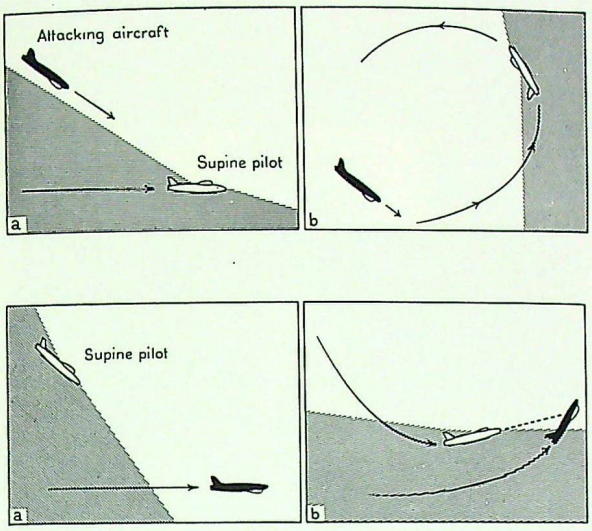


adequate from any tactical aspect. Here we meet a serious problem. It has never been suggested that the supine or the prone position should be used in any existing fighter. The scheme has always been for a special design incorporating the lying down position as part of it. Therefore it is quite useless to produce complicated drawings of arcs of vision and to calculate them on the assumption that the pilot will be accommodated in a Meteor, Vampire, Swift, or other existing type. The prone or supine pilot wants his aircraft designed around him. We cannot tell how good or how bad his view will be without a mock-up of the special fuselage planned for accommodating him with the power unit visualized.

One thing can be said, however, and that is that the idea that it would be difficult or impossible to see downwards from a recumbent posture is completely incorrect, for if a supine position were used a fuselage would be of small cross-sectional area. There would be little point in using the supine position otherwise. With a fuselage of small cross-sectional area the pilot's head movement required for seeing downward and to either side would be exceedingly small. He could also see down and to either side without moving the head, by the very smallest control movements. For the critical field of tactical vision he would be well placed. He would be able to keep a watch over his tail better than a pilot seated in the normal pilot attitude and incomparably better than any pilot accommodated in the prone attitude.

Gunnery Advantages

As for gunnery we can also say that the supine pilot will start with an advantage. Gunnery is becoming a very largely automatic affair and the latest sights and other equipment do not call upon those qualities of marksmanship which were needed in 1940. None the less, marksmanship does still count and one has only to look to the practice at Bisley to be sure that the supine position may be



The supine pilot is likely to be aware of the approach of an attacking aircraft. He can then go into a turn at smaller radius or higher speed because he can accept a higher g. *The two situations are shown at* a, *in elevation, and* b, *in plan, the two aircraft in* b *being on vertical banks. The contrasted situation if the supine pilot attacks and the prone is the quarry is illustrated below, again figure* a *being side elevation, and* b, *plan.*

as good as the prone position for accurate sighting. Some of the finest marksmen have used the supine position in rifle shooting. The prone position, although the one normally adopted for Army purposes, is not by any means invariably accepted by the expert marksman.

If, as some suppose, fighters grow larger and larger and heavier and heavier there would be little point in continuing the researches which have been made into new attitudes for the pilot. If, on the other hand, there is a reaction towards lighter aircraft with smaller engines, obtaining their performance by other means than brute force, there would be an urgent need to investigate all possible variations in pilot attitude and especially those which would enable the fuselage cross-sectional area to be reduced and would permit the pilot to accept high accelerations without blacking out. The *g* suit does, of course, perform the function of allowing a man to accept a high acceleration without blacking out, but it is perfectly obvious that an enormous advantage is gained if a man can be so accommodated in an aircraft that he can accept accelerations as high as or higher than a man in a *g* suit simply by lying down. The *g* suit is an added complication with its piping and other accessories. If we are to reduce weight and increase simplicity, the *g* suit is one of the things that ought to be avoided if it possibly can, and one way of avoiding it would be the adoption of the supine pilot attitude.

In general these remarks have been applied, as has been said, to the lighter kind of fighter. Where the pilot is flying a pantechnicon, like some of the up-to-date all-weather types, the advantages of laying the pilot down are less pronounced, but I must add the note that if a powered chair is provided for him the pilot could make good use of the supine and backward reclining positions even in big aircraft. Vickers produced a few years ago a chair for airliners in which the reclining angle could be rapidly altered by the operation of a finger switch on the arm. Again we see the resemblance to the dentist's equipment. If the pilot were accommodated in a chair having quick power adjustment of rake, he could enjoy in the same cockpit the advantages of a more or less upright sitz for ordinary flying, and could then quickly tilt back the seat if circumstances demanded a changed outlook or increased resistance to *g*.

While it is not my purpose to become involved deeply in the mechanical details of the supine seat, it is not impossible that a spring-loaded arrangement might be devised whereby the seat would automatically flatten itself according to the *g* load actually being experienced. This would bring many mechanical complications with it, but the opportunity that the supine position affords of widening the possible fields of view to include both those best for combat and those best for landing and take-off is too attractive to be ignored.

I have deliberately avoided references to an adjustable seat in the body of my notes, because it entails considerable complications, especially in the matter of the controls. The complications could be met by appropriate design but they are not an essential feature of the discussion about the relative merits of the prone and supine positions.

Feminine Gen

VAUDEVILLE AT ROCKCLIFFE

WHEN the airwomen at R.C.A.F. Station Rockcliffe decided recently to put on a variety show, they didn't have far to look for talent. Singers, dancers, comediennes, and actors, seemed to abound right on their own station. Not only were the airwomen the stars of the production, they also provided the writers, costumers, stage management, lighting, property and make-up crews, ushers, commissionaires, and stage directors. In addition, they arranged their own publicity and took the pictures.

"On the Road" was an all-airwoman undertaking from start to curtain-call, with L.A.W. Rhona Rowdon as producer and director.

Rehearsals were held after duty-hours in the school auditorium, where the show was subsequently presented. The auditorium soon came to resemble any other theatre during rehearsals, echoing nightly to the tap-tap of dancers, the tuning up of instruments by Sgt. Jeff Leonard's trio (the only airmen involved), and the recitation of lines.

Rhona (Lady-known-as-Lou) Rowdon in the leading rôle of "The Shooting of Dan McGrew."

Rhona Rowdon getting into the mood.

At the performance itself, Corporal Winona McKee was mistress of ceremonies.

Entertainment was varied and interesting, with dance routines, comedy sketches, acrobatic numbers, and singing. Act followed act with clockwork precision, and round after round of applause from

Lil Nelson helps Barbara Shore with her costume.

the audience soon assured the airwomen that their show was a hit. Our front cover and the accompanying photographs may give some slight idea of the girls' versatility.

The performers were Lillian Nelson, Betty Brown, Eleanor Richmond, Marie May, Jacquie Hassell, Terry Erickson, Marlene Wambolt, Ella Webber, Yvonne Burwood, Barbara Shore, Rhona Rowdon, Mary Nash, Margaret Shoup, Kitty Catton, Fern Smith, Mary Ball, Mildred Boyle, Betty Smith, Mary McDonald, and Carmel LeBlanc.

In the chorus were June Newman, Ellen Lamb, Lillian Trywich, Dolores Usselman, Elizabeth Martin, and others already mentioned.

Assisting with the show were: Elizabeth Taylor (photographer); Thérèse Berrault and Barbara Dean (advertising); Edith Carter, Grace Henwood, Kathleen Engelhart, Margaret Cherwonack, and Mary McNeil (ushers); Lila Clark and Mary Mitchell (lighting); Esther Clifford (properties); Kay Pettigrew (curtains); Stella O'Byrne (costumes); Hazel Salter and Betty Ann Leopold (make-up).

The concession booth was supervised by Margaret Parsons, Jeanne MacRae, and Margaret Phillips.

The grande finale.

Letters to the Editor ★ ★ ★

GRENADE FUSES

Dear Sir:

Question 13 in your February "What's the Score?" asks a debateable question about the fuse of a training-grenade.

The answer states that it has a seven-second delay. I would say that this is wrong. Since 1944 I have lobbed some 200 grenades and they have all had four-second fuses.

As in the case of most Ground Defence Weapons, there are no E.O.s; so I couldn't find any information there. However, if I may make reference to SMALL ARMS TRAINING, Vol. 1, Pam. 13, 1942, GRENADES, "When the grenade is thrown, a four-second fuse is used. This is white and has a rubber band on it which should not be removed. When it is fired from a discharger, a seven-second fuse is used. This is coloured yellow and has no rubber band on it."

Further reference for proof of the training-grenade having a four-second fuse may be found in the TEXT BOOK OF AMMUNITION, Pam. 6, 1945, GRENADES, and in INFANTRY TRAINING, Vol. 1, Pam. 7, 1951, GRENADES.

Soon after the beginning of the last war the seven-second fuse was withdrawn from general use, although possibly there remains the odd one around for demonstration purposes.

Sgt. A. R. P. Golding,
R.C.A.F. Station Camp Borden.

Dear Sir:

Your fast-moving Ground Defence corporal in "What's the Score?" of the February issue of "The Roundel" has "had it" by three seconds.

The grenade in Tracy's picture has a four-second fuse, the seven-second fuse being used for the rifle discharger cup.

Cpl. F. A. H. Stuart,
R.C.A.F. Station Bagotville.

Dear Sir:

May we point out that anyone who relies on having seven seconds in which to remove himself from the vicinity of a dropped hand grenade is liable to receive an unpleasant surprise?

The standard fuse for hand grenades burns for four seconds. The seven-second fuse was used in grenades fired from a rifle discharger and is no longer in use.

Yours for more Ground Defence,
Flt. Lt. F. A. Wingert,
R.C.A.F. Stn. Camp Borden.

(The writers of the foregoing letters are correct, and we are recommending that the framer of question 13 — if he is still with us — be invited to give a public demonstration of what must be a most interesting technique. —EDITOR.)

THE R.C.A.F. TARTAN

Dear Sir:

I read with considerable interest your reply to W.O.1 H. W. Mace's enquiry in the January issue, and feel that both he and present members of the R.C.A.F. and R.C.A.F. Association would like to have some further information regarding the actual origin of the tartan.

When No. 9 S.F.T.S. moved from Summerside to Centralia in 1942, the C.O., Group Captain E. G. Fullerton, was working on a design for a Royal Canadian Air Force tartan. I was posted to Centralia as Adjutant in August of that year, and I believe the design was then practically completed. I handled correspondence between Group Captain Fullerton and the Lord Lyon in Edinburgh, which eventually resulted in the tartan being officially recognized and registered. In the meantime the Group Captain was corresponding with the Loomcrofters; and while they no doubt created the tartan as far as the actual weaving was concerned, I feel sure the creation was based upon Group Captain Fullerton's design.

The famous 9 S.F.T.S. Pipe Band was then organized by Group Captain Fullerton and was the first to be equipped with kilts of the new plaid. Instructors and graduates of No. 9 will recall both the Pipe Band and the Highland dances which provided entertainment for relatives and friends of graduates at Wings Parades.

A. E. Lunn (R.C.A.F.A.)

FUEL FOR SHATTERPROOF

Dear Sir:

It has been many months since I last had the urge to write to "The Roundel"— not because there were no faults to find with the magazine, but rather due to lack of time. As I have pointed out in past letters, I regret receiving a copy of any magazine dated a month earlier than received (e.g. the January issue received in February). I believe you are alone and unique in this respect.

My only other beef at this time is primarily directed at the Air Historian. Some rather ancient correspondence from the Editor revealed that the story of No. 8 (B.R.) was in the making, but lo! I have failed to enjoy it as yet.

J. A. Hill. (R.C.A.F.A.)

"MODUS OPERANDI"

Dear Sir:

Glancing idly through the circulation copy of the January issue, I was profoundly shocked by the article bearing the above title. Squadron Leader Heide has grossly insulted the good old English W.C. Further, to state that there has been no improvement in the basic design is hardly playing the game. In fact, it is a downright distortion of fact.

While I admit that the subject of methods of attack is fairly well covered, I consider it my duty to point out yet another method which is always used in the most troublesome places, and which has been completely ignored by Squadron Leader Heide. This method consists of employing the contents of the nearest fire bucket to simulate the defective flushing-mechanism.

The Squadron Leader may, I might add, consider himself very fortunate not to have met the won't-stop-running type. This problem demands a far more serious approach, and a knowledge of both ball-tap bar-bending procedure and simple lever systems is essential.

A. Sheppard,
A.M.C.H.Q.

(Once again we would like to remind our readers that anonymous letters cannot be published in "The Roundel", although writers' names will be withheld upon request.—EDITOR.)

Answers to "What's the Score?"

1: (c)	2: (a)	3: (d)	4: (b)
5: (c)	6: (b)	7: (a)	8: (d)
9: (c)	10: (a)	11: (d)	12: (c)
13: (c)	14: (b)	15: (a)	16: (a)
17: (a)	18: (d)	19: (b)	20: (c)

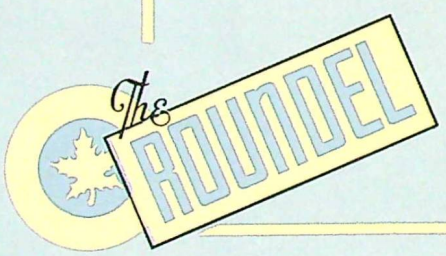
A MAGAZINE WORTH READING

Our March issue contained a note from R.C.A.F. Staff College on the subject of recommended reading for Flight Lieutenants' qualifying examinations and for the Staff College entrance examination. It referred, among other publications, to "Air Power—the Air Forces' Quarterly", formerly known as the "Royal Air Force Quarterly and Commonwealth Air Forces Journal."

The objects of "Air Power" are to stimulate interest in air matters, particularly those appertaining to military affairs, and to provide a vehicle of thought and information on events in the Air Forces of the Commonwealth. The journal has a wide appeal to all ranks, and it includes articles contributed by eminent serving and retired officers. It is therefore particularly interesting to those studying for higher appointments in the Service.

This magazine has the backing of an Air Ministry advisory committee which includes members of the Royal Air Force and the Air Forces of the Commonwealth. Contributions are paid for, and serving personnel of the R.C.A.F. will be welcomed as contributors, via the proper channels as laid down in Q.R. (Air).

"Air Power—the Air Forces' Quarterly" is published by Gale & Polden Ltd., the Wellington Press, Aldershot, Hants, England, and a year's subscription costs $2.20.


The
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