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The Roundel

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Contents

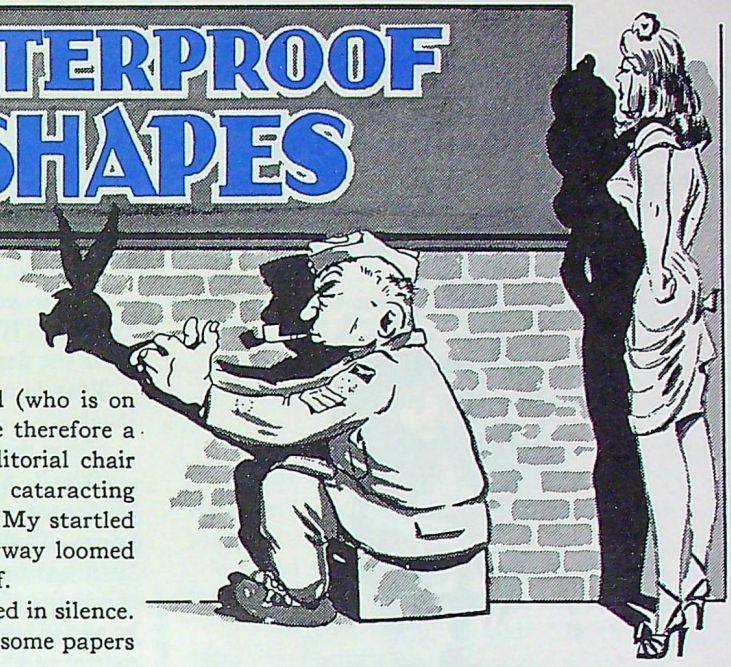
EDITORIAL

ARTICLES

REGULAR FEATURES

MISCELLANY

SHATTERPROOF ON SHAPES



A MUFFLED SCREAM from Hildegard (who is on a reducing diet and whose nerves are therefore a bit unsteady) ripped me from the editorial chair and sent the midmorning cup of tea cataracting across the manuscript I was reading. My startled gaze followed hers. There in the doorway loomed the sombre figure of Sgt. Shatterproof.

He advanced towards me and saluted in silence. Then, opening his KR's, he extracted some papers and offered them to me.

"Only one picture came out, sir. Something must have gone wrong with Corporal Aperture's camera after he took that. The clipping is from 'The Exhaust Pipe', our Station paper."

I stared at the photograph in stark horror for a few seconds before I remembered: Shatterproof had, of course, promised to send me the press notices of the Christmas Play at his Station. I unfolded the clipping and read:

". . . the highlight of the evening's entertainment was Sgt. Shatterproof's interpretation of the role of The Disgruntled Demon. It was a truly appalling performance. A wild cheering from children and adults alike rent the drill-hall roof when, in the last act, Prince Charming (ably characterized by Sqdn. Ldr. Bostitch) plunged his sword into the prostrate form of the fiend who had kidnapped Santa Claus."

Shatterproof accepted my congratulations with the elaborate unconcern of an artist accustomed to such homage. He relit his pipe. Then he remarked:

"But enough of the drama. What are your plans for 1949?"

"Vague, at present. But they'll take shape."

He leaned over the desk and tapped my blotter solemnly with the stem of his pipe.

"Ah!" he said. "That's what I was afraid of. They'll take shape—but what shape? There are many shapes. Let us have no loose thinking, sir. Let us plan."

He studied me for almost a minute, puffing thoughtfully, before he went on:

"If the Editorial Committee has decided (as it obviously has) not to bring any happiness into the lives of the boys in the field, at least it might start teaching them something useful. Now, take that questionnaire in the last number—"

"You liked it?"

"Liked it?" His expression was one of shocked surprise. "No, I couldn't say that, and I don't suppose anyone else could either. The idea's good, but naturally it was badly handled. Who wants to be told that General Clay is the first president of Korea? It doesn't matter—except maybe to the Koreans and General Clay. What does matter to the boys in the field is how they're going to get ahead in life—and how to do it comfortably."

"I have," he continued," been discussing the problem with LAC Bladder. LAC Bladder is a promising young airman whom I've recently taken under my wing. We've prepared a couple of sample questions just to give you an idea of the right approach."

He ferreted inside his tunic, pulling off another button in the process. At length he produced and gave me a typewritten sheet. While I perused it,

he occupied himself by rivetting on the button with the aid of a pair of scissors and a paper clip.

I read:

"1. If peace continues, your Commanding Officer will in all probability exhibit an increasingly offensive interest in your personal appearance. The correct method of combatting this tendency is:
   (*a*) To demonstrate by example the beauty of a more Bohemian style of dress.
   (*b*) To explain to him patiently that clothes do not make the man.
   (*c*) To leave the Service.
   (*d*) To engineer an international incident that will lead to war.

"2. It has been established by medical science that peptic ulcers are on the increase. The best way to fight this evil is to eliminate:
   (*a*) Medical science.
   (*b*) Work.
   (*c*) Promotion examinations.
   (*d*) WO1 Gallstone."

I returned the paper, somewhat at a loss what to say. Sgt. Shatterproof favoured me with a nod of approval.

"I knew you'd be impressed," he said. "The development of a progressive outlook in the Service: that should be our aim. This is the age of the atom bomb, but how many of us would know what to do if the flesh began to drop off our bones? What would *you* do?"

"There you have me," I confessed gloomily. I turned to Hildegard. "Hildegard, what would you do if the flesh began to drop off your bones?"

That hungry maiden's eyes filled with a great longing.

"Give three hearty cheers," she said.

"Yes," Sgt. Shatterproof resumed, quelling Hildegard with a glance, "I doubt if any of us know. That's why the Editorial Committee in 1949 has got to concentrate on one shape only: the shape of things to come.— Unless, of course," he added hopefully, "the Brass sees the light in the matter of cheesecake."

I shook my head.

"Very well." He heaved an elephantine sigh. "I shall leave you to your thoughts. A Happy New Year, sir—and keep smiling. After all, it can't get much worse"

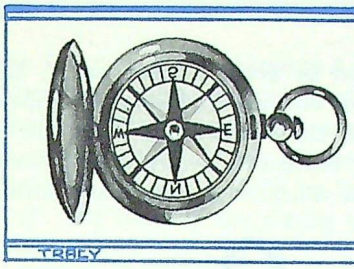
As he disappeared from view, a sudden suspicion seized me.

"Just a moment, Shatterproof," I called after him. "What can't get much worse? The world?"

His unrelenting voice floated back from the corridor.

"No, sir. I do not mean the world. . . "

—EDITOR.



It's Fun Looking Back On Compasses

(Reprinted by Courtesy of "Air Clues")

SITTING AT OUR DESK idly subtracting our income from our income-tax and doodling on our blotter, the editor's hot breath metaphorically scorching our neck as "copy day" approached, we suddenly started to think about the title of this series of articles—the "Fun Looking Back" part, we mean.

We thought about "looking back" and in less than no time, and certainly in the best of Pelmanistic traditions, one thing had led to another: the word "back" had led us on to "direction" and then successively through "pole-star" and "Geographical Pole" to the "Magnetic Pole" and "compasses." It occurred to us that without compasses things would certainly be a little difficult, especially in the navigation world. In fact, now we came to think about it, things must have been quite tricky before the invention of these very necessary instruments. So in case any of our readers were troubled by similar daydreams we decided to find out just who invented such handy gadgets, how, and why. Accordingly, we donned our hat and went off, without any directional aid, to seek the old historian. Not that we needed a compass for this trip: we could find that particular pub in town blindfolded, anyway.

And sure enough, huddled there in the corner sat our friend, a picture of nationalized misery. Even his beer looked flat and dejected. Obviously, he had just received his income-tax demand note, too. However, casting care aside, we topped up his tankard, filled one up for ourself, and got down to business.

"Well, Sir," we said, "we've just had some extraordinary thoughts on the subject of compasses and we wondered if you could enlighten us with a few facts about their history."

WHAT'S IN A NAME?

"Compasses?" said the old historian. "You're a fine one to ask about compasses. Why, I'll bet you don't even know why they're called compasses."

We had to admit, albeit a little shamefacedly, that we didn't know why they were so called.

"I'll tell you, then," he said. "In the old days when everybody thought that the world was a flat disc with their particular country in the centre, they found that, by using the instrument which we now call the compass, they could determine the bearing of any point on the 360° of their horizon: in fact, it encompassed their whole world—or so they thought. And from the word "encompass," which my dictionary tells me means 'to surround', 'encircle', or 'hem in', it was a simple step to lop off the 'en' and apply the resulting word to an instrument which, in indicating a given direction, could be used to point out, by reference, any other direction. And there you have it—the source of the name compass."

At this early stage of the evening even we could understand this, so we let him carry on without comment.

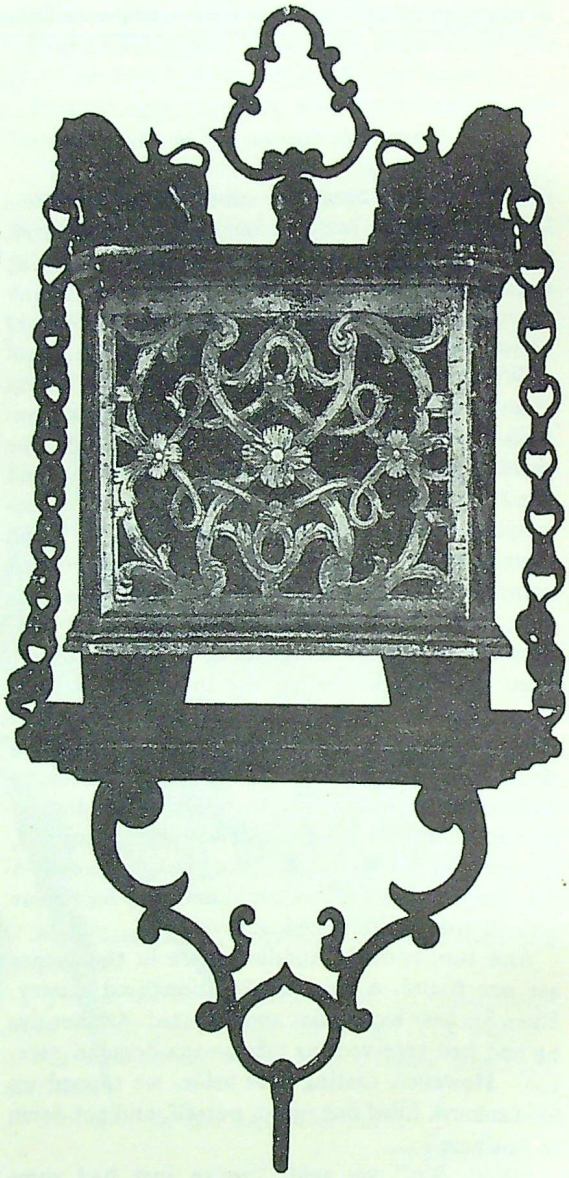
LODESTONE LEGENDS

"Now, as for the invention of the compass," he proceeded, "the exact origin is a little obscure; but we generally let the Chinese have the credit for the discovery of the lodestone with its magnetic properties, which is, as it were, the father of the compass. Looking back into Chinese history we find that the earliest reference to an instrument for indicating direction is contained in quite an amusing story of a certain Chinese general, Hiuan-Yuan by name, who, while attacking another Chinese general on the plains of Tchou-

lou in about 2634 B.C., suddenly found his army in rather embarrassing circumstances in the middle of a thick fog created by the enemy. Now this sort of thing would obviously never do at all, so Hiuan-Yuan is reputed to have constructed, on the spot, a chariot for indicating the South; and, having thus created the very first instrument for navigating in ten-tenths, he was able to pursue the enemy general and take him prisoner, much to that gentleman's surprise and chagrin.

"However, that's as may be, and whether it's true or not I wouldn't be prepared to say. There is, in fact, another story that a shepherd of the Near East, whose convenient name was Magnes, was the first to discover the magnetic properties of the lodestone because pieces of this strange metal stuck to the soles of his iron-studded boots and to the iron heel of his shepherd's crook. Once again, I wouldn't be prepared to say whether this is gospel truth or not: personally I have grave doubts as to whether people used iron nails in their boots or iron heels on their crooks in those days. So I think that taken all round it would be as well to be more general—no pun intended on the story of the general in the fog—and to say that the absolute origin of the compass is uncertain.

"From these beginnings, however, the compass did indeed pass into use as a navigational instrument, and once again the Chinese must be given what authentic credit there is for its first use in this manner. The power of the lodestone to communicate polarity to iron is explicitly mentioned in a Chinese dictionary, finished in A.D. 121, which defines the lodestone as 'a stone with which an attraction can be given to the needle', the needle referred to undoubtedly being a compass needle. Later on, the first mention of the use of the compass for navigation occurs in a Chinese encyclopaedia, in which it is stated that during



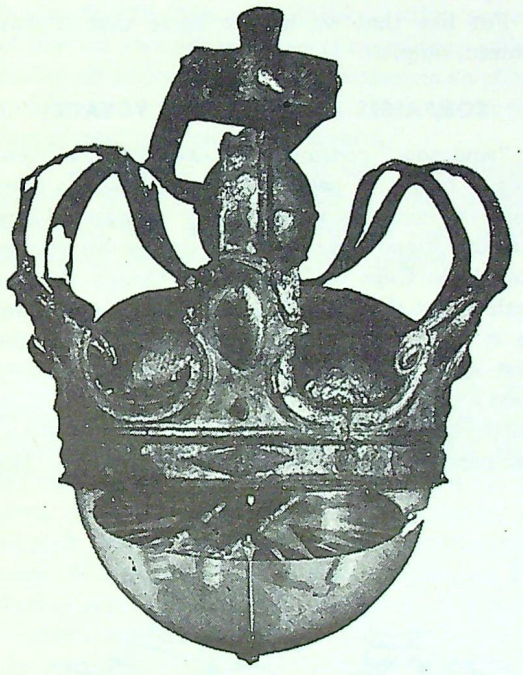
Lodestone: mounted in bronze, with supporting chains. (Reproduced by kind permission of the Trustees of the National Maritime Museum).

the Tsin dynasty—or between A.D. 265 and 419—'there were ships directed to the South by the needle'. Their compasses seem to have stood them in good stead, too, for there are records of their trading as far afield as India, the Persian Gulf, and the Red Sea during the first few centuries A.D."

"What form did their compasses take?" we asked.

THE CHINESE CONCEPTION

"Well, according to such reports as we have," replied the Old Man, "they were a little different from those used by European navigators. The needle was peculiarly poised with its centre of gravity a little below its point of suspension and was exceedingly sensitive. It was seldom more than an inch in length and less than a hair's breadth in thickness. A distinguishing mark was fixed on its Southern pole as we have one fixed on the Northern pole, though the reason for this is not known with any certainty. But it might be significant that the Chinese name for the instrument means literally: 'needle pointing to the south'. Their compass card was divided into twenty-four points, starting at the South. And that's about all we know of Chinese compasses . . ."



Hanging type of Danish compass in the form of a crown. About 1790. (Reproduced by kind permission of the Trustees of the National Maritime Museum).

He broke off, as though there was more he might have said but which he deemed prudent to withhold. His face became set, and, indeed, at that moment it reminded us not a little of that "inscrutable" mask which, reputedly, characterizes the Chinaman's everyday expression.

"What then?" we pressed, hoping to coax the Old Man from his reflection. There followed a struggle to collect his thoughts.

AND ARABIAN ADROITNESS

"From the Chinese," the historian said, managing at last to take up the thread, "it seems very probable that the knowledge of the compass passed to the Arabs, by whom it was transmitted to Europe. In an early Arabic compilation of the works of various philosophers there is a footnote on the function of the lodestone, thought to have been added by the Arab translators. Their actual word for the compass is 'Bossola', signifying that both the object and the word were foreign to them. That the Arabs were pretty clever at this navigation business is common knowledge. In fact, from a fairly early character named Osorio we learn that the Arabs were instructed in so many of the arts of navigation, that they did not yield much to the Portuguese mariners in the science and practice of maritime matters. Mariner's charts and compasses are known to have been used by the early Arabs who navigated the Red Sea."

"And when did the compass reach Europe?" we enquired from behind our tankard.

A "COULDN'T CARE LESS" ATTITUDE SETS IN

"There you've got me!" said the Old Man. "I told you this was a difficult subject, but you will keep pressing on. According to Harbord's *Glossary of Navigation* there is a possibility

that the vikings of Norway made use of a form of magnetic compass in about the 9th century. And that may be so; but the fact remains that we only have definite proof that the knowledge that iron could be magnetized and made to indicate direction in the manner of the compass existed in Europe in the 11th and 12th centuries.

"The form in which it was then used is unknown, but it may be assumed that it was exceedingly primitive and unreliable. This assumption can be made because that particular period marked the ending of one of the least fertile stages of man's intellectual life. A 'couldn't care less' attitude had set in until then and apparently nobody had bothered to invent anything at all. Thus, the invention of the compass did more to forward the science of navigation than any other single invention, though the time it took to reach anything like a reasonably workable stage would make even a Royal Commission look like an express train."

The Old Man paused and interested himself in his beer. He was taking a lot of prompting tonight. Perhaps the income-tax was too heavy a charge on his thoughts: even we couldn't help thinking of it occasionally. However, stepping into the breach, we refilled both our tankards and launched ourself into the fray once more.

POINTS ON POINTS

"You said the Chinese compass was divided into twenty-four points," we observed. "Who thought of dividing it into thirty-two?"

"When, and by whom, the thirty-two point card was introduced," said the Old Man, "are still matters of great conjecture. Certainly the thirty-two points, or 'rhumbs' as they are sometimes called, were recognized at least as early as the time of Chaucer, who, in 1391, wrote: 'Now is thin Oristonte departed in xxiiii partiez by thi asymutz, in signaficacion of xxiiii partiez of the world: al be it so that ship men rikne thilke partiez in xxxii'."

We choked a little at this mouthful of wisdom.

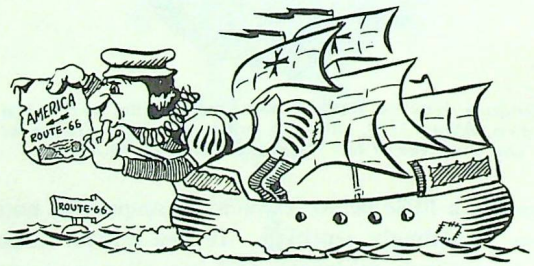
"What on earth might all that mean?" we asked.

"That?" said the Old Man, with a trace of a smile. "Oh, that's a bit of very Basic English for you. Translated it means that the horizon is divided into twenty-four parts in azimuth in signification of the twenty-four parts of the world, whatever they may be; but that the sailors, having even in those days a reputation for not caring, have divided their horizon into thirty-two parts. Simple, isn't it?"

Put like that we had to agree that it was, indeed, simple.

COMPASSES AND THE EARLY VOYAGES

"And now," continued the Old Man, "to mention a couple of people who are known to have used the compass on their early voyages. There was our friend Diaz who used one on his voyage round the Cape of Good Hope, though there is little doubt that the Phoenicians had beaten him to it on this particular route. But his was the first well-authenticated voyage and he certainly used a compass of some sort. Then, Columbus in his voyages used a single needle supporting a paper compass rose and pivoted on a steel point. His



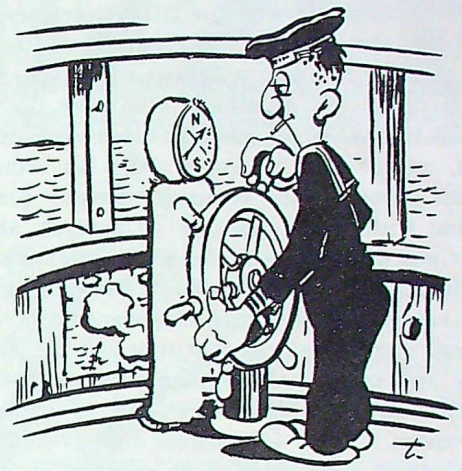
ships were wooden and non-magnetic, but they were also small and consequently subject to large motions in seaway. Steering by that sort of compass must have done an awful lot towards enriching nautical language!

"Incidentally, it might be of interest to mention that on nearly all modern marine compasses, on some old air compasses, and on most magnetic roses on maps and charts, the North point is indicated by a fleur-de-lys, or a half of one. Now this is definitely a relic. It is probably the symbol of the lotus blossom and it was undoubtedly first placed on the East point of the compass, since at that time the East point would definitely be more important than the North, for it indicated the direction of the Far East islands with their spices, gold, silks, brocades, tea, and other riches and foodstuffs. The history of all the maritime powers of that era abounds in stories of expeditions which rushed off periodically in all directions in an effort to find a quick route to the East. They all met the fate of most get-rich-quick ventures."

We felt a little ashamed at this, remembering some of the similar enterprises on which we had embarked with more foolhardiness than profit, but we hid our shame behind our tankard.

EMBELLISHMENT—BUT NO SCIENTIFIC IMPROVEMENT

"As I said before," the Old Man went on, "the development of the compass was extremely slow. Indeed, it's rather amazing to consider that between the time of Columbus and right up to about 50 years ago, no scientific improvement at all took place in the design of the magnetic compass—despite the efforts of such stalwarts as Sir George Airy and Flinders. Moreover, this state of affairs persisted notwithstanding the fact that the magnetic compass was then the navigational instrument. More and more ships were leaving the slips, the world was opening up, there was plenty of talent available which could have handled the problem quite satisfactorily, and still nothing was done in the way of technical advancement. Instead, the navigators of nearly all countries seem to have contented themselves with embellishing and improving the container—sometimes



out of all recognition. In appearance, some of these earlier compasses range between what are apparently very intimate domestic utensils for household use only and grandfather clocks. Nowhere can you see the forceful creative imagery of the sailor displayed to better effect than in these particular specimens of the compass-maker's art."

He was obviously well in his stride now and there was no stopping him.

MODERN MARINE MAGNETIC AND AIRCRAFT COMPASSES

"This situation," pursued the Old Man, "lasted until about 1880, when William Thompson, who later became Lord Kelvin, carried out research into the whole question of the magnetic compass, and produced what is, in effect, the very excellent modern marine magnetic compass of today. Not until then were navigators given a really reliable instrument with which to make their way about the seas. Kelvin was, in fact, a most remarkable and versatile man. It has been said that he once proved mathematically—beware of that word!—that it was impossible for a heavier than air machine to fly. One could sometimes wish that his genius had been sufficient to make this particular proof of his a correct one; but despite his small slip, his name lives on today, linked with the quest for precision and progress in the development of scientific instruments.

"After the development of the marine compass, of course, the next logical step was the introduction of an aircraft compass. Here we have to hand the credit to the Admiralty, who were the first people to try out a compass in an aircraft. In 1909, one of their personnel fitted an ordinary marine pattern liquid compass, carefully packed around with cotton wool, in an aircraft, and a flight was made using it. The pilot of the aircraft, incidentally, was a chap named Cody, of whom you have probably heard. We can really date aircraft compasses from that time and the Admiralty still remain *the* authority in the British Empire on all questions relating to magnetic compasses.

"The first really satisfactory compass for use in aircraft was developed during World War I after several very disheartening attempts, and this is the P.4 or P.6 Aperiodic Aero Compass, which is probably the best of its type available anywhere in the world today."

He paused and looked at his empty tankard in surprise. Once more our expense account soared.

THE BLAMELESS GYROSCOPIC COMPASS

"What about the gyro compasses then?" we urged.

The Old Man took a quick half-pint swallow.

"It's a funny thing about gyro compasses," he remarked, "but they might never have been developed at all if the magnetic compasses in use had been able to stand up to 'man-o-war' conditions or had been suitable for use in submarines. But as the magnetic variety didn't meet these requirements, people started to search for something that would. Hence the gyroscopic compass came into being. Nowadays there are three distinct types in production, the Anschultz (German), Brown's (English), and Sperry's (American/English). And magnificent pieces of mechanical construction they are, too. In recent years, moreover, we have seen the development of the gyroscopic compass for use in aircraft, so that it is no longer possible—except under very unusual conditions—for the pilots or navigators of aircraft to blame their compasses when they find themselves in the circumstances with which all navigators are so familiar."

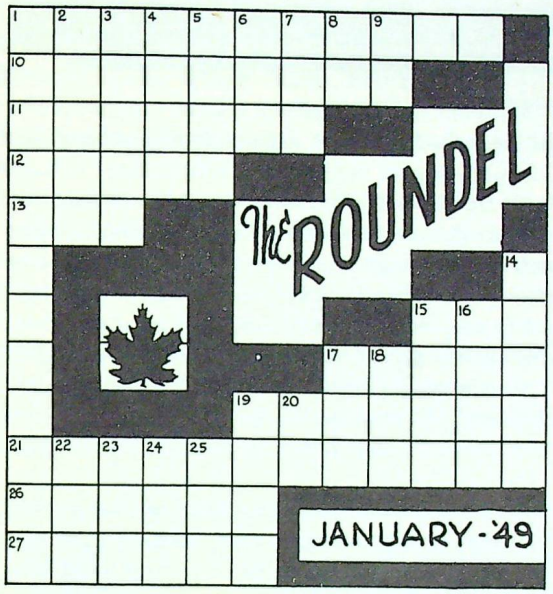
We weren't too keen on this innuendo. It seemed directed to cut our only stand-by from under our feet, as it were. But it was only five minutes to closing time so we let the matter pass unchallenged. Instead, we asked him whether, as a parting gesture, he would care to define "magnetism" for us.

MAGNETISM AND MR. X

"I've told you before that I much prefer stories to definitions," the Old Man responded. "And I think I can oblige you this time with a story about our old friend, Lord Kelvin. For a time he was a lecturer at Glasgow University, where he earned a reputation for never suffering fools gladly. On one occasion just after he had spoken on elementary magnetism, he turned to the class and asked: 'Well, gentlemen, and what *is* magnetism?' At this, a not very attentive youth at the back raised his hand, and then, noticing that no one else had done likewise, quickly withdrew it. Too late: Kelvin had spotted him. 'Come, come, Mr. X,' he said. 'Stand up and tell us'. The unfortunate youth rose, gazed helplessly around, and then replied: 'I'm sorry, Sir, I've forgotten'. Kelwin drew himself up, adjusted his gown, and glared at the class. 'Well, well, gentlemen' he said, and there followed a moment's dreadful silence. 'You have just witnessed one of the major tragedies of our age. Only two people know what magnetism is: God—and Mr. X. God won't tell us and Mr. X has forgotten'. And with that he swept out of the room."

The Old Man bade us goodnight and sauntered off, and it wasn't till we were halfway home that we realized *he* hadn't defined magnetism either.

CROSS WORD PUZZLE



NOTE

The only three words in the above puzzle that you won't find in Chamber's Twentieth Century Dictionary (1944 edition) occur in 11 across and in 8 and 25 down. However, everybody in the Service is thoroughly familiar with all three of them.

ACROSS

1. A lop-sided officer to whom RCAF aircrew are strongly attached.
10. Can only occur after closing.
11. Though he prefers his girl's in nylon, the AFM likes oil for this.
12. Something the Accounts Officer does to his cash box every evening—provided he can find the head of his key.
13. Means nothing to a sheriff without a compass bearing of 135°.
15. A valuable man when horse-power fails.
17. A fragrant resinous substance.
19. Perhaps not so romantic as marrying for love, but much better for the race.
21. A knowledge of this subject will convince you that you can't fly on one wing.
26. Fireproof houses built with bone knives.
27. You won't find algae in moist places unless you first cut off the end of your nose and then grab a Scotch girl's dowry without grabbing her.

DOWN

1. The first stage in the development of brass.
2. This kind of eel doesn't look sulky, because he isn't under training.
3. The Editor hopes they will always be "joyeux" for his French friends.
4. The abbreviated final chapter of a remarkable period turns out to be nothing.
5. A selfless English widow deprived of her favourite beverage.
6. If you're Scotch you'll find one.
7. Supply the high tension and the answer will shine forth.
8. Without the help of a popular brand of gasoline there's nothing to be learned here.
9. The only survivor of these teachers of the poor is the Inspector-General who led them.
14. Help them to keep cool and, strangely enough, they'll become altogether too enthusiastic.
15. This I did before perceiving what I subsequently vanquished.
16. It will not be prevalent in the district unless you begin with the end.
17. Most women over thirty wish this was really the way it went.
18. Though its tail is on, you'd better cut it off if you don't want a sour answer.
19. The groom looks a bit confused.
20. A negative approach which means a lot to employees of the United Nations.
22. Can be dangerous if inflated.
23. The forgotten G.I. wasn't the only one who whistled at them.
24. Even a crack rifleman can't do it unless he is first enjoined to silence.
25. Some critics consider that his spectacular air-raid on Japan accomplished little, but we aren't concerned with that just now.

Answer on page 48

CROSS-WORD COMPETITION

Try your hand at making up cross-word puzzles. The best received each month will be published in "The Roundel," with full acknowledgements. Make them as difficult as possible and state the dictionary used. Address entries to:

"The Roundel,"
Room 2540,
D.N.D. Bldg. "A",
Ottawa, Ont.

A Cadet in the U.S.

by A. Macdonald

In the December 1948 issue of "The Roundel" Air Cadet F/Sgt. Kilger described his "exchange" visit to England last summer.

At about the same time, Air Cadet F/Sgt. Jack Holmes, of No. 58 (Kingston) Squadron, made a trip to the United States under a similar arrangement between the Air Cadet League of Canada and the U.S. Civil Air Patrol. This latter exchange has also been proclaimed an outstanding success, and one which reflects great credit on the U.S.A.F. and R.C.A.F. officers and airmen who assisted the two civilian agencies in carrying out the involved programme.

Probably the best measure of the appeal of the exchange is the effect it had on the cadets involved. They returned to their homes tired but immensely thrilled, and with a new awareness of what is meant by the term "good neighbour." There can be little doubt that the sharing of common experience with American youth has helped them to become better and more enlightened citizens of Canada.

Jack Holmes is typical of the 24 young men who represented Canada in the exchange last summer. A summary of his reactions to the trip appeared recently in the "Kingston Whig-Standard." It is reprinted here as a first-hand report of one of the most inspiring activities of the Royal Canadian Air Cadets.

* * *

"Jack Holmes, 19, of 13 Tenth Street, says he feels 'dazed by the marvelous welcome' which he and 23 other Canadian air cadets received during their two-week flying trip through the United States. The Canucks were feted royally by their American hosts.

"Jack, a member of No. 58 (Kingston) Air Cadet Squadron, won the trip as 'an outstanding cadet'. Twenty-four American air-minded youths made a similar tour through Canada at the same time.

"The young cadet cannot make up his mind whether he was most thrilled by a visit to Hollywood's studios, the greeting the boys received from a bevy of gorgeous beauty contestants at Phoenix, Ariz., or the reception at the home of Col. D. Harold Byrd, brother of Admiral Byrd, Antarctic explorer, near Fort Worth, Texas.

"Jack arrived at Trenton Monday evening and has since motored home, loaded with pictures and other souvenirs of his flying adventure.

"Cadet Holmes, with 11 other youths from eastern Canada, left Ottawa July 31. Another dozen cadets left Calgary at the same time. First stop was Detroit. The group there visited the Edison Institute, Greenfield Village and the Ford Museum.

"After touching down at Springfield, Ill., the boys landed at Fort Worth, where they met those who had flown from Calgary. They toured the Consolidated Vultee factory where they saw giant six-engined bombers being built. They passed up and down the plant which lacks only 800 feet of being one mile long.

"They visited the Temco factory which is one of Col. Byrd's 'Hobbies' where cabin planes and

vending machines are made and army planes overhauled. At the colonel's summer playhouse they enjoyed a barbecue. Jack was amazed at the bowling alley, billiard room and outdoor dance floor of the playhouse. They were treated also to a floor show featuring 'name' stars.

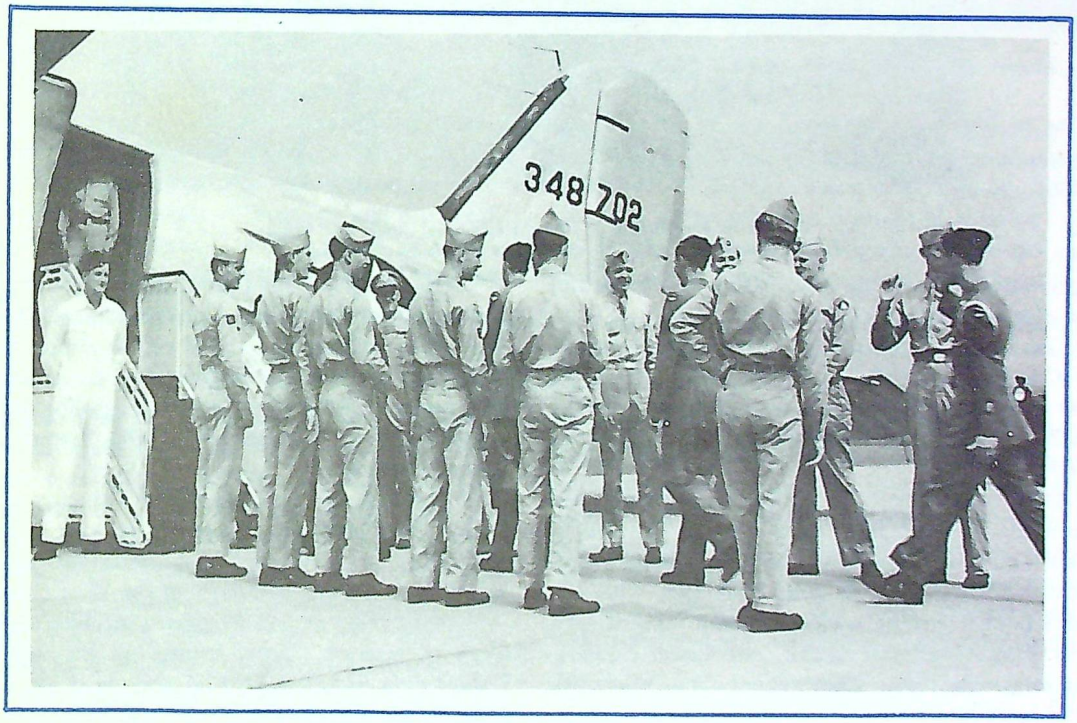
"After a visit to a glider school at Grand Prairie, Texas, they took a five-hour flight to Phoenix, Ariz., where 'Miss Phoenix' and 11 runners-up in a beauty contest greeted them and accompanied the Canadian cadets to a country club for a swim and dinner. 'Those were four short hours', sighed the now homebound cadet.

"At March Field, 60 miles from Los Angeles, Cal., the group left the plane and took buses to the city where they were greeted by the mayor of Los Angeles, the Canadian trade commissioner and the British Consul. They were dinner guests of Hon. Mr. Hadow, British consul. They put up for the night at 'LA'S' swanky Hotel Hayworth; breakfasted at Clifton's.

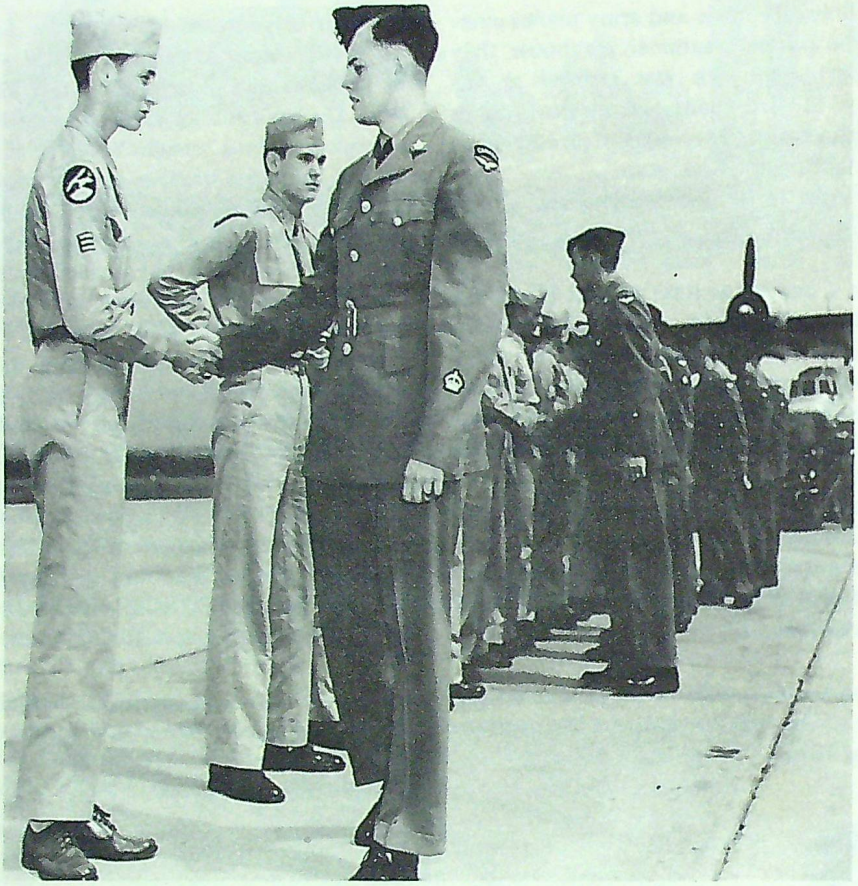
"Four days were spent in the Los Angeles-Hollywood area. Activities included a bus tour of both places and a tour of Warner Brothers and Walt Disney's studios and a meal at Paramount's commissary. Jack brought back one of the celluloid backed drawings used in making movie cartoons from the Disney studios. The Hollywood visits impressed on him that 'movies are a complete fake'. He mentioned 'battle fleets' in small tanks.

"Jack and his comrades saw pictures, then unreleased, which will probably not reach Kingston until next year. Then came a tour through the Northrop factory and Aeronautical Institute where 'flying wings' are produced. Next they attended a concert at Hollywood Bowl which featured the works of Richard Strauss.

"The cadets spent a night at the Plaza Hotel in downtown Hollywood. Next day they visited the Lockheed plant where they had lunch, then flew to Catalina Island, 25 miles offshore, and dined at the Casino. They spent the night at the famous



Civil Air Patrol Cadets, already arrived at Rockcliffe, say goodbye to Canadian Air Cadets about to leave for U.S.



Franklin R. Meyer, of Cheshire, Conn. (left), and WO2 Earl Barr, of Toronto, shake hands on meeting.

resort. After a morning swim, they flew back the next day to 'LA'.

"The Civil Air Patrol at Burbank entertained the Canadians at dinner, after which the boys went to a Pacific Coast League game at Hollywood Baseball Park, accompanied by CAP girls in uniform.

"After refreshments at the Punch and Judy Ice Cream Parlour the party took a bus to their plane at March Field, arriving at 3.30 a.m. The following afternoon they flew to San Francisco where a Smörgåsbord supper awaited them. 'There was everything imaginable to eat', said Cadet Holmes, smacking his lips. They spent the night at Hamilton station of the United States Air Force after seeing a show.

" 'From early morning until late at night it was one round of fast-moving activity', said Jack. The rather tired cadets toured an oil refinery the following day. Jack was impressed by the amount of processing required to produce gasoline from crude oil. They had supper at the 'Lamps of China' restaurant.

"A highlight of four days at San Francisco was a tour of Chinatown, escorted by two plain-clothesmen who pointed out notorious spots associated with the 'bad days' of the West Coast.

"Other events at San Francisco included more tours of aircraft plants, supper at the famed Fisherman's Wharf, ice follies and rides in the cable car to view the city.

"A flight across the Grand Canyon took the

party to Albuquerque, home town of Major C. L. Phillips, USAF, who accompanied the Canadians throughout their trip. A dance was a feature of their stay at the oddly-named city, which they left the next day for Denver. There they went into the mountains for a picnic. They also saw the 'hot rod' races, accompanied by CAP girl cadets, and enjoyed a boat trip and a visit to Denver's city park.

"The next morning the cadets got up at 4 o'clock, took off at 6 a.m. and after waiting in fog for three hours over Great Falls, Montana, arrived at Calgary at 2 p.m.

"At Calgary, both Canadian parties and both United States parties met at a banquet at which high-ranking officers of both air forces were present.

"The menu included everything from hors d'oeuvres, through filet mignon to candy. 'That's the sort of meals we ate all along the trip', commented Jack. A colourful ceremony at the banquet was the placing by each youth of his country's flag on his hometown on a giant wall map. The much-travelled Northwestern Command RCAF band entertained.

"The two U.S. and two Canadian planes left the following day carrying their respective groups of cadets. Jack's plane went east, landing cadets at air stations nearest their homes along the route. They spent one night at Winnipeg and had breakfast at Fort William.

"After the Kingston cadet stepped off the plane at Trenton, he was met by three officers of the local squadrons, FO's J. F. Descent, commanding officer; R. A. Baines, Equipment Officer; and G. W. King, adjutant, who brought him home.

" 'I can hardly settle down now after so much excitement and royal treatment', said Jack."

Calgary. Cadets place flags on home towns.

GEO-RESCUE

A GEOPHYSICAL exploration party, roaming over the flatlands searching for suitable test sites, became completely lost. Having explained their predicament to the field office by radio, the members of the party were instructed to explode a charge of dynamite, which they carried for seismic exploration, at a pre-arranged time. The blast, travelling through the earth, was intercepted by a pattern of geophones connected with the field office, while an oscillograph recorded the times of arrival of the shock wave at several locations. A short computation, essentially the loran problem worked backwards, revealed the location of the lost geophysicists. Informed by radio, the party took a bearing for home and got there. Readers will recognize this technique as a solid-land version of the sofar system, which locates ships at sea by precisely the same technique.

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The SOVIET AIR FORCE

by "Polygon"

(Reprinted by courtesy of "The Aeroplane")

AIRCRAFT ENGINES AND ARMAMENT

SUPERIORITY OF EQUIPMENT is a tremendous factor in any highly mechanized fighting service. In equipping our own R.A.F. the accent was on quality rather than on quantity. In Russia production came first, and, as I have pointed out, the Russian aircraft were generally inferior to those of the Germans. Yet towards the end of the War they had achieved complete air superiority over their enemies by weight of numbers. I do think that, in England, we are inclined to devote too much attention to detailed refinement. For instance, in the early days of the War our control system for operating night fighters was extremely simple, if not crude; the whole equipment was contained in a mobile trailer. Yet I know of one controller who achieved results with this simple equipment which were never surpassed by the very elaborate and highly developed control rooms of a later date.

Similarly, the Russians got good results from their simple and, to our minds, crude equipment. Quality won the Battle of Britain, for the Hurricanes and the Spitfires were superior to the German aircraft in both performance and fire power. But had the Germans thrown another 500 aircraft into the battle, the result might have been a victory for our enemy. Weight of numbers can tell, and it certainly did towards the end of the Russo-German War. The Soviets achieved this numerical superiority by a policy of concentrating their production on a few types of simple design.

Production and development passed through four stages. The first stage at the start of the War found the S.A.F. equipped mainly with obsolete aircraft. During the second stage designs were improved and orders were given for mass production. Meanwhile, the airmen at the front had to make do with their obsolete types and the casualty rate was terrible. At this stage the Russians were fighting a losing battle, and one may well imagine the urgent necessity for getting new types and for getting these in quantity. It was evident that the operational requirement staff did not lose their heads in this crisis, but went quietly ahead and selected designs for their suitability for mass production, yet having reasonable performance. The urgent demand was for quantity, and it was at this stage that the Russians had to cope with the terrific task of moving their great factories. Technical and scientific development, somewhat naturally, suffered.

The third stage was when standardization had been decided and production was under way. Now more attention could be paid to research work and to the development of new designs. Finally came the fourth stage, towards the end of the War, when the Russians knew that the Germans were defeated and so could really establish the development side of their industry.

Fighters were produced in greater quantity than any other types, so I will deal with these first.

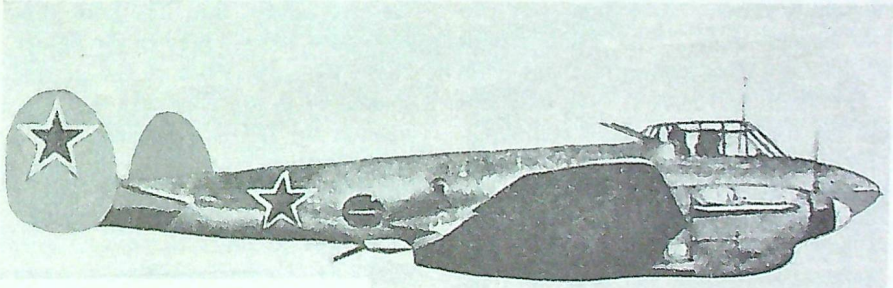
So far as I know, very little has been published in the technical Press except a few pictures and details of the biplane types used in the Spanish War, and the description of the Yak-3 which appeared in THE AEROPLANE for March 22, 1946. The first Yak type was the Yak-1 designed to replace the obsolete biplanes, which had a wide inward-retracting undercarriage, reminiscent of the Hurricane. Just as with the Spitfire, when we adopted a policy of improvement and development of the basic design, so did the Russians develop and improve the Yak-3, which became the standard operational fighter in 1944. The resemblance of the Yak-3 to the Spitfire is very marked, and it is clear that it is a cleaned-up version of the Yak-1. Although the Yak-3 has been described before, it is such an important type that it is worth recapitulating some of its essential features.

The article in THE AEROPLANE for March 22, 1946, gave the impression that the aeroplane was made of wood in order to get the lightest possible structure. I think most aircraft designers will agree that while wood is an economical material for very light aircraft of low-wing loading it is far from suitable for aircraft over, say, 4,000 lb. weight, and is particularly uneconomical for a heavily loaded fighter. The Yak-3, however, is certainly not an all-wood machine. The wing was made in one piece, with light-alloy spars, and covered with a plywood skin, whilst the fuselage is made of welded steel tube covered with plywood and, finally, with doped fabric.

It must be remembered that when the Yak-3 was laid down the Russians were short of light alloys, hence the composite metal and wood construction, and the extensive use of steel tube. Also a welded fuselage is extremely simple to build and, for small aircraft like the Yak, provides a very economical structure. Stressed-skin construction undoubtedly would be lighter still, but it demands a higher standard of manufacture and maintenance. The Yak-3, therefore, represented an admirable compromise. The armament consisted of one 20-mm. gun with 200 rounds and two 12.7-mm. guns with 150 rounds each. Alternatively, it could be fitted with one 37-mm. and one 12.7-mm. gun. Consideration was given also to the fitting of two 25-mm. guns.

Dimensions, weight and performance were as follows:—Span, 30 ft. 2 ins.; length, 27 ft. 9 ins.; wing area, 172 sq. ft.; normal weight, 5,850 lb.; max. speed at 13,100 ft., 365 m.p.h.; climb to 16,400 ft., 4 mins.; service ceiling, 35,000 ft., and range (max.), 465 miles.

It proved to be a handy fighter, although the wing loading at 34 lb. per sq. ft. is reasonably high. It was simple to build and maintain and gave quite a fair performance for low-altitude work,



THREE'S A CROWD. — The Petlyakov Pe-2 two-motor long-range fighter and fighter bomber seats three, but in rather cramped positions. In addition to fixed forward-firing guns in the nose, there are guns for rear defence, aft of the pilot's cockpit and beneath the fuselage.

and this was its main job.

The LAGG-3, which was an original although somewhat orthodox design, was an interesting aeroplane, in that its fuselage was built entirely of wood, as was the tailplane and fin. The wing was built in three all-wood sections with the normal pair of box spars and plywood covering originated by Fokker in 1917. This aeroplane was designed as a fighter-bomber and carried an armament of either one 20-mm. gun in the engine, or one 23-mm. gun in the engine plus two synchronized 12.7-mm. guns. It could also carry a maximum load of 300 kg. (661 lb.) of bombs, taking various types from 10 kg. (22 lb.) to 100 kg. (221 lb.).

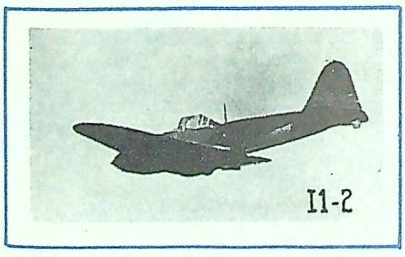
Dimensions, weight and performance of the LAGG-3 were as follows:—Span, 32 ft. 1 in.; length, 29 ft. 2 ins.; wing area, 188.5 sq. ft.; all-up weight, 7,050 lb.; max. speed at 16,400 ft., 365 m.p.h.; climb to 16,400 ft., 7 mins.; service ceiling, 29,500 ft., and max. range, 500 miles. The engine was the same Hispano type as fitted in the Yak-3 and the differences in all-up weight and rate of climb are of interest in view of the all-wood construction of the LAGG-3.

The LAGG-3 is also interesting in that it was developed into the La-5 in which the Focke-Wulf influence can be seen most distinctly. Like its predecessor, the La-5 was of all-wood construction, but fitted with the M-82 radial engine which was an orthodox 14-cylinder engine developed directly from the Wright Cyclone. Armament was two synchronized 20-mm. guns. The all-up weight was 7,450 lb., giving a wing loading of about 40 lb. per sq. ft.; the climb to 16,400 ft. was only five minutes, and the top speed was about 380 m.p.h. Like most Russian fighters, it could carry bombs. This aeroplane appeared first in 1943 with the same fuselage as the LAGG-3, but was later modified to give a better rearward view. The La-5 was developed, later in the War, into the La-7 and La-9, which were generally similar, but of all-metal construction.

The MIG-3 was another orthodox "Hurricane-type" fighter of composite construction and was used in small numbers; it was developed from the MIG-1, which it closely resembles. Perhaps the most interesting of the MIG series was the twin-engined MIG-5, an original design and the first twin-engined single-seat fighter made in Russia. It was of composite construction and had the useful service ceiling of about 40,000 ft. although the top speed was only 310 m.p.h. at sea level. Engines were developed from the popular Hispano and the fighter carried a heavy armament of two 20-mm. guns, two 7.62-mm. guns and one 12.7-mm. gun. An interesting feature was the fitting of one fixed 12.7-mm. gun arranged to fire behind and below.

Ground-attack aircraft were produced by the Soviets in a quantity second only to fighters. The standard type was the Il-2. The original version of this aeroplane came into service as a single-seater in 1941 but was converted to a two-seater in 1942. Construction was, as usual, composite, but the main fuselage and centre section were built of metal as an armoured shell. Outer wings were plywood and the engine was the usual 12-cylinder V type. Radiators were protected by armour and the guns were two 20-mm. and two 7.62-mm. fixed types, with one manually operated 12.7-mm. gun for the rear gunner; maximum bomb load was 400 kg. (882 lb.).

Normal weight of the Il-2 was 12,250 lb.; its span was 47 ft. 9 ins. and the wing loading was approximately 30 lb. per sq. ft. Maximum speed was about 250 m.p.h. at 7,000 ft. This aircraft is more reminiscent of our Fairey Battle than of the German Stuka, but, like both these types, was obviously an easy prey to the fighter. No wonder there were casualties in the ground-attack regiments, when one considers that this type was up against the German fighters. The Il-2 type was later developed into the Il-10 which was generally similar, but had a more powerful engine and carried a dorsal cupola with one 20-mm. gun.



The mainstay of the Soviet Bomber Force during the War was the Pe-2, a type in which one can see distinct influence from Dornier. This, and its very similar development, the Pe-3, were all-metal aeroplanes with the normal type of 12-cylinder liquid-cooled engine. Armament of the Pe-2 consisted of two fixed forward guns of 12.7-mm. and 7.62-mm. calibre, together with a hand-operated 12.7-mm. dorsal gun, one 7.62-mm. central gun and one 7.62-mm. lateral gun.

Weights, dimensions and performance of the Pe-2 were:—Span, 56 ft. 5 ins.; length, 41 ft. 6 ins.; wing area, 436 sq. ft.; normal weight, 16,700 lb.; max. speed at 16,400 ft., 330 m.p.h.; climb to 16,400 ft., 10 mins.; service ceiling, 29,000 ft.; and max. range, 930 miles. Neither of the two Pe types seems very inspiring and, in view of their weak armament, it is remarkable what a long life they had. One must remember that they were usually protected by a strong fighter escort.

Another type of bomber which was used in quantity, especially by the Long Range Force, was the DB-3, later called Il-4. This was a very ordinary medium bomber, but it did have a dorsal turret carrying one 12.7-mm. gun, together with a 7.62-mm. gun in the central position, and another fixed in the nose. It was of all-metal construction, was powered by two 14-cylinder radial engines and carried a crew of three, and a bomb load of 3,000 kg. (6,615 lb.), with 10 carriers in the fuselage and three underneath. Performance was nothing out of the ordinary, with a maximum speed of 280 m.p.h. at 22,300 ft. and a climb of 11 minutes to 16,400 ft. Normal weight was 22,000 lb.

The Tu-2 was an original design produced in 1944 and the only really new design of the War. It was of all-metal construction with two Ash (M-82) engines, a crew of three or four and a bomb load of up to 2,300 kg. (5,070 lb.). Dimensions and performance were as follows:—Span, 61 ft. 10 ins.; length, 43 ft. 3 ins.; wing area, 530 sq. ft.; normal weight, 23,200 lb.; max. speed at 19,000 ft., 348 m.p.h.; climb to 18,000 ft., 9.5 mins.; and max. range, 1,550 miles. These are good figures for a medium bomber.

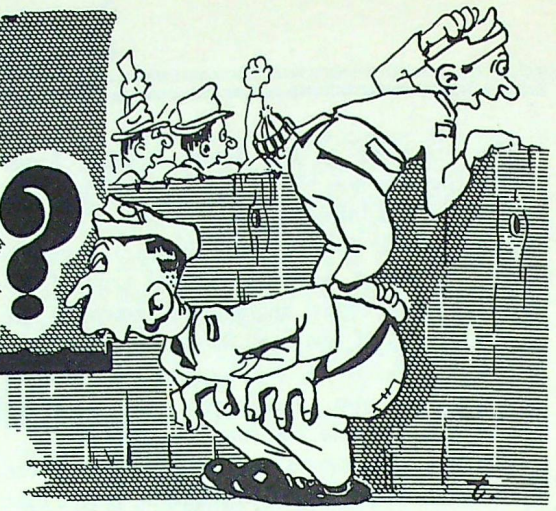
I have explained already that the Russians had no use for a strategic air force and consequently most of their types were designed for close support work. However, at least one four-engined "heavy" was built and this was the Pe-8, formerly known as the TB-7. This is a perfectly orthodox four-engined machine of all-metal construction, and fitted with either liquid-cooled Diesel engines or air-cooled radials. The most remarkable feature of this heavy bomber was the provision of dorsal and tail turrets each carrying a 20-mm. gun. In addition there was a nose turret with two 12.7-mm. guns and two 12.7-mm. rearward-firing guns in each engine nacelle—another original feature of the armament.

Main bomb load was 4,500 kg. (9,920 lb.) and the aeroplane could take bombs up to 2,000 kg. (4,410 lb.). Dimensions and performances were:—Span, 129 ft. 6 ins.; length, 76 ft. 5 ins.; wing area, 2,070 sq. ft.; normal weight, 66,000 lb.; max. speed at 19,700 ft., 240 m.p.h.; climb to 20,000 ft., 20 mins.; and max. range, 2,500 miles. The Pe-8 seems to have been a satisfactory machine of sound design, although, of course, out of date to-day.

A study of the types of aircraft described leads to the conclusion that Soviet design was orthodox rather than daring or original, but all designs were laid out with a careful eye to the material and labour available. Standardization and mass production took precedence over performance, and the policy paid. No jet aircraft appeared during the War and no aircraft was used operationally which had a spectacular performance. We must not conclude from this that no such designs were laid down, for we know that towards the end of the War the Russians were able to concentrate on research.

(To be continued)

What's the SCORE?



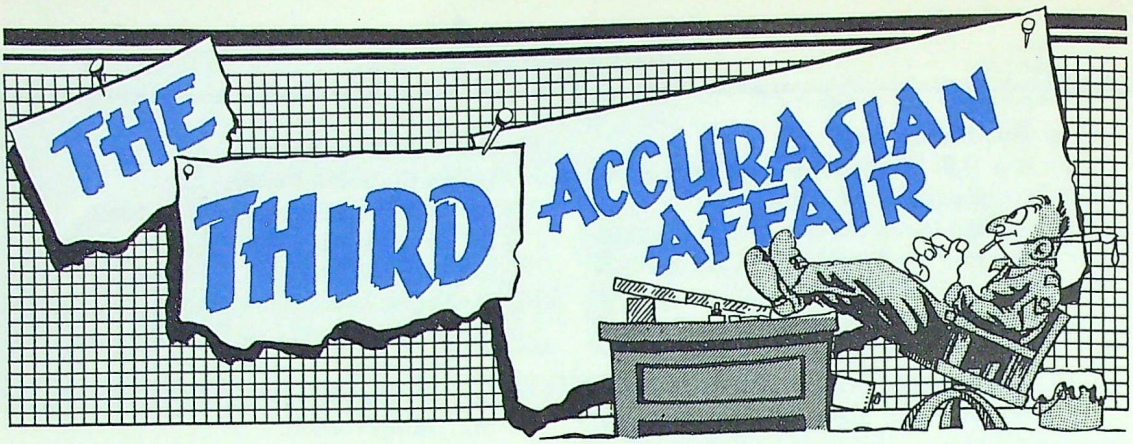
Score one point for every correct answer. Answers are given on page 48.

A score of 16 or over is above average.

A score of anything between 12 and 15 is average.

1. Some unpublished papers of Boswell were recently discovered. Boswell was:
   (*a*) The geographer upon whose advice Drake undertook his voyages.
   (*b*) The biographer of Dr. Johnson.
   (*c*) The leader of the Southerners in the American Civil War.
   (*d*) The first Hudson's Bay explorer in the West.
2. "Smog" has been unpleasantly in the news lately. Smog is:
   (*a*) A method of punishment used by the Japanese upon their prisoners of war.
   (*b*) A lethal mixture of smoke and fog.
   (*c*) The term used by the striking U.S. dock-workers to restrain crews from boarding ships.
   (*d*) A term used by smugglers of opium and other similar drugs.
3. In November, John Foster Dulles was in the news. He was:
   (*a*) U.S. co-delegate with Marshall to the U.N. General Assembly.
   (*b*) Special U.S. envoy to the Vatican.
   (*c*) Co-administrator of E.R.P.
   (*d*) Selected by Truman as his Secretary of State.
4. The "Chaillot Follies" is a name given to:
   (*a*) The French theatrical group presently touring the U.S.A.
   (*b*) A new book by Sinclair Lewis.
   (*c*) The United Nations Assembly at Paris.
   (*d*) A celebrated painting by Matisse.
5. An irrigation programme is projected on the Nile. Where does the Nile rise?
   (*a*) Lake Rudolf.
   (*b*) Lake Zambesi.
   (*c*) Lake Victoria.
   (*d*) Lake Salisbury.
6. Thorium is:
   (*a*) The dependency of Malaya in revolt against the Communists.
   (*b*) A potential source of atomic bomb material.
   (*c*) An adhesive mixture used in the construction of light aircraft.
   (*d*) The agent used in the manufacture of magnesium.
7. In their recent election campaign Truman and Dewy re-iterated that the minimum wage rate allowed by law is too low. What is the minimum wage?
   (*a*) 35 cents an hour.
   (*b*) 50 cents an hour.
   (*c*) 30 cents an hour.
   (*d*) 40 cents an hour.
8. Paotow is:
   (*a*) The winner of the recent English classic race, the Cambridgeshire.
   (*b*) The governor of the Independent State of Colombo.
   (*c*) The important railway centre that recently fell to the Chinese Red Army.
   (*d*) One of the recently convicted Japanese war criminals.

9. The Taft-Hartley Act:
   (*a*) Is a U.S. law outlawing the principle of the closed shop in industry.
   (*b*) Is a new law in the U.S. detailing the successor to the Presidency in the event of the death of the Vice-President.
   (*c*) Debars negroes in the Southern States of the U.S. from holding public office.
   (*d*) Permits public inquiry into misappropriation of public funds by U.S. politicians.
10. "Stage 49" is:
   (*a*) A newly released motion picture, starring Ray Milland.
   (*b*) One of the historic sites of the western colonization drive in the U.S. in the 80's.
   (*c*) A CBC series of plays.
   (*d*) The last and most vital stage in the construction of the atomic bomb.
11. Dr. Hewlett Johnson is:
   (*a*) The co-discoverer of the new drug thiamin.
   (*b*) The physician who recently attended to Princess Elizabeth.
   (*c*) The new president of the University of Manitoba.
   (*d*) Popularly referred to as the "Red Dean of Canterbury."
12. Puerto Ricans are:
   (*a*) Citizens of the U.S.A. but cannot vote for President.
   (*b*) Citizens of the U.S.A. in all respects.
   (*c*) Merely dependents of the U.S.—*i.e.* with no rights of U.S. citizenship.
   (*d*) Self-governing in all respects.
13. The Negeb is:
   (*a*) The successor to the rule of Transjordan.
   (*b*) An area of recent fighting in Palestine.
   (*c*) A river in India sacred to the Moslems.
   (*d*) An area of intense discontent between the U.S. and Russia in Korea.
14. T. S. Elliot is:
   (*a*) The proposed successor to Marshall as U.S. Secretary of State.
   (*b*) A U.S. playwright recently awarded the Nobel Prize.
   (*c*) The new Parliamentary Assistant to the Minister of Mines and Resources.
   (*d*) One of the permanent Canadian members of the U.N. delegation.
15. The situation of Bahrein Island is:
   (*a*) In the South Pacific.
   (*b*) On the Oslo-Murmansk sea route.
   (*c*) In the Persian Gulf.
   (*d*) South of Korea.
16. The British Labour Government has presented bills to nationalise all but one of the following:
   (*a*) Iron and steel.
   (*b*) Transportation.
   (*c*) Coal mines.
   (*d*) Banking.
17. Dr. Solandt is:
   (*a*) The head of the Defence Research Board.
   (*b*) The discoverer of a new drug—analythene.
   (*c*) The inventor of a new high-flying safety device for pilots.
   (*d*) The most recent recipient of the Nobel Prize for his services to medicine.
18. A general reduction in world armaments was recently advocated by:
   (*a*) Mr. Bevin.
   (*b*) The President of the U.S.A.
   (*c*) Mr. Vishinsky.
   (*d*) Mr. Bideault.
19. Graham Greene is the name of:
   (*a*) A modern English novelist.
   (*b*) A celebrated Scottish divine who spoke at the Lambeth Conference.
   (*c*) The winner of the last Dominion Curling Championship.
   (*d*) The Deputy-Director of the Bank of Canada.
20. Col. Winters is:
   (*a*) The Chief of Canadian Army Intelligence.
   (*b*) The newly appointed Canadian Services representative of the U.S. Atomic Commission.
   (*c*) The new Canadian Minister of Reconstruction and Supply.
   (*d*) The author of a recent book on Eisenhower.



(Reprinted by courtesy of "The Aeroplane")

by Group Captain E. S. D. Drury, A.F.C.

It is, regrettably, a long time since we had any reliable information about what goes on in Accurasia and Bulldozia. The trouble is that a security curtain of great opacity has been drawn around these two States and it is only recently that our intrepid agents have been able to penetrate it. At last, however, we have obtained verbatim translations of the minutes of two important conferences which have recently taken place. Both States have been considering, in their own ways, what their air armament and weapons policies for the next few years should be, and how the development of new horrors might affect their plans.

From these minutes it is obvious that the Accurasian Staff is compact, efficient, integrated, and decidedly three-pronged. The Bulldozian Staff, on the other hand, is disinterested, disunited, and disgruntled. It seems to be incapable of making those clear, concise, and logical decisions to which all R.A.F. officers who have attended conferences, particularly at the Air Ministry, have become so well accustomed. The disorganization of the Bulldozian Staff is not surprising, since Baron Bombasti is still S.A.S.O. and Count Ost Weltwistle is now serving under him as "Head of the Bulldozian Air Training Section" (short title: B.A.T.S.). Here are the translations:—

EXCEEDINGLY TOPMOST SECRETEST

*(Not to be communicated to any person except within the P.U.B.S.)**

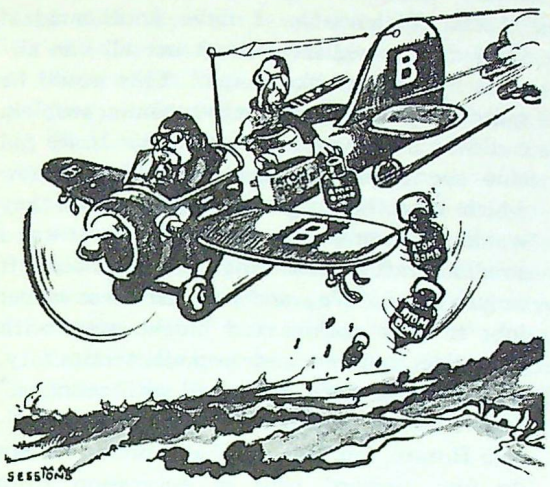
MINUTES OF MEETING HELD AT BULLDOZIAN AIR HEADQUARTERS TO CONSIDER REARMAMENT AND WEAPONS POLICY

S.A.S.O.—Baron Bombasti: I shall start the ball rolling by putting you all in the picture, after which I shall almost certainly return to the charge, and bowl a very fast one because what I am about to say is in the nature of a cock-shy. The situation is of more than ordinary fraughtness, and therefore, with our backs to the wall, we must march boldly forward, exploring every avenue vis-à-vis every other avenue, and leaving no stone unturned. In this way every possible contingency will be considered vis-à-vis every possible step that can be taken. Having thus made the position crystal clear, I will end on that note and ask Count Ost Weltwistle to give his views.

Count Ost Weltwistle—B.A.T.S.: Remain of an icy calm my Baron and not to worry, because I have some ideas which are novel and original. To start with, I propose that we arm all our aircraft immediately with atom bombs, thus removing the necessity for all this complicated, unnecessary, and expensive sighting apparatus. As everybody knows, the atom bomb is of such a potency

**Translator's note*: P.U.B.S. is the short title for the "Presidential Union of Bulldozian Services", *i.e.*, the Armed Forces of Bulldozia.

that a mere two or three dropped absolutely at random would bring the Accurasians, dispersed as they are in their mountains, bogs, deserts, caves, and jungles, to their knees in a matter of hours. With atom bombs, accuracy of delivery no longer counts—not that it ever did. I have discussed



. . . accuracy of delivery no longer counts . . .

this with two of our best pilots, who have done almost 200 hours and flown no less than three different types of aircraft. They agree that my suggestion would be easy. Thus, the feasibility of the idea is established beyond all possible doubt. We know that—but for the obstructionist outlook of the scientist and technician—this proposal could be put into effect within a month.

S.A.S.O.: Who but a Count could have thought of such a brilliant idea? The President himself shall hear of it. You will probably receive, as you so richly deserve, The Most Wishful Order of the Embedded Ostrich Head. By a most extraordinary coincidence the same scheme had occurred to me, so I asked our scientific adviser about it. As usual, he made nothing but difficulties and pointed out a number of trifling problems that might present themselves. Four that he mentioned were that we do not know how to make atom bombs; that we have no uranium—which I understand is used; that these bombs are very expensive and we are not very solvent; and that our aircraft could not carry them. These difficulties, of course, can all be quite easily overcome, but in my own mind I am not yet *entirely* convinced that the project is immediately practicable. What do the technicians think—if anything?

Staff Engineer Officer—Colonel Plumbatore: Some very excessive major snags would crop up, my Baron, whereby the equipment could not be serviced, a dangerous risk would be incurred, and the idea would thus be an uneconomical waste. For instance, the nuts used might not fit the bolts, the spanners might not fit the nuts, and the tool-kits might not contain the spanners. There would be no spares, and if there were, the equippers would not be able to obtain them. These are the snags by means of which the proposal does not have a very great future. I know that if poor Micawberwicz were still alive he would agree with me.

Staff Signals Officer—Major Empiro Antennae; I do not agree with Colonel Plumbatore —I seldom do, even though he is senior to me. The main difficulties would be of quite a different nature. They would not be easily comprehensible to anybody but a signals officer—so they are not worth discussing.

Staff Armament Officer—Third Lieutenant Ricochet: In spite of my juniority I must say that I do not actually agree with anybody. The real difficulty is the great shortage of manpower. This would prevent the proper painting and annual inspection of the bombs—if we had them. Thus, we could not comply with State Statutes, Presidential Regulations, Air Orders, or Explosive Rules. This drawback renders the project not very agreeable. Clearly, the Engineer and Signals Officers are not fully conversant with the "gen."

S.A.S.O.: You technicians give me a pain of the most severe character in the neck. You are indeed nothing but obstructionists. It is understandable that you never agree with me, a G.D. officer, but it seems that you cannot speak with an integrated or even intelligible voice for yourselves. In future be so good as to remain silent—all of you—or I shall have you sent to the Staff College. Don't forget what happened to Micawberwicz when he wrote that letter published in *Air Clues*. Even his great skill as a technician didn't save him.

Staff Weapons Officer — Captain Picolo Sanitas: May I enquire if anybody has yet considered whether any of the enemy targets are suitable for atom bombs, remembering that Accurasia has no large towns, ports, or industrial areas? Would it be worth while, for instance, attacking a pill-box, a few prefabricated huts, a pontoon bridge, or a railway train, with atom bombs?

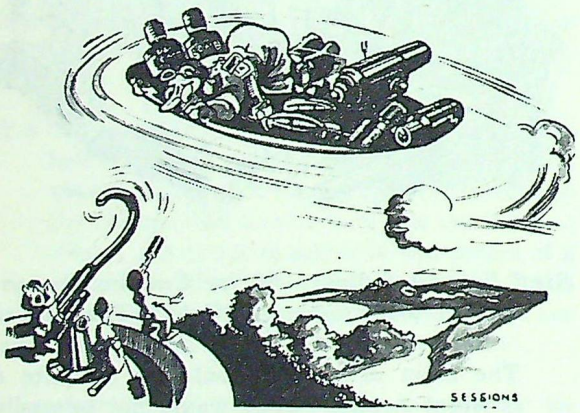
S.A.S.O.: Kindly refrain from making irrelevant and disrespectful remarks, or you will be by way of incurring my very severest displeasures—which are not very nice to incur.

Count Ost Weltwistle: I have another idea! Why not immediately construct all our aircraft in a saucer-like shape? This would be quite simple, and the aerodynamic problem could be overcome in a few days. If we did this the enemy gunners would not know which way the target was going, and they would not even be able to tell whether it was a small aircraft at close range or a large aircraft at long range. We could then use these saucer jobs to drop cookies and blockbusters with regardless random and impudent impunity, and they would also be armed with cannons.* I have discussed this fully with Lieut. Verticalo Rotato, our best aerobatic pilot—he can do four upward rolls in succession from ground level on one magneto—who says: "It is absolutely bang on! Anybody who says it is not is an obstructionist. They would probably go like the clappers!"

Staff Equipment Officer—Major Quadruplicate Vocabularus (who has been asleep up to this point): Did I hear the word "saucers"? There is a great shortage of them. I must make it clear that anybody breaking one by carelessness would be charged four times the vocab. price, plus 25 per cent departmental expenses and 150 per cent purchase tax, on form 69432C.

S.A.S.O. (not understanding the Equipment Officer): An excellent idea! That would be about two years' pay and might cause our pilots to exercise a little more extreme caution about extending the chassis before alighting.

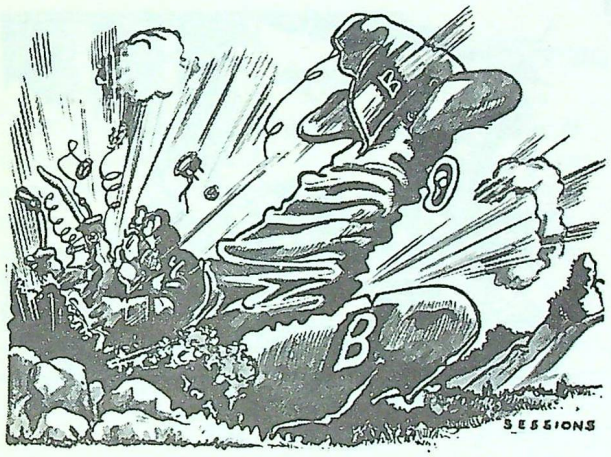
Count Ost Weltwistle: One thing further, my Baron. You will remember that sight called



. . . aircraft in a saucer-like shape . . .

**Translator's note:* The words: "cookies", "blockbusters," and "cannons" are untranslatable Bulldozian slang expressions for certain types of bomb and gun. They would not be understood in the best RAF circles.

the G.G.S. or something—ground gunnery sight, I presume—that we recently obtained from abroad? Well, as you know, I am against using sights at all, but Verticalo Rotato and I thought that just for fun we would give it a really comprehensive trial against a ground target. So we did no fewer than four attacks each—without firing, of course. As I suspected, the sight is quite useless; in fact, it is so badly made that the graticule keeps wobbling about in the most stupid way whenever you put G on the aircraft. The sight was not illuminated when Rotato used it, but he condemned it on the ground that in an accident resulting from failure to extend the chassis—a mishap which, as you know, all our pilots naturally have the misfortune to suffer about once a week—the visage would impinge itself on the sight, whereas normally it impacts itself on the instrument board. Rotato much prefers to have his face mangled by the instrument board.



. . . the visage would impinge itself on the sight . . .

S.A.S.O.: To sum up, then; we have now considered every conceivable possibility. All our armaments are out-of-date and it seems we cannot have atom bombs just yet. It would be a gross waste of effort to continue with obsolete weapons, and thus there is obviously no point in having any weapons at all or in doing any weapons training. Therefore, with effect from tomorrow, all armament equipment will be removed from our aircraft, explosives' stocks will be destroyed, and weapons training will cease. The Air Force will, however, hold itself at the highest pinnacle of efficiency, ready for instant and effective defensive or offensive action of every kind by day and by night. Anyone contravening this order—which is to be strictly obeyed—will be shot.

Scientific Adviser—Professor Erf Boffinski: From a purely scientific standpoint, my Baron, I find a not inconsiderable difficulty in comprehending how the Air Force can remain in any sense efficient without weapons or weapons training.

S.A.S.O.: I fear, Professor, that not being an aviator, such matters are just a little beyond you. The conference is terminated.

* * *

That was the Bulldozian Conference. That of Accurasia, which was in progress at the same time, took a rather different line; and here is the translation of those proceedings:—

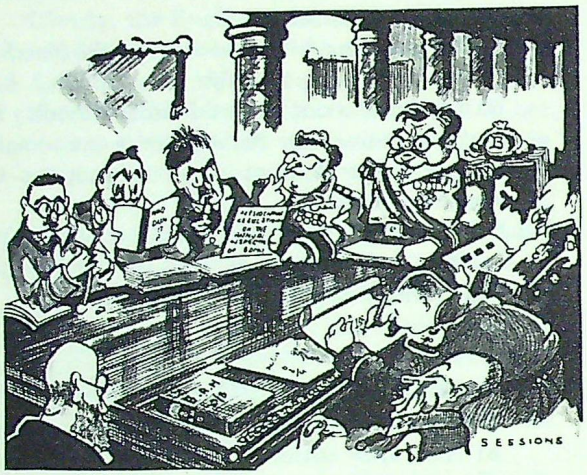
SECRETISH

MINUTES OF MEETING HELD AT ACCURASIAN AIR HEADQUARTERS TO CONSIDER REARMAMENT AND WEAPONS POLICY

S.A.S.O.—Colonel H. Sapiens: I have called you together to tell you that I have considered the appreciations on "Weapons Policy" which have been submitted by Branches. I am glad to see that before deciding your courses of action you have taken into account all relevant factors such as the results of weapons and armament trials, our experiences in recent wars, and the intelligence which we have been able to acquire from other countries. Furthermore, it is encouraging to see that you have related your examinations primarily to the targets which we may anticipate having to attack in Bulldozia. The benefits you have derived from your Staff College and Weapons Courses are apparent in

the clarity and brevity of your reports. The obvious unity of technical policy and thought is most heartening. The following points are now clear to me:—

We cannot expect the new weapons that are under development to materialize for some time to come. This fact is, however, no excuse for neglecting training with our present weapons and the systems for aiming them.

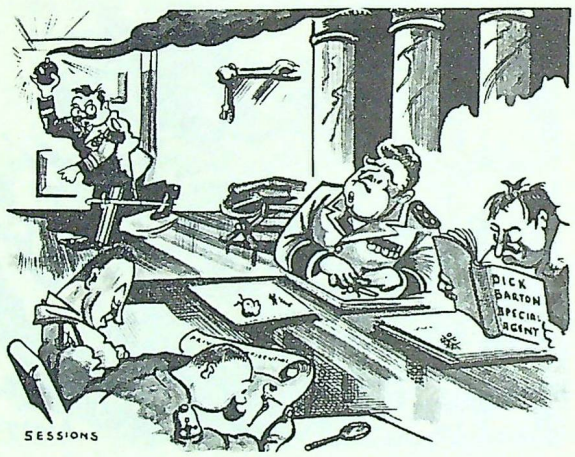


The whole of the technical, scientific, and user sides are working on our problems as one team with a relationship of the most harmonious nature. Their aim is to perfect the use of our present air armaments while developing new ones and, above all, to improve accuracy through training and the fullest use of scientific devices. These measures are to continue with the utmost intensity.

We must retain flexibility in our systems of applying and aiming weapons. No matter what our future projectiles may be, it will always be necessary that they hit their target. When they do come along we must have the techniques, equipment, and training for accurate delivery prepared, tried, and ready for use. The new weapons will be expensive and difficult to make. For this reason, aiming and accuracy will be *more* important, not *less* so. The idea that just because a weapon is very powerful it is justifiable for it to strike at random is nonsense.

The weapons officer organization is now running smoothly, and in conjunction with the Intelligence and other Branches it is making a detailed survey of the vulnerability of all Bulldozian targets and target systems in order that we shall be prepared, immediately the need arises, to hit the enemy where it will hurt him most. The essential technical and administrative organizations to back our striking force are being developed on parallel lines; there is no weak link in the chain.

As we must remain a small Air Force for some time to come, owing to our lack of funds, our only hope lies in efficiency, and efficiency means accuracy. There are some who are inclined to tell me that shortages of manpower prevent everything that is desirable being done. It is indeed true that we are short of men; that is all the more reason why we must go full out for efficiency.



. . . and bowl a very fast one . . .

I will now ask our Financial Adviser to forecast what might be the Treasury reaction to our policy, which will cost some money.

Financial Adviser—Mr. Lucretius Spondulick: Indeed, yes! Our Treasury will not be convinced of the need for these policies. And I

predict this with some confidence because, in 20 years' experience, I have never known our Treasury to be convinced in such matters. Often it is only by the continual exercise of a determination so inflexible as to be almost inhuman that they manage to prevent themselves being convinced. However, have no fear. When I receive your estimate I shall immediately double it. Our Treasury, with great perspicacity, realize that I shall do this. Thus they are enabled to reduce it by half with a clear conscience, believing that they have thereby performed a useful function known as "cutting down."

S.A.S.O.: I suppose they cannot behave otherwise; we have many responsibilities and first things must be put first. In conclusion, let me remind you that I shall hold progress meetings regularly and that I shall welcome constructive suggestions from anybody at any time. Now, does all the Staff clearly understand our aims and the part that each must play?

The Staff (as one man)*:* Yes! our Colonel. Long live ACCURASIA!

S.A.S.O.: Amen. Here is my order of the day:

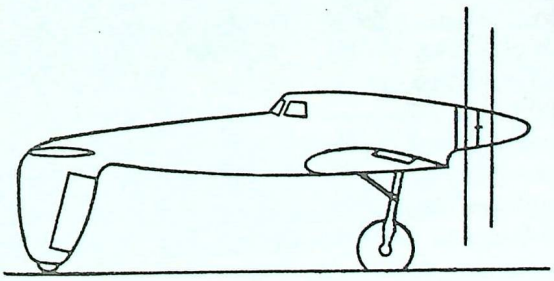
"ALL
CHAPS
CO-OPERATE,
UNIFIED BY
RESOLUTION,
ASSISTED BY
SCIENCE,
IMPREGNATED WITH
ACCURACY".

Moral: The right weapon in the wrong place isn't much good. The wrong weapon in the right place isn't much better. The wrong weapon in the wrong place—at the wrong time—is just pure Bulldozian.

INTERESTING 1942 DESIGN

THE QUESTION of providing a fighter capable of high-altitude operation and of carrying heavy armament, was engaging the attention of several firms, among which was Armstrong Whitworth. After carefully examining the problem, this firm produced a layout for a tail-first fighter which was intended to be powered initially with a high-altitude Merlin engine until such time as a Whittle engine was in production. The A.W. fighter was designed to have an all-up weight of 6,670 lb. and to operate at heights up to 40,000 ft. For this purpose the wing loading was kept to the reasonably low figure of 28 lb. per sq. ft. while the aspect ratio of 6.8 was higher than that of either the Hurricane or Spitfire. Although the firm was satisfied that the layout was feasible, a considerable amount of research and development work would have been required and the machine was never built.

(Courtesy of "The Aeroplane")



Northern SKYTRAILS

PART THREE

The Story of the Work of the RCAF in Canada's Arctic and Sub-arctic

by Flt. Lt. E. P. Wood, D.F.C.

(*In our last issue Flt. Lt. Wood gave a general picture of the type of operations carried out by the RCAF in the sub-arctic in the years between 1921 and 1926 inclusive. He now goes on to tell the personal stories of a few of the men of the RCAF who flew in those regions after the period he has referred to as "the early years" and before the outbreak of World War II.* —Editor.)

THE RCAF IN THE SUB-ARCTIC 1927 TO 1939

Air Commodore A. D. Ross, G.C., C.B.E

Air Commodore Ross's career in the RCAF began in February 1929, when he finished his *ab initio* Pilot's Course, received his wings, and was posted to RCAF Station, Jericho Beach, Vancouver, for a seaplane course. The course lasted for seven weeks. It included instruction and practice on an Avro 504N single-float seaplane, a DH Moth seaplane, and a Vickers Vedette flying boat.

"This course," observes the Air Commodore, "was of little use to one destined for northern flying operations. On its conclusion, I was transferred to Winnipeg Air Station, where I found myself detailed as OC Transport Flight. The Flight, which consisted of four Vickers Viking flying boats and one Fairchild FC2 seaplane (each aircraft manned by a pilot and a crewman) did not really operate as such at all. All aircraft worked independently on operations, detailed by the CO of Winnipeg Air Station, and my sole duty as Flight Commander was to prepare a report at the end of each year. Early in May I was sent to Lac du Bonnet Sub-station to take over my aircraft and crewman, and to receive instruction on the Viking."

At Lac du Bonnet he found to his delight that his crewman was to be LAC "Plugs" Cooper. Cooper had been a Sergeant in the RFC and the RAF, and a Flight Sergeant in the RCAF. He had just rejoined the Service after two years with Western Canada Airways. Cooper was one of about the only six people in Canada who really knew how to get the best out of the Rolls-Royce Eagle IX engines which constituted the inadequate power plant of the Viking.

Ross's first operational task was (in company with other very junior officers) to build a corduroy road through the muskeg from the air station to the highway. At odd intervals he managed to acquire about three hours' dual and two hours' solo on the Viking.

Experience in those days was gathered quickly —and in the hard way. Early in June, Ross was instructed to pick up a Topographical Survey party and, as soon as ice conditions permitted, take them to Pukatawagan on the Churchill

River, whence they were to carry out an extensive survey of Indian Reserves. Throughout the summer he worked with them, moving them from place to place and keeping them supplied.

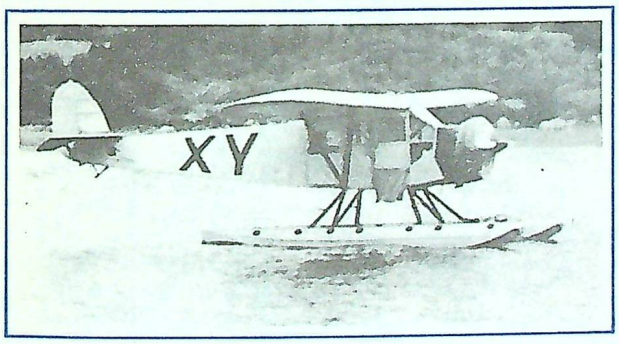
Ministration to the party's needs, however, was only a part of his duty during the next six months. He had, in addition, to fulfil a variety of other functions—which are perhaps best described in the Air Commodore's own words . . .

"Following the trip to Pukatawagan, I returned to Cormorant Lake, where I was based until the end of November.

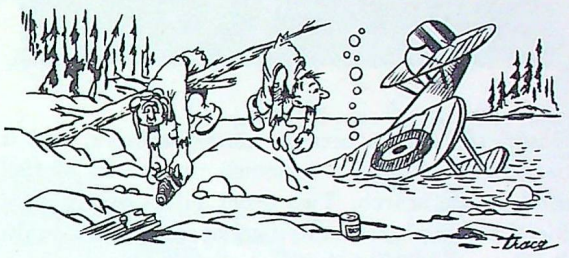
"During this period I carried out a considerable number of forestry patrols. It was a bad fire year, and from time to time it was necessary to use every available aircraft. I also made quite a few flights transporting Government officials all over Northern Manitoba and Saskatchewan, and carrying equipment for photographic flights that were working in the Reindeer Lake, Granville Lake, Foster Lake, and Cree Lake areas.

"It was in July that I first tried my hand as a photographic pilot. The attempt came to a quick and untimely end. I had been detailed as temporary replacement for an injured pilot of a photographic flight operating in the area between Oxford and Split Lakes. The flight was using Vedette flying boats, in which was installed a doubtful batch of Lynx engines.

"On my return trip to base (at Thicket Portage on the Hudson Bay Rly.) at the end of my first day's flying, I encountered a line squall and lost two grasshopper springs from the engine almost at the same moment. I quickly decided on a forced landing in the nearest bit of water, which happened to be a rather narrow stretch of the Nelson River. Owing to turbulent air and lack of power—and maybe skill—I found myself in the position of having to crash on the windward and rocky shore or else into the water. I chose the latter, close to the shore.



Fairchild



"Neither my crewman nor myself was seriously injured, but our emergency equipment and cameras were all submerged and we were unable to salvage them. To add to our discomfort, heavy rain commenced as soon as we got ashore, and it continued for almost seventy-two hours.

"Towards the end of this period a party of Indians appeared on the scene, gave us bush tea, and offered to take us out to the railway via canoe. They told us one portage we would have to traverse, only a mile in length—but they neglected to mention another one which was twelve miles long and led through heavy wet muskeg. As we ploughed through the latter, the ferocity of the mosquitos was matched only by the ferocity of our language and our feelings towards Indians in general. However, after we'd done about six miles of it, the weather broke and we saw aircraft looking for us. In due course we arrived back at base, somewhat sadder and wiser; and after a rest I returned to Cormorant Lake.

"During the summer and fall of this year I made six so-called 'mercy flights', on one occasion beating the stork to The Pas by twenty minutes.

"Some time in September we received word at Cormorant that Col. McAlpine, President of Dominion Explorers Ltd., was missing with his party on a flight between Baker Lake and Great Bear Lake, via Bathurst Inlet and Coronation Gulf. All available RCAF and civil aircraft began a search for the missing men. As the winter drew

Varuna

closer, the search became more intensive, and it became necessary to replenish the stocks of fuel used in the search. Two other pilots and I were therefore employed in flying gas and oil to Lac du Brochet and Fond du Lac, the bases for search operations. While returning from the last of these trips, almost at the end of October, I ran into a heavy snow storm and was forced to land on Sisipuk Lake, on the Churchill River. The storm held us there for two days, at the end of which time we had to break ice out to open water in order to take off.

"I might remark, in passing, that the latter series of flights marked the first occasion on which 'Prestone' was tested as an aero-engine coolant in Canada. It proved quite satisfactory. In fact, without it the operations could not have been carried out, as continuous sub-freezing temperatures prevailed at that time of year.

"I remained at Cormorant Lake until the end of November, when I was detailed for employment with the Civil Aviation Branch as an airways engineer in charge of construction on the air route then being developed between Winnipeg and Regina."

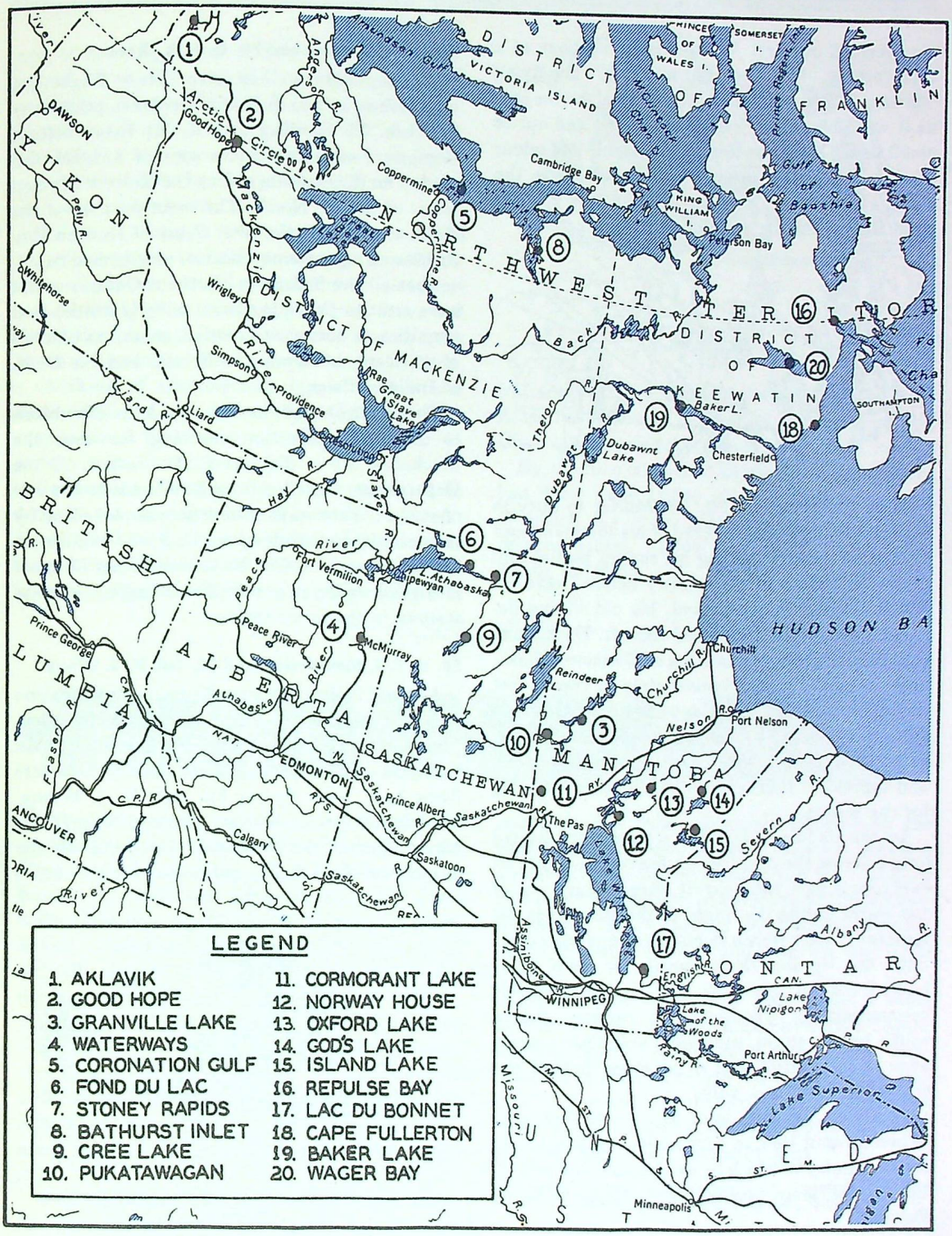
The beginning of April 1930 found Ross again posted to the job of OC Transport Flight for the year. But once more circumstances decreed that he was to spend a great deal of his time on forestry operations, among which was an inspection trip over a large part of Northern Manitoba and Saskatchewan with the Hon. John Bracken, then Provincial Premier. He also took the Topographical Survey party back into the Reindeer Lake area to finish the work they had started the year before.

Towards the end of June, Flt. Lt. A. L. Morfee, OC Cormorant Lake, fell sick, and Ross assumed command of the base.

July was an extremely busy month. Ross did 112 hours' flying and was able to spend only three nights and one day at Cormorant Lake coping with the administrative end of his duties. During this month he moved the supplies and equipment of a photo flight from Cormorant Lake to Stoney Rapids and later to Lake Athabaska, and thereafter kept the flight supplied, making several exploration trips to assist its operations. In between all these activities he somehow managed to sandwich a Treaty Flight, which he describes as follows:

"At Norway House I picked up an Indian Agent, his clerk, an R.C.M.P. Sergeant, and several thousand brand new one-dollar bills. We paid treaty and held court at Island Lake, God's Lake, Oxford House, and Split Lake. It was a most interesting experience, lasting a week. The benefits of civilization and Christianity upon the Indian were, I must confess, not too well evidenced by the number of criminal cases that were heard and the pagan rites that were practiced sometimes only an hour after a missionary had held church service. I had the doubtful honour of being offered by an Indian his daughter in exchange for a ride in my aeroplane or a gallon of gas (value $6.00). While on this trip, I was given the name 'Pemitou-haugen-okinow' (Cree spelling doubtful), meaning 'Chief of the flying gasoline canoe'.

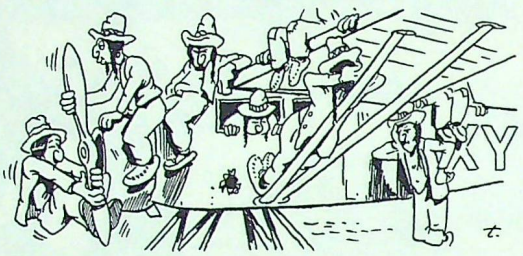
"Following this operation, and during August, I spent most of my time on forestry work, including two search-rescue flights. About this time



LEGEND

1. AKLAVIK
2. GOOD HOPE
3. GRANVILLE LAKE
4. WATERWAYS
5. CORONATION GULF
6. FOND DU LAC
7. STONEY RAPIDS
8. BATHURST INLET
9. CREE LAKE
10. PUKATAWAGAN
11. CORMORANT LAKE
12. NORWAY HOUSE
13. OXFORD LAKE
14. GOD'S LAKE
15. ISLAND LAKE
16. REPULSE BAY
17. LAC DU BONNET
18. CAPE FULLERTON
19. BAKER LAKE
20. WAGER BAY

we received our first Vancouver flying boat as a replacement for the tail-wagging, low-flying Varuna. This new aircraft proved ideal for the job, as it was able to carry large loads into and out of small lakes. None the less, the spectacle and odour of sixteen smoke-begrimed Indians sitting in the cabin chewing and spitting tobacco was not too good for the morale or the temper."



With the return of Flt. Lt. Morfee to duty in September, Ross was relieved of his command and began the task of moving his survey parties and photo flights out of the country before freeze-up. While he was thus occupied, his old Viking decided one day that it had had enough. The bottom collapsed while he was landing at Cormorant Lake, and the aircraft sank immediately in twelve feet of water. Cpl. Cooper, who was still his crewman and staunch stand-by, suffered a broken nose; Ross, as he expressed it, "was merely pained, grieved, and suprised." This event virtually ended his flying for the season.

In the middle of October a three-day blizzard swept across the country. By Herculean efforts on everyone's part two aircraft were dragged out of the water during the height of the storm, but the remainder were frozen in and had to remain there until the ice was thick enough for them to be hauled out on top of it. There were, however, compensations. Thousands of caribou, driven south by the storm, suddenly made their appearance in the district, and all personnel hunted and feasted royally for a while.

In December, Ross went on leave to Winnipeg. When he went back to duty again, it was no longer in the country to which he had become so attached, but in the more prosaic surroundings of Camp Borden.

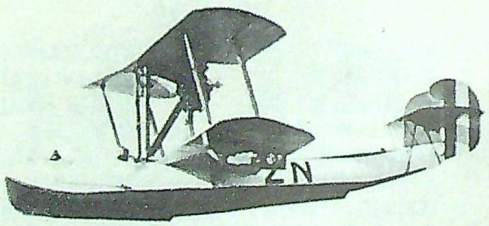
Flt. Lt. D. Harding and Flt. Lt. R. K. Rose.

In July 1930 an extensive Treaty Flight was undertaken in two Bellanca seaplanes piloted by Flt. Lts. D. Harding and R. K. Rose. Fifteen stops were scheduled and a sum of $25,000 was carried for distribution among the scattered Indian tribes of the far North. The main purpose of the flight was to visit the West Coast of Hudson Bay to draw up agreements with two unattached tribes, so that all the Indians in Northern Ontario would have treaties providing them with gratuities and annuities. A doctor was carried, as well as officials of the Dept. of Lands and Forests and the Dept. of Indian Affairs.

The latter Department also used the expedition to make an inspection reaching far into the Mackenzie River district. C. C. Parker, of the Department, travelled from Edmonton to the end of steel at Waterways, where he was picked up by the aeroplanes and flown up to Fort Good Hope. With him went Lt. Col. E. Forde, Acting Director of Signals at Ottawa, in order to inspect wireless stations in the arctic region.

Flt. Lt. F. J. Mawdesley and Flt. Sgt. H. J. Winny

Another flight that stirred popular imagination was that headed by Flt. Lt. F. J. Mawdesley. Flying a Fairchild seaplane, he left Ottawa on July 6th, 1930. With him, as pilot of a Vedette flying boat, went Acting Flt. Sgt. H. J. Winny. The two aircraft were bound on a trip through the barren lands of the Northwest Territories for the purpose of inspecting gasoline and supply caches

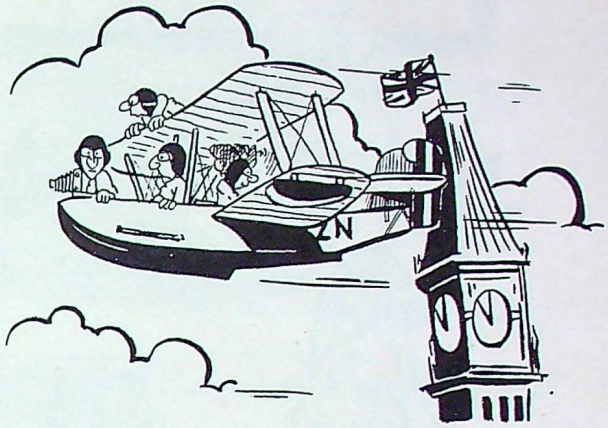


Vedette

and of opening up air routes in practically unknown areas. Corporal S. C. Dearaway, RCAF, was taken in the Vedette to carry out the important photographic work, while Mr. Colin S. McDonald, well-known surveyor and engineer, accompanied Flt. Lt. Mawdesley. Other airmen were carried for special duties.

This was primarily a survey flight intended to precede extensive air operations in the Far North. Strip maps were secured of little-known air routes around the Mackenzie Basin, the Great Slave and Great Bear Lakes, and in the wide stretch from Hudson Bay to the Mackenzie River. In addition, a check-up of gasoline and repair caches was made, some of which had been established in remote places by steamers and dog teams and—in certain cases—aeroplanes.

On leaving Ottawa, the flight proceeded to Aklavik via the Mackenzie River, then to Great Bear Lake and Coronation Gulf and on to Great Slave Lake. Following the Thelon River to Baker Lake and Chesterfield Inlet, it proceeded north



to Cape Fullerton, Wager Inlet, and Repulse Bay. After the return to Chesterfield, it flew south to Churchill, arriving there on Sept. 21st.

By the time it reached Ottawa, the detachment had flown some 12,000 miles, a good proportion of which lay over unknown territory and unmapped routes. 31,000 photographs were taken during the flight.

(To be continued)

PARTICLES

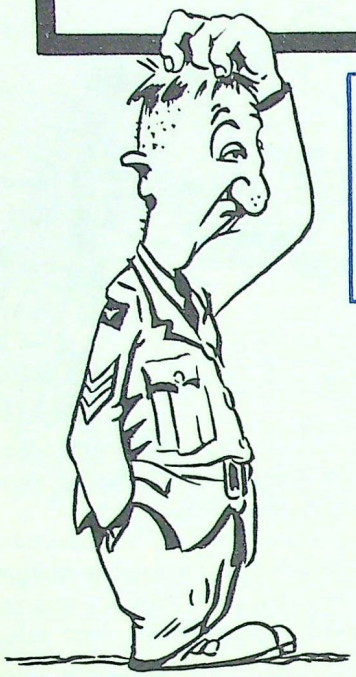
TIME WAS when the electron and proton sufficed to describe the structure of our material world. Then came the positron. Then, a decade ago, it became impossible to ignore the neutron. For a while these four particles held the stage to themselves. The neutrino was suggested but, being virtually impossible to detect, it has remained a figment, a dream particle. But lately the cosmic-ray physicists have bumped into the meson, and the flood gates are down. We have positive mesons and negative mesons, mesons of several different masses, all transitory, living long enough only to leave a track in a cloud chamber. Most lately we have the "heavy component" of cosmic rays.

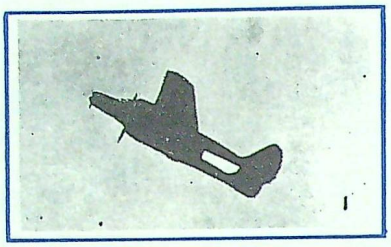
Understandably, the discoverers of these latter-day particles have tended to label them "fundamental." But other physicists, clinging to the hope that nature has a simple core, say it is only a matter of time before mesons will be found to consist of aggregations of electrons and positrons. We hope so too. Things are tough enough without multiple-valued mesons cluttering up the landscape.

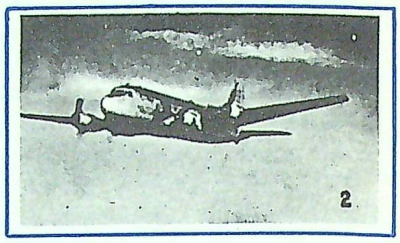
Whatever the future may hold, there is some comfort in the fact that, since electronics began, only two types of particle have amounted to anything in practical electron tubes, electrons and ions. If we add the absence of an electron, the "hole" of the transistor, we have the lot, so far as practical electronic engineering goes.

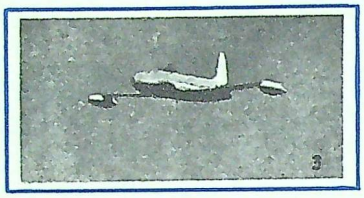
(Reprinted from "Electronics" by courtesy of the McGraw-Hill Publishing Co., Inc.)

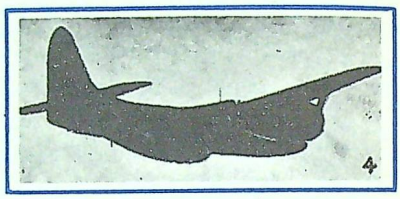
DO YOU KNOW THEM ?

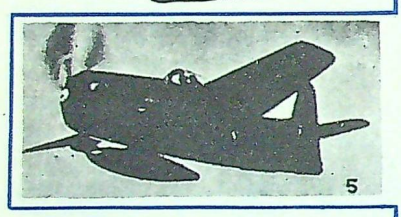


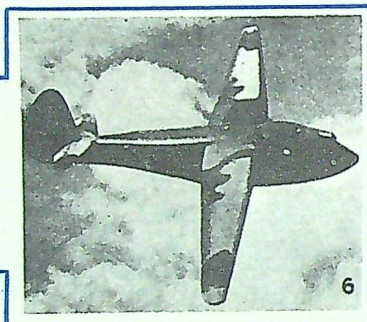


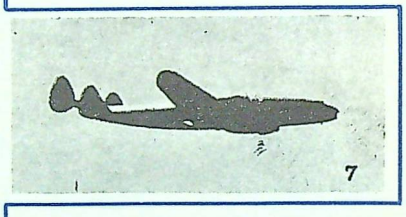


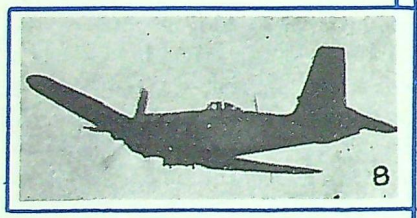


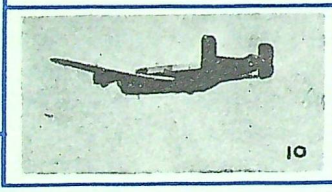


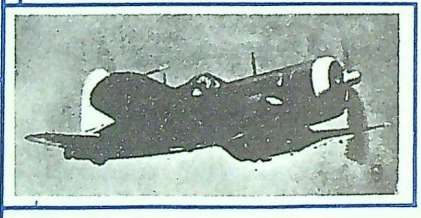


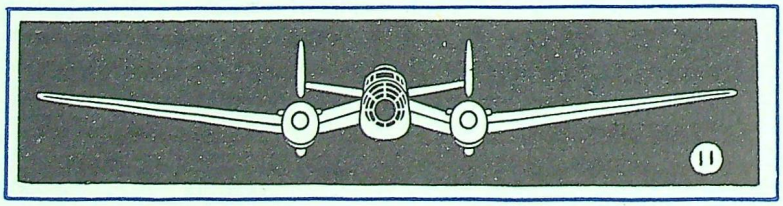






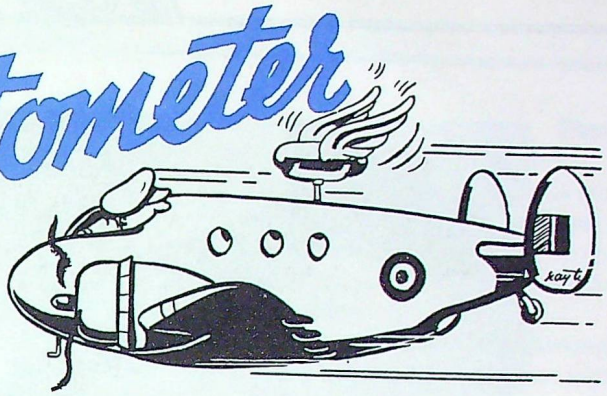






Answers are given on page 48

The AIRBORNE Magnetometer



By J. M. BRIDGEMAN

Mgr., Technical and Electronics Division, Photographic Survey Co., Ltd.

(Reprinted by courtesy of "Canadian Aviation")

At the time of his discharge from the RCAF on May 1st, 1947, Mr. J. M. Bridgeman was serving as a Squadron Leader in the Directorate of Electronic Research and Development.

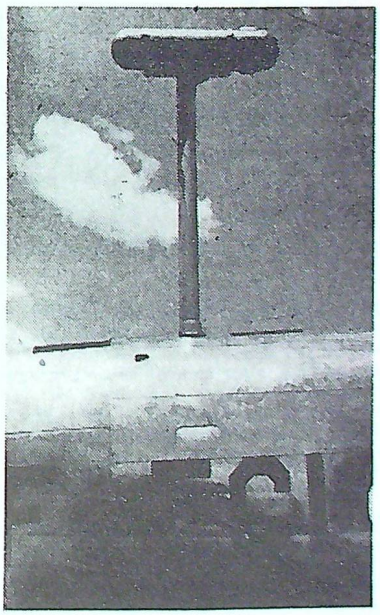
WITH THE INTENSIVE postwar development of the airborne magnetometer, a device perfected during the war to detect submerged submarines from an airplane, aviation in Canada enters a new field of usefulness to the Canadian mining industry.

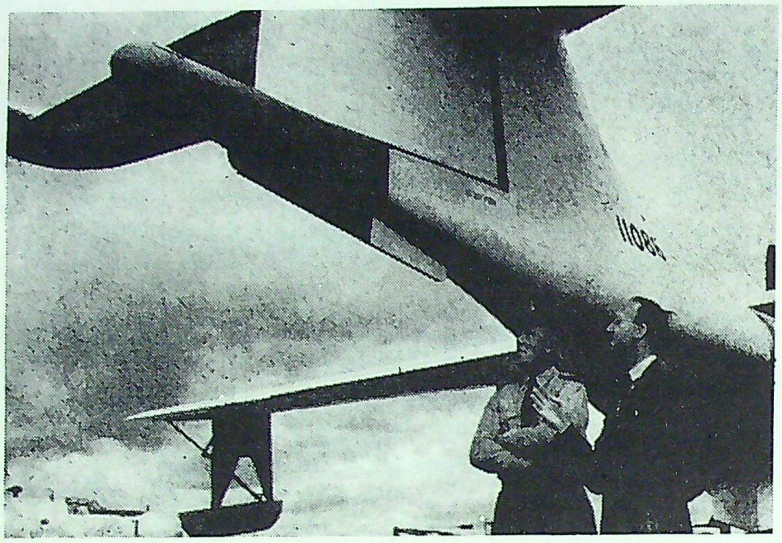
The Principle of the Magnetometer—The earth is a giant magnet with its poles at the North and South. It is this great magnet to which the magnetometer responds. The earth's entire surface has a magnetic field, which in general is most intense at the poles and the weakest at the equator. But the field varies measurably from spot to spot because of variances in composition and structure. Charting these differences gives vital clues to the nature of geologic strata, and scientists can draw conclusions about their oil and ore content.

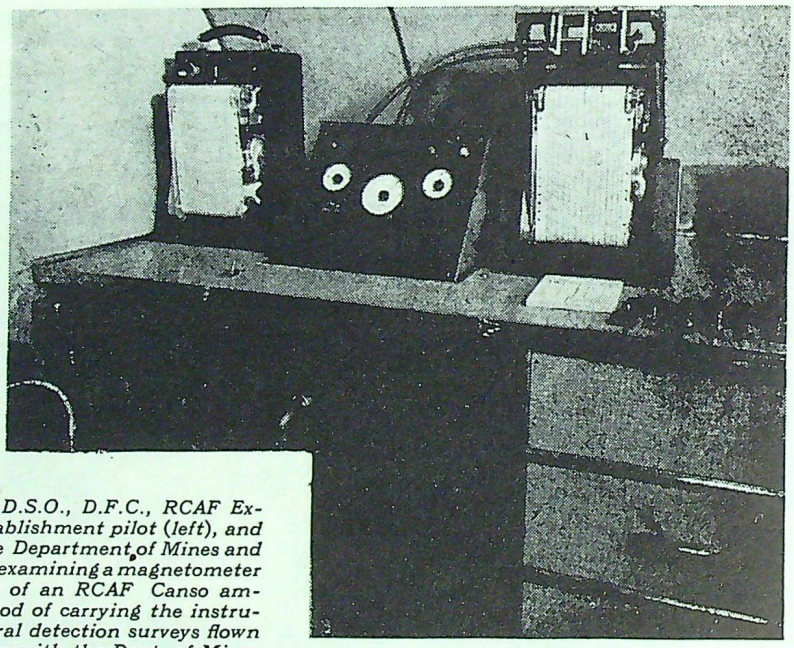
History — Obtaining geological information through the measurement of magnetic variations is not actually new. It has been done on the ground with varying success for many years through the use of a magnetometer consisting basically of a magnetic dip needle. However, the use of the ground instrument is relatively slow and expensive.

The idea of putting a magnetometer in an aircraft was first tried in Russia in 1915. There was also some development for naval purposes in England about the same time. However, development was largely dropped between the wars. In 1943, however, the German U-boats, which up till then could be located by radar when they surfaced, became equipped with a device for air intake

Close-up of the magnetometer "bird" on its fixed mounting over the fuselage of a Lockheed Hudson.







TOP: *S/L J. C. McCarthy, D.S.O., D.F.C., RCAF Experimental and Proving Establishment pilot (left), and George Shaw, scientist of the Department of Mines and Resources (right), are shown examining a magnetometer "bird" attached to the tail of an RCAF Canso amphibian aircraft. This method of carrying the instrument is being used in mineral detection surveys flown by the RCAF in co-operation with the Dept. of Mines and Resources.*

ABOVE: *This is the recording and control apparatus as it appears mounted in the soundproof control room of the RCAF's Canso aircraft. At left is the altimeter recorder (variations in altitude affect the magnetic reading), centre is the control panel, and right is the magnetic profile recorder.*

which enabled them to remain permanently submerged at sea. An alternative method for locating them had to be developed and the Magnetic Air Detector (M.A.D.) was brought into use by the U. S. Naval Ordnance Laboratory. This was, in effect, an airborne magnetometer.

The air problem was, however, a much more difficult one than on the ground, since clearly the aircraft gave off a large and varying magnetic field of its own, and it is extremely difficult to maintain any instrument in an aircraft in a fixed position relative to the earth. Gyros have not the necessary precision on the whole.

The U. S. Navy solved the problem and established the pattern for most subsequently developed airborne magnetometers by placing the instrument in a bomb-shaped shell and trailing it by cable about 100 feet beneath and behind the aircraft to avoid response to the plane's own magnetic impulses. Stabilization was accomplished by means of ingenious electronic mechanism. This "flying eye" or "bird" was then towed along a predetermined path at altitudes of 500 to 1,000 ft. at speeds of 150 mph or more. In certain aircraft of low magnetic "noise," the instrument was mounted in the tail, well away from sources of magnetic interference, as in the RCAF Canso used by the Geological Survey of Canada.

Photographic Survey Company, however, is at present carrying out tests with an installation which locates the bird on a fixed mounting above the fuselage of the aircraft. This type of installation shows promise of being completely satisfactory for mineral exploration but conclusive results have not yet been established. If proven satisfactory, this installation will eliminate the flying hazard created by the trailing bird and cable or, alternatively, the high cost of special non-magnetic aircraft, and will result in greatly reduced exploration costs.

How the "Bird" Works—In the nose of the bird is a detector element called a Fluxgate, no larger than a cigarette, which is kept parallel to the earth's magnetic field by a delicate electronic servo mechanism. As the magnetic field varies in intensity the changes are induced in an alternating current imposed across the detector. These changes are detected, amplified and recorded.

The record data is later transferred to maps and then sent off to the client, whose specialists take over. Magnetic maps are subject to different interpretations and two geologists examining the same chart may not agree.

In any case, the limitations of the magnetometer are such that its purpose is to delineate areas with geological possibilities which deserve detailed investigation on the ground, rather than to function as a divining rod which tells the operator "dig here for iron" or "drill here for oil."

In other words, the magnetometer will not replace the usual surface prospecting methods, but it will guide the ground prospector to areas where there is less chance of his wasting time.

Four Stages in Survey

A normal airborne magnetometer survey goes through four main stages, i.e., planning, flying, reduction of data, and interpretation. The planning stage involves a study of existing geological information to determine the direction of flights and the spacing of flight lines. It also involves securing high-altitude vertical air photographs for use in flying and the plotting of the data.

The flying stage consists first of the establishment of base lines and then of flying straight parallel flight lines at right angles to these base lines. The reduction of data is a laborious job which occupies perhaps 10 men in the office for every one flying. The geophysical interpretation calls for much practical experience which only time can provide.

To appreciate the plotting method, brief reference must be made to the ancillary instruments in the aircraft. These consist of the following:

(a) *Continuous Strip Recorder*—This records the magnetic profile along the line flown.

(b) *Radio Altimeter*—This is to give the exact height of the aircraft above the ground.

(c) *Data Recording Camera*—This records ranges from radar beacons (when employed), aircraft altitude, barometric height, temperature, etc.

(d) *Location Camera*—This is a 35 mm. camera which records continuously the area immediately below the aircraft so that the magnetic profile can later be plotted with the aid of the photographs on to a base map.

A special camera is under construction in the technical laboratories of Photographic Survey Co., which, in association with special plotting apparatus which has been built by the same laboratory, will greatly simplify the problem of correlating aircraft position and the magnetic record.

This camera utilizes a film strip which is exposed while moving on a roll at a speed commensurate with the aircraft's ground speed, thus eliminating the blurring of detail which would result normally from the speed of the aircraft at low altitude. It takes vertical pictures of the terrain directly beneath the aircraft at intervals adjustable to as low as two seconds, and a recording device marks the magnetic profile record tape at the moment each exposure is made. Each photo exposure is numbered, and may be related exactly to a reading on the tape.

By comparing the 35 mm pictures with a photomosaic map of the area, interpreters may determine the exact position at which each magnetometer reading was recorded. An interim camera now in use for this purpose has been constructed from a modified aerial survey camera.

Naturally, over water the location camera is useless and the position at which readings are taken must be determined while in flight by a system of radar location. Loran, a war-developed form of long-range radar location, has been used over both land and water by American companies engaged in magnetic survey work. Photographic Survey Company have a special radar installation under development which will not only provide position fixation but will also automatically select straight parallel flight lines and indicate deviations to the pilot on a "left-right" meter.

Extent of Surveys to Date—In all, almost half a million square miles of the earth's surface—more than twice the area of France—probably have been scoured by the airborne magnetometer in the global search for oil and ore since 1944. The U. S. Geological Survey alone has surveyed about 200,000 square miles in the U. S. and its possessions since April of that year. And the U. S. Government is running routine surveys now at a rate of 75,000 miles a year.

In Canada, most commercial magnetic air surveys to date have been carried out by American companies who have been allowed to operate in this country because Canadian firms have not been in a position to take on the work.

The Geological Survey of Canada propose to survey the whole of the Dominion in time, issuing the magnetic data with their geological sheets. At present they are using the M.A.D. instrument, which has been adopted for their use by the National Research Council.

As an over-all picture today, lead, zinc, copper, iron ore and oil are being consumed faster than they are being located. The geologists claim that they exist in abundance but those that are comparatively easy to locate have been largely found and exploration today must look increasingly to the use of scientific methods, many airborne, to provide the solution.

HIGH FLIGHT

Oh, I have slipped the surly bonds of Earth
And danced the skies on laughter-silvered wings;
Sunward I've climbed, and joined the tumbling mirth
Of sun-split clouds—and done a hundred things
You have not dreamed of—wheeled and soared and swung
High in the sunlit silence; hov'ring there,
I've chased the shouting wind along, and flung
My eager craft through footless halls of air.
Up, the long, delirious, burning blue
I've topped the wind-swept heights with easy grace
Where never lark, or even eagle flew—
And, while with silent lifting mind I've trod
The high untrespassed sanctity of space,
Put out my hand and touched the face of God.

John Gillespie Magee, Jr.
September 3, 1941.

P/O Magee, R.C.A.F., was killed on active service on Dec. 11th, 1941, aged 19

*Calling all CANDIDATES

"... a high percentage of examination failures results from not reading the question. The candidate presumably applies his eyes to the paper, but his answer shows that he is incapable of discovering by that process what the question is. This means that he is not only slovenly-minded but, in all except the most superficial sense, illiterate."

DOROTHY L. SAYERS: Preface to *The Mind of the Maker*.

by Air Commodore T. N. McEVOY, C.B.E.

(Reprinted by courtesy of "Air Clues")

I HAVE DETECTED an impression, particularly amongst officers who have had to drop one or two ranks since the war, that the promotion examination has been introduced to make sure they shall never rise again. That most of the recommended books are unobtainable lends colour to this suspicion. This is not really so, and my aim is to throw some crumbs of comfort and encouragement to the candidate whose palsied fingers will soon be reaching for his pen.

Your practical ability and your qualities of leadership are not assessed on promotion examination results and never will be. What the examination is for is to make sure that you can read, think, and write, and that you have the width and depth of professional knowledge that you ought to have if you are fit in other ways to hold the higher rank. If you think this is unfair don't just bind about it to your chums but write and tell us a better way.

Now (things being as they are) for some helpful hints. Remember that each paper is set and marked by a human being who has been through it himself and is keen to pass you if he can. It's up to you to help him do this. Here are some ways.

Plan your answers. Deduct 20 minutes (for revision) from the time allowed for the paper and divide what remains by the number of questions that have to be answered. This will give you your E.T.A. for the end of each

question, and some spare time for reading through your answers and crossing out the nonsense.

Do what you are told. Answer all the obligatory questions and the right number of alternative questions.

Make sure that you understand the questions.

Answer the question. Obvious? Let's go back and see what Dorothy Sayers said about it. You'll agree that she has something there. The examiner has taken a lot of care in the selection and wording of each question and he will be distressed and perhaps, at the end of a long evening of marking, rather cross if he finds that in your answer you have dealt exhaustively with something else. Before you start to write, therefore, the vital action is to read through the question again to make sure that you are answering what it asks. Check again when you have finished: "Have I answered the question?"

Keep your answers short. Windy irrelevance antagonizes examiners. "Quality, not quantity" is their cry.

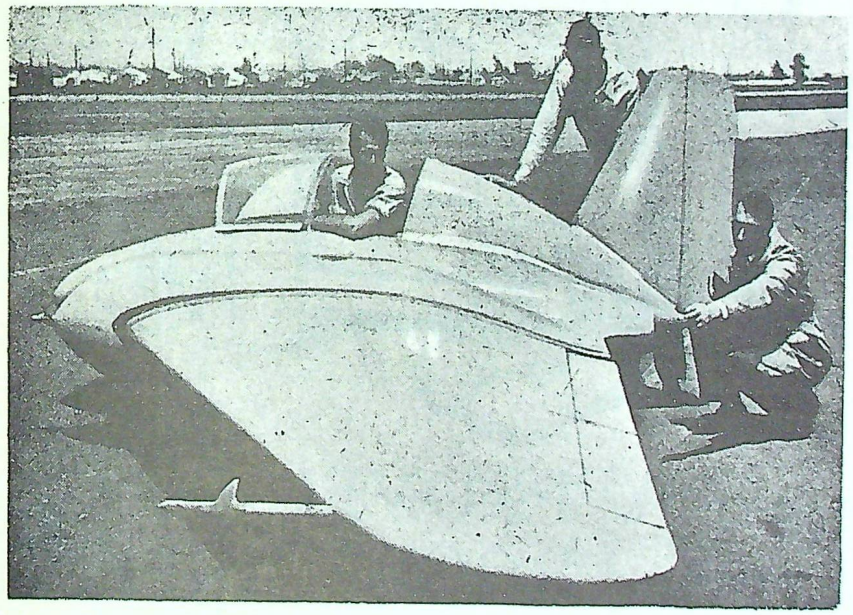
Tabulate where you can, rather than ramble.

Write legibly. Remember how brassed *you* get when you have to decipher bad writing.

All this goes for the Staff College qualifying examination, too.

Don't be too discouraged if your knowledge is a bit short of detail. A reasoned answer, showing that you can apply your common sense, will get you more marks than a smoke-screen. The examiners know that you will have had difficulty in getting hold of the books and will make allowances.

Finally, good luck to all candidates; may you be full of confidence and cunning.

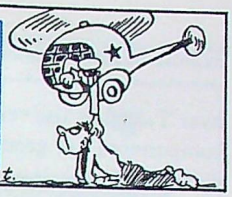


FOR FLYING-BOMB RESEARCH.—A piloted glider version of the Northrop B-35 Flying Bomb, this little tailless glider (less than 30 ft. in span) was built for experiments on aerodynamic and control features. During the flying tests, the glider proved capable of aerobatics, and even slow rolls could be performed with it. The Northrop Flying Bomb is equipped with two propulsive ducts of the V-1 (Schmidt - Argus) induction-engine type.

When **ICING CONDITIONS** prevail . . .

. . . employ only APPROVED PROCEDURES!

AIR PICK-UP



Although the RCAF at present employs air pick-up only in connection with gliders at Rivers, Man., many of our readers may be interested in obtaining some idea of the principles on which the science of air pick-up is based.

The following notes on the subject have been condensed from All American Aviation Inc.'s booklet, "Air Pick-Up Handbook," by kind permission of the publishers.—EDITOR.

NON-STOP AIR SERVICE

AIR PICK-UP provides direct service to inaccessible areas as well as airports, saving the time and cost of making frequent landings.

The applications of air pick-up have embraced the extremes

from the smallest to the largest

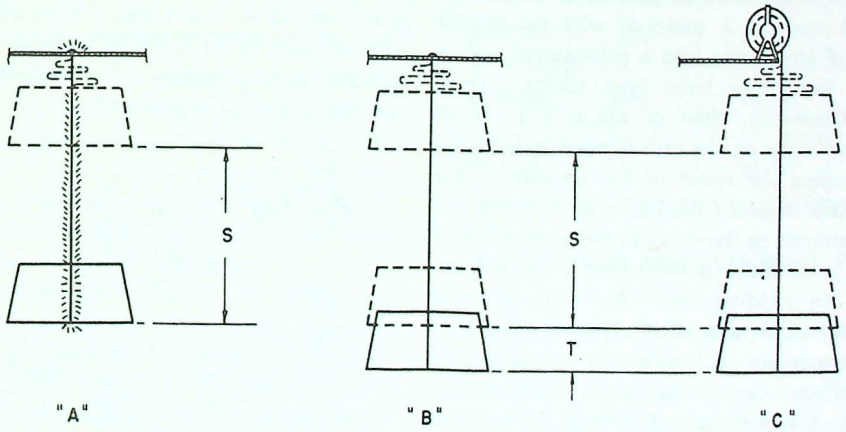
from the slowest to the fastest

PRINCIPLES OF OPERATION

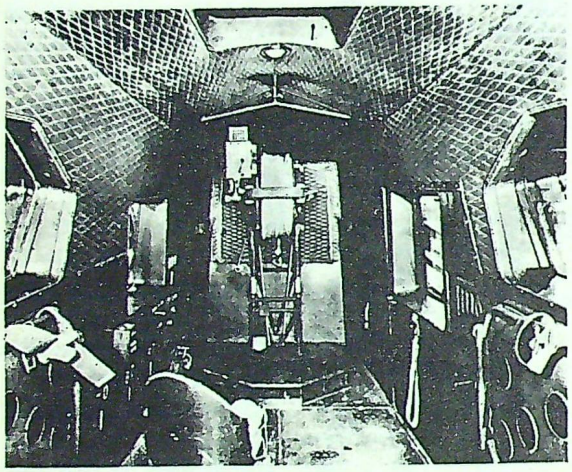
The air pick-up system has three major components: the airborne mechanism, the ground station, and the object to be picked up. A compact energy-absorbing reel with rope or cable and hook, a retractable arm with hook retainer which swings below the fuselage, and a delivery or tow release comprise the airborne equipment. The ground station is simply two sectional poles with small flags and rope clips at their tops. Little or no modification is necessary to the object to be picked up.

Two considerations are important in the operation of the air pick-up; (1) the elimination of possible damage to the objects being picked up; (2) the prevention of overloading a part of the aircraft or adversely influencing flying characteristics. The factors of acceleration and distance or time are the keys to the solution. When properly *controlled,* the problems are simple.

Several examples may serve to illustrate: A represents a heavy weight dropped a distance S, where the fall is arrested or stopped by a non-yielding cable. The forces acting on the weight, cable and the overhead support are uncontrolled and exceedingly high because the arrest or stop is effected instantly. At B, the same weight is dropped the same distance but in this case a cable with stretching properties is utilized so that the material gradually elongates, under loading, through distance T. Thus, the arrest is completed



over T, which also requires time. The forces on all components are greatly reduced. The longer the distance T, the less are the forces on the weight and support. Another method of accomplishing this is illustrated at C where the cable is supported by a reel with a brake. The brake may be adjusted so that the distance, T, may be controlled over a wide span and the weight may be varied over a considerable range. In their practical application for air pick-up, the above processes are reversed. The weight is at rest on the ground and the support is actually in the aircraft. The pick-up is completed when the weight is accelerated to the velocity of the airplane.



Model 4 Unit in Norseman.

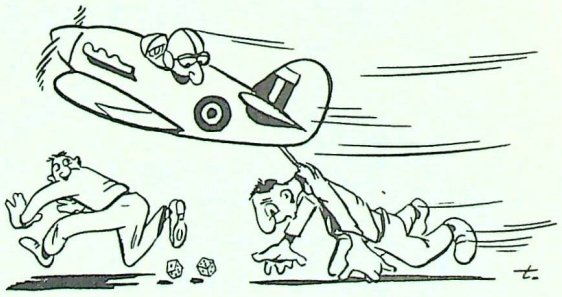
All American Aviation air pick-up employs both methods B and C; a material with favourable properties of elongation and a mechanical reel or unit. To the latter have been added certain definite refinements, chief of which is a means whereby the brake on the unit is not applied until the reel attains the speed of the aircraft. This feature further insures a minimum force exerted on cargo and aircraft as the delay in the application of the brake is carefully matched with the characteristics of the yielding rope. The brake delaying and application means is so designed that the action takes place automatically after proper setting. Thus, during the actual pick-up, no attention to the operation of the unit is required. Another refinement is the use of an electric motor to reel in the rope or cable, thus relieving the crew of the work required in bringing the cargo on board the aircraft.

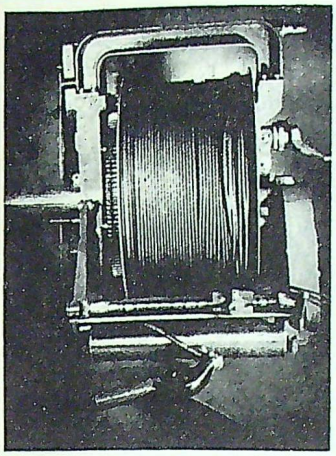
A significant fact in the understanding of the All American Aviation system is that all equipment is designed and manufactured so that pick-ups are made at the normal cruising speed of the airplane. Heretofore minimum speeds, slightly above stalling, were necessary to accomplish pick-ups. The fixed position of the hook until it engages the loop permits cruising speed pick-ups. Thus, not only is the operation entirely safe, but the delays resulting from reduced flying speeds are eliminated.

TYPES OF UNITS

All American Aviation Inc. manufactures various models of air pick-up units. All of them, however, stem from the basic Model 4, which has been in daily service on all air mail pick-up routes in the United States since 1940. Some of these units have already made more than 75,000 pick-ups.

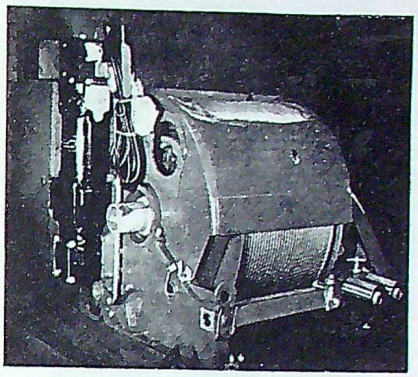
The construction of All American Aviation air pick-up units consists primarily of a reel, frame, brake assembly and electric motor. Rope or cable is wound on the reel. The latter is held in place by supports which are bolted to the unit mounting frame fastened to the airplane structure. The brake assembly has a time adjustment mechanism incorporated to determine the interval of brake delay and the final brake pressure. The winding and unwinding (excepting during pick-up) of the rope or cable on the reel is performed by an attached electric motor, which also provides the locking means for the brake assembly.



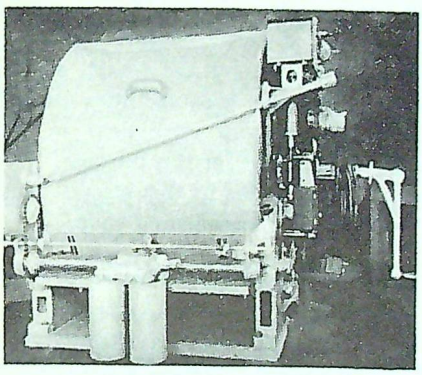


A Model 40 with drum guard removed. Emergency rewind crank in foreground.

A Model 80, complete, ready for shipment.



Cable payout side of a Model 160. Operator's side to the right.



In operation, only two controls are involved in the Model 4—brake resetting crank and electric motor switch. The former governs the brake delay action and the latter controls the reel rotation. This unit is designed to provide equal brake delay and braking force on each pick-up. Adjustments in flight are thus kept to a minimum.

Military requirements during the recent war called for pick-up units possessing greater capacity than the Model 4, and the Model 15 was developed. This has since been followed by six larger models designed primarily for glider and aircraft salvage.

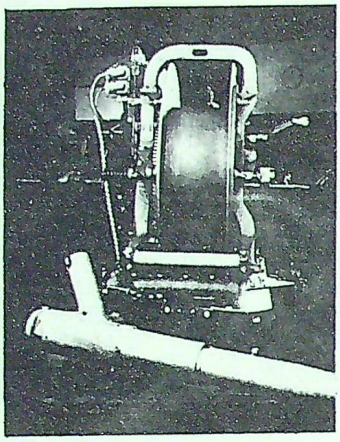
Particulars are given below of the capacities of various types of units.

Unit	Wt. of Unit (lbs.)	Pick-up Limits	
		Weight (lbs.)	Speed (mph)
Model 4	95	550	70
Model 15	144	1,500	120
Model 40	275	4,000	120
Model 80	620	8,000	120
Model 81	778	8,000	135
Model 120	1250	12,000	140
Model 160	1900	16,000	140
Model 200	3100	20,000	150

MAIL, CARGO AND PERSONNEL PICK-UP

Model 4 or 15 in Dakota

A portable installation, for either the Model 4 or Model 15, is supplied for use in the Douglas C-47. The standard paratroop door provides the hatch and all components; unit, pick-up arm and



Model 15 in pick-up position immediately inside cabin door. Forward portion of pick-up arm in lower foreground.

retractable pulley are mounted on a common bed secured to the floor by means of the standard cargo tie-downs. No alterations to the aircraft are required and two men may easily handle the "packaged installation" without resorting to the use of special tools. Virtually none of the cargo capacity of the C-47 is affected by the equipment.

Similar to the portable installation in the Noorduyn, the C-47 with Model 4 or Model 15 provides the maximum in operational flexibility. The equipment may be transferred from one C-47 to another at remote fields by the normal flight crews. With the Model 15 unit, personnel pick-ups may be made.

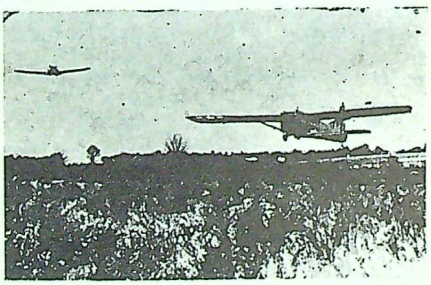
GLIDER PICK-UP

Model 80 in Dakota (as used by RCAF)

During the recent war, the Allied Forces received hundreds of C-47's or Dakotas equipped with the Model 80 glider pick-up system. This pick-up combination saw action in practically all active theatres. Not only have thousands of routine glider salvages been completed throughout the World, but a number of spectacular evacuations and rescues were accomplished in Burma, Europe, New Guinea, and Northern Canada. Gliders grossing as much as 9600 lbs. (4400 kg) as well as powered aircraft, have been frequently picked up.

The normal military operation of the Model 80—C-47 combination specifies approach or contact speeds of from 130 m.p.h. (210 km/h) for 4900 lbs. (2200 kg) gliders to 145 m.p.h. (235 km/h) for gliders grossing 9000 lbs. (4100 kg.) The speed of towplane and glider immediately following pick-up depends primarily on the rate of climb and the amount of engine power applied. Usually, it will be between 105 and 120 m.p.h. (170 and 195 km/h).

The total weight of all the pick-up equipment installed in the C-47 is approximately 925 lbs. (420 kg). About 26 cu. ft. (0.74 m^3) of the forward port side of the cabin is occupied by the unit, air ducting and fairing. In operations not involving pick-up, all of this equipment, plus the pick-up arm and external pulley, may be readily removed so that only 150 lbs. (68 kg) of the installation remain and the total cabin volume is available for cargo. Many of these aircraft were originally built with provision for the Model 80 unit and accessories. Average shop facilities are sufficient to mount the pick-up equipment in airplanes originally constructed for this purpose. However, the initial installations in this aircraft should be made only by very experienced shops.



A Douglas with Model 80 picks up a WACO.

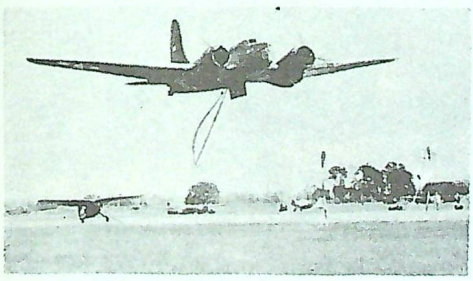
AIRCRAFT SALVAGE

Aircraft forced to land due to engine or propeller failure, or any other cause not involving extensive air frame damage, may be picked up without resorting to expensive dismantling and ground transportation. All necessary equipment for the salvage can be dropped from the rescuing aircraft, thus eliminating surface communication.

Whether the forced landing is due to failure of power plant, exhaustion of fuel, weather grounding or loss of way, the aircraft can be picked up out of a considerably smaller area than it could take off from on its own power. In most cases, the pilot who landed the aircraft would require no additional training to fly the aircraft out on pick-up. Simple instructions dropped from the pick-up airplane would be sufficient for the pilot to prepare all necessary ground equipment and to advise him of the few precautions to take when in towed flight.

Following pick-up, the two airplanes proceed to an airport where the towed aircraft releases and makes a normal dead-stick landing.

A simple attaching release has been developed that fits directly onto the propeller hub of many single-engine aircraft. In most cases, it is not necessary to remove the propeller. The release kit includes a tether to prevent propeller windmilling and a light cable to connect cockpit and release for pilot dis-connection.



U. S. Army Air Forces

Douglas B-23 (Dragon) with Model 40 picking up a Stinson Reliant.

Douglas C-47 (Dakota) making a pick-up from a five man rubber life raft.

PERSONNEL PICKUP

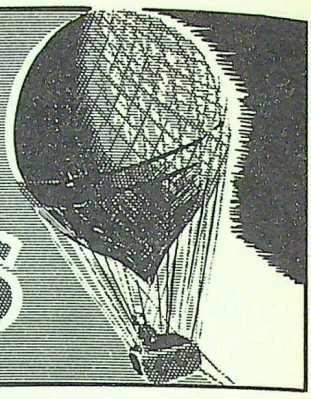
The urgent need for a method of rescuing personnel isolated in remote or inaccessible areas resulted in not only a successful modified version of the Model 15 but also in the development of "packaged installations." The latter feature made it possible for certain standard aircraft to be equipped for pick-up in a matter of minutes with the aid of two men and a few simple tools.

A number of different types of airplanes have been utilized for personnel pick-up; from Stinson Reliants to Douglas C-47s (Dakotas). Generally, any aircraft that can be adequately controlled at 130 m.p.h. (210 km/h) and proceed through a flight pattern requiring a sharp pull-up or climb will be satisfactory for this service.

Ground station equipment has been adapted so that it is not only simple but may be dropped from the air and readily prepared for pick-up without the aid of experienced or trained personnel. A modified parachute harness is the only additional equipment required.

For rescue at sea, accessories to the standard five-man rubber life raft are being developed so that personnel pick-ups from water might be accomplished. The station poles are telescopic and are extended by means of compressed air.

ICING'S First VICTIMS



SALOMON AUGUST ANDRÉE, one of the foremost balloonists in the last decade of the nineteenth century, conceived a plan to fly to the North Pole in a steerable balloon. This, he said, would be a much easier way to get there than foot-slogging with the surface explorer and his man-hauled sledge. Baron Nordenskiold—whose surface Arctic exploration was commemorated in the territory bearing his name—and rich chemical engineer Alfred Nobel backed the Swedish engineer.

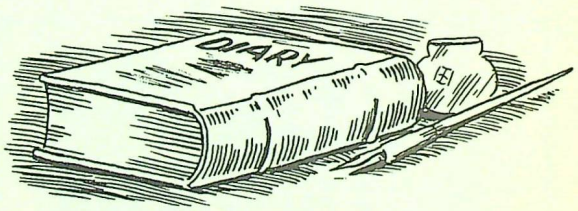
With two companions, experienced balloonist Nils Strindberg and sportsman Knut Fraenkel, Andrée started from Spitzbergen (Svalbard) on 11th July 1897 in the *Ornen* (Eagle). Unfortunately, during its ascent the guide ropes—which were to have acted as ground kedges to slow the balloon's pace to less than that of the wind and thus permit the three sails with a total area of 818 sq. ft. to deflect the course away from the wind drift—became detached and remained on the ground. The steerability of the balloon, whereon the whole project was founded, vanished at the start.

The balloon was borne away in perfect weather. By the beginning of this century three buoys from it had been found on the shores of Karl Island (near Spitzbergen), Norway, and Iceland. They contained optimistic messages, and recorded that four carrier pigeons had been released. The birds never reached their lofts. Nothing was known of the fate of the three balloonists who had flown into the Arctic wastes and disappeared.

In August 1930 a Norwegian expedition ship *en route* to Franz Josef Land stopped at White Island, sixty miles due east of the Spitzbergen group and on latitude 80 deg. north. On the southwest tip of the island a camp was found. The remains of Andrée and Fraenkel were found unburied. Strindberg, who had died first, had been buried by them. Diaries and instruments were excavated in fair to perfect state. The whole story was revealed.

The balloon had reached about 83 deg. north latitude at about 20 deg. to the east of its starting-point, following a period of erratic parallel drift. At 8.11 a.m. on 14th July 1897 it was finally brought down on the ice by weight of ice-formation on the envelope after flying in a fine drizzle—probably the first recorded instance of ice-formation during flight in the history of flying.

The three men struggled southwards from their landing-point and reached White Island on 5th October 1897. They continued their trek until 7th October. Ten days later the last entry was

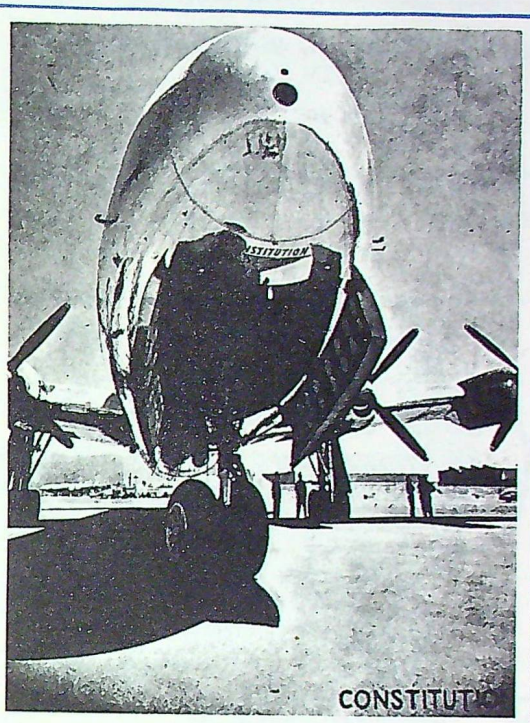


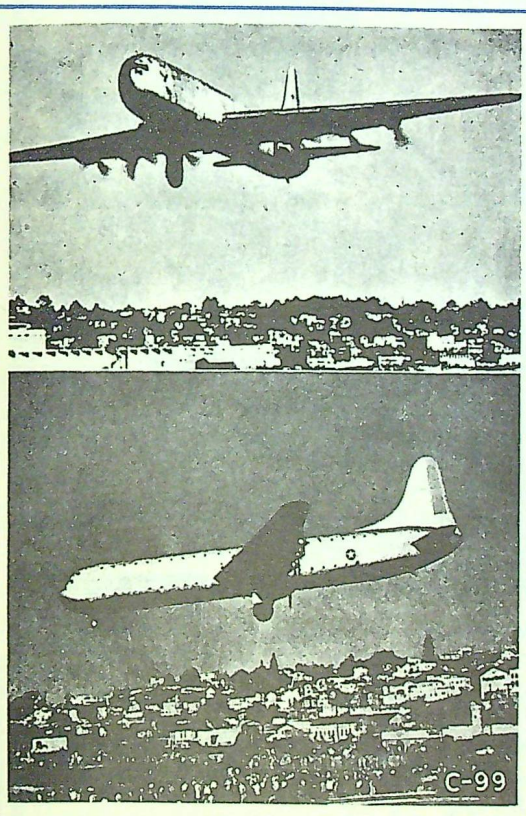
made in Andrée's diary. They perished in the Arctic as Scott and his companions perished in the Antarctic—through cold and hunger—and in each case the leader's diary, found later, told the story.

(Reprinted, by courtesy of the "Air Reserve Gazette," from an article by Captain Norman Macmillan, M.C., A.F.C.)

TROOPSHIPS

THE LOCKHEED XR-60 CONSTITUTION weighs 92 (U.S.) tons. It was designed for the United States Navy who wanted a transport capable of linking their bases in the Pacific with those in the United States. Power is at present provided by four Pratt and Whitney Wasp Major 28-cylinder radial motors of 3,500 h.p. each, but the aircraft is considered to be under-powered. Lockheeds say that the aeroplane is stressed to take turbo-jets or propjets. Its carrying capacity in terms of men is 180 maximum, and to give some further idea of its size it can be said that its tail-plane area is equal to 3½ times wing area of the P-80. A further idea can be gained from the fact that it carries a crew of 12 and 10,000 gallons of fuel. Wing "tunnels" permit some servicing of engines in flight.





THE CONSOLIDATED VULTEE XC-99 has a gross weight of 133 (U.S.) tons. At the present time the U.S.A.F. has ordered 100. Its capacious fuselage is designed on the "double-bubble" principle although no "waistline" shows and the cross-section appears pear-shaped. It will carry 400 fully-equipped troops or 100,000 lb. of equipment: an alternative internal arrangement turns it into a flying hospital carrying 335 stretcher patients. Power is provided by four 3,500 h.p. Pratt and Whitney Wasp Major 28-cylinder radial engines, though in all probability it will later have propjets. On its first flight, which took place on the 23rd November, 1947, it was airborne at 115 m.p.h. after a run of 1,000 yards; it was, of course, practically empty. With a full load of fuel, 21,160 U.S. gallons, it has an extreme range of 10,000 miles though with reduced pay-load.

(Courtesy of "The Inter-Services Journal of Aircraft Recognition")

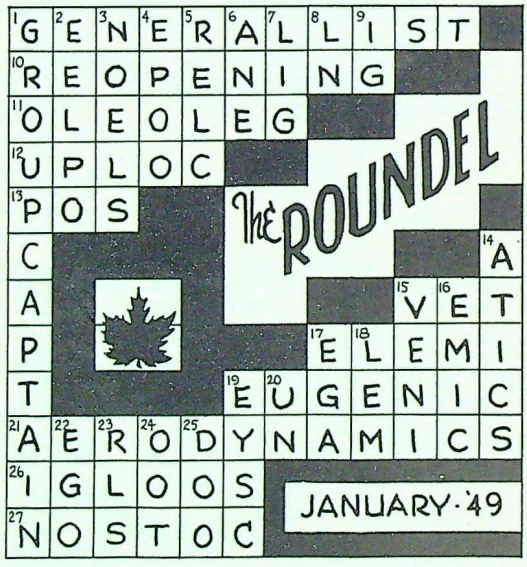
ANSWERS TO QUESTIONNAIRE ON PAGE 18.

1 : B	6 : B	11 : D	16 : D
2 : B	7 : D	12 : A	17 : A
3 : A	8 : C	13 : B	18 : C
4 : C	9 : A	14 : B	19 : A
5 : C	10 : C	15 : C	20 : C

Answers to Aircraft Recognition Quiz on Page 32.

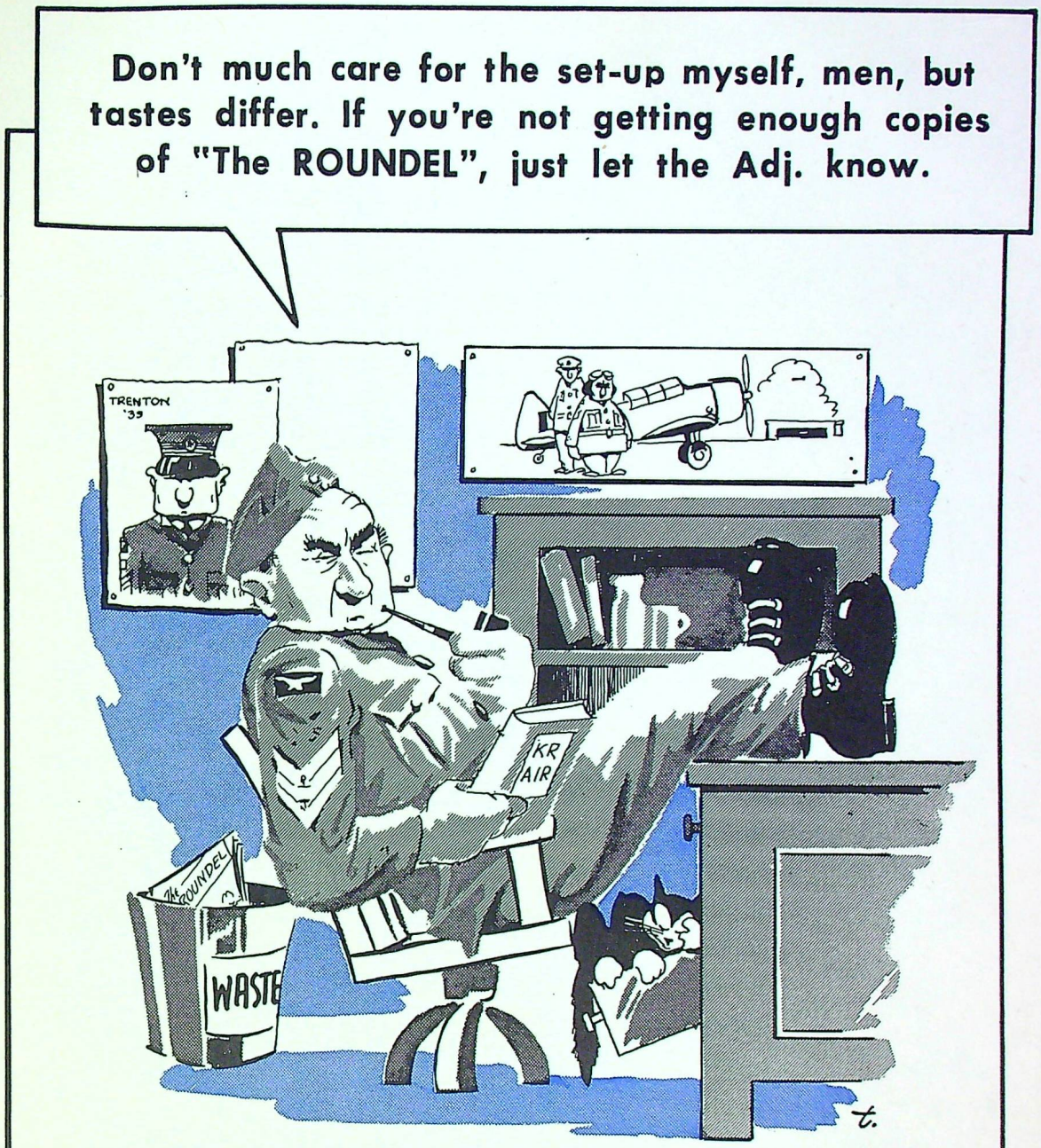
1. Black Widow (P-61)
2. Skymaster (C-54)
3. Shooting Star (P-80)
4. Tigercat (F7F)
5. Bearcat (F8F)
6. A-7
7. Constellation (C-69)
8. Firebrand
9. Corsair (F4U-4)
10. Halifax
11. ER-4

Cross Word Puzzle Solution



DELAYED ACKNOWLEDGEMENT

Thanks are due to the U.S.A.F. for their kind permission to use the photographs of Okinawa operations which appeared in our December 1948 issue.



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