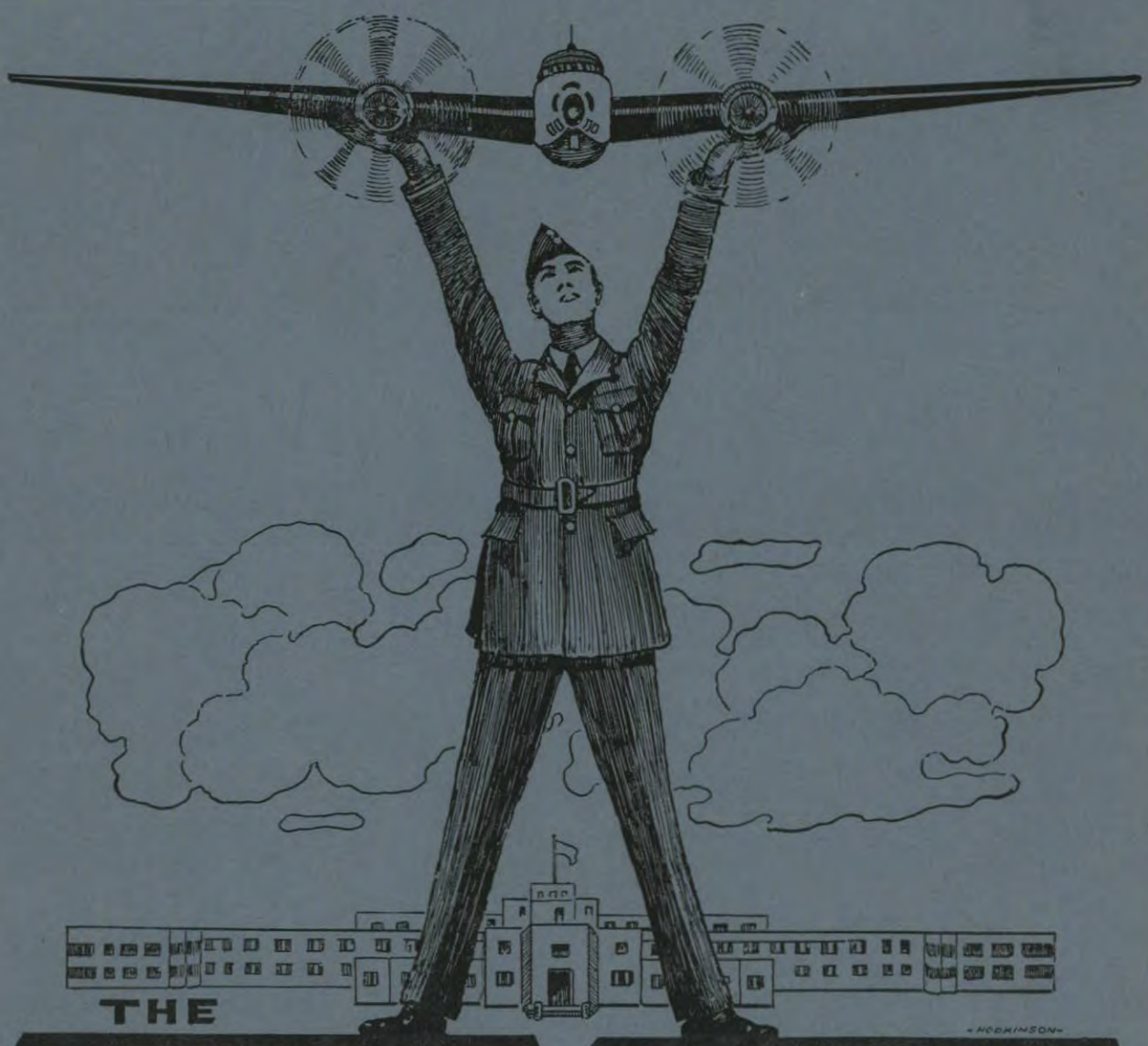


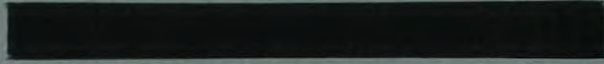
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THE *Aircraftman*



THE
TECHNICAL TRAINING
SCHOOL
ST. THOMAS ONTARIO



THE AIRCRAFTMAN

A Magazine of the R.C.A.F. Technical Training School
Published Monthly at St. Thomas

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Subscription Rates for Airmen who leave the Station is \$1.50 a Year. This covers cost of printing and postage.

"The result to date has been achieved through the magnificent team work of the officers and men of the R.C.A.F. and the generous and bountiful support of the Canadian people. The record of the past six months must be our incentive and example for the future. There has not been and there can be no star, no solo performer. From the newest joined general duties man to the Chief of the Air Staff, everyone—mechanic, wireless pupil, maintenance man, air crew pupil—has a part to play. Each is necessary to the other. Each is contributing in equal measure to the success of the plan. Each is an essential cog in the machine; if anyone weakens, falters or fails, the whole structure is jeopardized."

MAJOR THE HONOURABLE C. G. POWER, M.C.,

Minister of National Defence for Air, in a commemorative address on the first anniversary of the British Commonwealth Air Training Plan, December 17th, 1940.

« « EDITORIALS » »

MORALE

Professor Hocking, of Yale University, at the close of the last war wrote a book on morale. In it he says:

"Perhaps the simplest way of explaining the meaning of morale is to say that what 'condition' is to the athlete's body, morale is to the mind. Morale is condition; good morale is good condition of the inner man: it is the state of will in which you can get most from the machinery, deliver blows with the greatest effect, take blows with the least depression, and hold out for the longest time. It is both fighting power and staying power and strength to resist the mental infections which fear, discouragement and fatigue bring with them, such as eagerness for any kind of peace if only it gives momentary relief, or the irritability that sees large the defects of one's own side until they seem more important than the need of defeating the enemy. And it is the perpetual ability to come back."

The morale of the British people in the Battle of Britain is magnificent. It is well to remember that it was the break of the German morale that gave us victory in the last war.

* * *

Both Hitler and Mussolini have often advocated that the weak should be exterminated and only the strong should survive. We wonder what Hitler thinks of his partner in crime now that he has been disgracefully defeated by one of the smallest nations in Europe—and a democracy at that.

* * *

ON GIVING OF THANKS

Thank thee, O Lord,
 For this, my bed,
 For roof unbombed
 Above my head,
 And for thy gift,
 My daily bread—
 Why is it we
 Must come to know
 Belatedly
 From other's woe,
 The gratitude
 We always owe?

—Fairfax Downey in *N. Y. Times*.

MARTIAL MUSINGS

By Flight Lieut W. S. Lighthall, D.F.C.

When these lines are read fifteen days will have elapsed since they were written and that half month may well have witnessed events which will change the whole course of world history.

The Army of the Nile has now practically completed the mopping up of the Italian forces in Libya, although this must be pressed to its conclusion at the Tunisian border so that no stretch of Libyan shore remains as a possible base of Axis operations. However, with the advance of Free French Forces from the South the final clearing of Italy's North African Empire can be carried out with relatively few of our troops and the bulk of those presently engaged can be diverted to other theatres of war.

The Ethiopian campaign is going according to schedule and the forces now advancing in Eritrea and from the South, aided by vengeful Ethiopian warriors, are most likely adequate to cope with any Italian troops they may encounter.

The Battle of Britain has been less in the public eye of late, due to events elsewhere which, besides distracting attention from the main issue, have had a decided bearing upon the operation of the Hun Air Force.

The sending of large fleets of planes to Roumania and Italy would appear to have drawn heavily on the supply available for attack on the British Isles. This further dispels the myth of vast Hun aerial supremacy.

Attention is now focused on the Balkans, where the Bulgars have bowed to Hitler's threats and bribes, the promised reward for their aid being Thrace and an outlet to the Mediterranean at the expense of Greece. About to be surrounded on three sides by Axis forces, Jugo-Slavia appears to have been bluffed into allowing passage of German troops through her country and perhaps she also is promised an outlet to the sea.

This passage through Jugo-Slavia will be a greater threat to Greece than that through Bulgaria, as it would enable the German hordes to strike at the rear of the Greek forces in Albania and also attack Macedonia through the Vardar Pass and at Monastir, where the Bala Shitza Mountains are lower than south of the Bulgarian frontier.

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However, it is still winter in the Balkans and what roads there are will be practically impassable for at least a month. This should give the British forces in the Mediterranean time to man the Grecian defences north of Salonika and the difficult nature of the country will prevent the use of blitzkrieg tactics, possible only where tanks and mechanized transport can move freely across fairly level ground.

Stalin has again shown himself in his true colors. Influenced by some dim Oriental reasoning or perhaps by fear of the German army, he has turned on his friend Turkey, threatening to invade from the east if the Turkish army moves to the aid of Greece or, in fact, acts in self-defence.

This is typical of the gangster methods of this bandit, and no peace can be secure after this war until the world is rid of him and his kind.

The Japanese situation is grave but may be a bluff. Any overt act against British or Dutch East India possessions might well bring the U.S.A. into the war against Japan and it is very doubtful if the Japanese would wish to face such an issue at present.

Hitler's plan is to divert Britain's attention from the main issue of home defence and his Balkan adventure, coupled with a threat to Gibraltar and a Japanese crisis, are hoped to divert units of our fleet from the Atlantic to the Mediterranean and Pacific, to say nothing of Air Force formations required by our forces wherever they may be.

About the middle of March he should be ready for a drive at Greece and at that time it may be expected that Japan will act as if about to attack the Allies in the East.

The middle of April appears the likely time

for the great invasion effort and may be the gravest hour of our history.

With Army, Navy and Air Force ready, backed by the indomitable will of her people, Britain awaits the issue, while from America comes an ever-increasing flow of planes and supplies which in the end will turn the tide against the madmen of Europe.

* * *

BREACHES OF POSTAL CENSORSHIP

As members of the R.C.A.F., your attention is drawn to a serious breach of discipline whereby service personnel are disclosing Service matters in letters and conversation which, if allowed to continue, may lead to very serious situations. Air Force Headquarters are taking a grave view of recently joined recruits and others who carelessly pass on idle talk in letters and otherwise. This may adversely affect the war, even to jeopardizing your own life by providing information to the enemy. If Service information should be discovered in your subsequent censored letters or indiscreet remarks passed on to your families and friends, it will not only reflect on the efficiency of this station but may react drastically upon yourselves. Personnel recently arriving from England are particularly cautioned in that Nazi intelligence agents in the United States are very active and that the problem of preventing the disclosure of vital information either through the mails or by injurious conversation is much more complex here than it is in the United Kingdom. If by fully appreciating the intensified seriousness of the present situation you think before you write or speak, you will minimize the problems involved, correct a difficult situation and render a service to our Empire.

* * *

« « SPORTS » »

HOCKEY

The end of the regular schedule found our boys firmly entrenched in second position. By the time that this article sees the light of day the St. Thomas Fliers will be battling in the play-offs. If the boys do as well in the time of testing as they did throughout the season, we have high hopes that they will emerge the League champions. In spite of illness and injury during these latter weeks, our team has put up a mighty fine show and now, with the

team at full strength, we are expecting great things.

There is one aspect of the picture which has not been very cheery. With a team that has all the ear-marks of champions, we have had but a handful of supporters at each of our home games. The past is gone and perhaps it is just as well, but we are in at the finish now so get out and give the boys that cheer from the sidelines. A good cheering section often helped a team to change defeat into victory. So let's go.

**THE COMMANDING OFFICER'S
TROPHY RETURNS TO
1 SQUADRON, 1 WING**

F./Lt. Williams can well be proud of the record his squadron has set in the Commanding Officer's Trophy Competition. 1 Squadron 1 Wing won the Trophy in its inaugural month and in the first month of the New Year they have succeeded in breaking the stranglehold 2 Squadron 2 Wing had on the cup.

Led by the redoubtable Sgt. Hilton-Sargent, 1 Squadron 1 Wing, with 13.8 points, had a clear-cut margin over 3 Squadron 1 Wing, in second place with 6.3 points.

With the new scoring scheme in operation for February, every Squadron on the Station is battling for the Trophy and at the date of writing we wouldn't care to predict a winner.

* * *

**CONGRATULATIONS
TO OUR BOXERS**

By Sgt. Carroll

Visiting the Drill Hall on the evening of February 6th, to take in the Army - Air Force

* * *

fight, we were more than pleased with the reception handed out to the visiting leather pushers. Our boxers defeated the Army team with a score of 19-15 in what proved to be the most thrilling evening of boxing ever to be staged on this Station.

"Mac," the little corporal from Headquarters, showed he knew what it was about, especially when he was at close quarters. He is a neat boxer, but a bit touchy where referees are concerned. Our own AC/2 Harpell is an up-and-coming lad and would have taken his fight had it not been for the fact that he was full of the flu. Boxer Hamilton put up a good scrap with a man well over his size and weight. He is one lad who is making the grade fast under the supervision of Jerry Despres, boxing instructor, and should go places with a few more fights tucked away under his belt. Fletcher and Carrothers, in the featherweight class, put up good bouts to win their fight. By the time this paper is off the press AC/2 Fletcher will have left the Station. Our best wishes go with him to speed him on his way to greater heights.

We can be justly proud of our Station Boxing team. We are with them one and all.

STATION ACTIVITIES

THE LONDON CONCERT PARTIES

During the last several weeks life around the Station has received more of the lighter touch by the visits of concert troupes from London. The London Life Troupe, under the management of Mr. Castle Graham; the Citizens' Committee Unit, under Mr. Alf Tibbs;



"Dance Moderne" group of the London Life Troupe

and the Tweedsmuir Revue, under the direction of Mr. Art Mann, have been most generous in the donation of their services. The spontaneous appreciation of the men as shown by their applause at the various shows is the best indication of the manner in which the shows were presented. We would like to give individual mention to all members of all troupes, but that would make quite a story, so we will make it brief and say: the shows were great; the girls were marvellous; the music was grand and the latch string is still out and there's welcome on the mat when the troupes can come again.

* * *

FRIDAY NIGHT DANCES

(From the Feminine Angle)

The weekly dances held at the Y.W.C.A. under the auspices of the Station Y.M.C.A. and the Station Girls for 100 (more or less) bachelor(?) airmen have so far proved successful.

It is reported that the girls are rapidly acquainting themselves with many different

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styles of dancing since, apart from a few men who consider it their bounden duty to support the walls, the men are only too keen to demonstrate the steps peculiar to their own part of the country. It is further reported that many of the ladies plan to deal with these aforementioned wall-supporters by arming themselves with hat-pins.

So far we have received no complaints about the "eats," which are provided by the girls who attend. All in all, we think they are swell dances and we know the Airmen think the same.

* * *

AIR RAID VICTIMS' RELIEF FUND

It is a pleasure to report the excellent response of all ranks of this Station to the appeal for donations to the Air Raid Victims' Relief Fund. A cheque for \$1,071.16 has been forwarded to The Toronto Evening Telegram and other donations from men who were on leave when the collection was made will be sent forward.

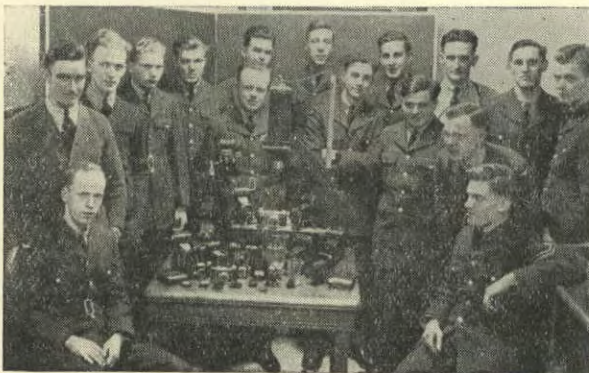
* * *

THE MOVIES

Three times a week there are Movie Shows in the Drill Hall. Most of the men on the Station have enjoyed these shows and the size of the crowds indicates that they are popular, but how many think of the men who run the projectors? AC/2 Eaton and AC/2 Salt are the men who run the machine. These men deserve a big hand. They give their time and services entirely without charge. The only recompense which they ask is that you enjoy the shows.

* * *

THE CAMERA CLUB



The boys of the Camera Club took the opportunity to face the camera at a recent meeting. Apparently they are as much at home in front of a camera as behind one.

FROM THE LIBRARY CORNER

By the Librarian

When Captain Yeats Brown wrote "European Jungle" in May 1939, the wild animals were just beginning to snarl and show their teeth. He states frankly his admiration for Hitler and Mussolini and tells some rather unpalatable truths about England. But surely he would now admit that the old lion and the cubs are preferable to the mad tiger now roaring in Europe.

Jumping from one continent to another, "African Intrigue" describes a German "big game" hunting expedition in the years immediately before the first Great War. The author is the only survivor of the party but his tale has the ring of truth which makes this story one of the most fascinating of its kind which we have read for a long time.

The Station Library is now a member of the New York Book-of-the-Month Club and the first arrival, "Kristin Lavransdatter," by Sigrid Undset, Nobel Prize winner of 1928, is highly recommended. Hemingsway's "For Whom the Bell Tolls" is due to arrive shortly, along with Valtin's "Out of the Night." These are good books but need more than one evening in which to read them.

Several new technical books are now on the shelves. "Elementary Aerodynamics," by Group Captain D. C. M. Hume, first commanding officer of this Station, should be of special interest.

Just a word about overdue books: To make the Library of maximum use, books must be returned in seven days. A renewal is usually granted if requested, but for the sake of the records and to prevent loss, books should be returned on the due date.

A new Station Library has been built in the Drill Hall and will be opened within a few days.

* * *

"IN A LIGHTER VEIN"

Willie: "Paw, does bigamy mean that a man has one wife too many?"

Paw: "Not necessarily, my son. A man can have one wife too many and still not be a bigamist."

* * *

The young lady walked boldly up to a woman whom she took to be the matron of the hospital.

"May I see Lt. Pearce, please?" she asked.

"May I ask who you are?"

"Certainly; I'm his sister."

"Well, well. I'm glad to meet you. I'm his mother."

« STATION STATIC »

HANGAR HINTS

By C. R. Aftman, A.I.R.

Don't be a wanderer on the field. Men have wandered into whirling airscrews. Two women wandered on to the path of Amy and Jim Mollison when they were taking off on an ocean flight from Wales to New York. Result: a crash and many weeks delay. Watch your step!

* * *

Socially, a suspicious man is a washout. But in aircraft work a suspicious man is wise. Be suspicious! If it doesn't sound right or doesn't look right, investigate. Take nothing for granted!

* * *

Wind socks and other wind direction indicators are not infallible. Pay attention to them, of course, but check wind direction otherwise whenever possible, by smoke, ripples on water, etc.

* * *

Don't try to be the fastest mechanic; try to be the best.

* * *

Sartorial note: When working around aircraft, keep your shoelaces tied. Keep clothing buttoned and free from flapping sleeves, lapels, scarves and wiping rags.

* * *

Keep your mind on your work. Douglas Corrigan is the only airman ever to make a success of absentmindedness.

* * *

Speak up! It may be all right to whisper sweet nothings into the "little one's" ear after duty, but on the field shout it out clearly and distinctly.

* * *

Cows, mules and other animals like the taste of dope-coated fabric. If you have to leave a stranded plane, be sure you're not leaving a free lunch for a herd of hungry bossies.

* * *

THOUGHT is the most moving word in our language, being the basis for all human action, but the word is a poor substitute for

the word KNOW. When it comes to making sure something is done don't just think — KNOW. During her record trip from England to Capetown Amy Mollison commenced an 1,100-mile night hop into the wilds of Africa with only five gallons of petrol. Luckily she got back without mishap. An experienced ground man THOUGHT he had filled the tanks.

* * *

Secret service may have its place in warfare, but it doesn't belong on an airfield. Report everything! When the U. S. army was flying air mail a few years ago, a pilot ran out of gas and was forced to land. During the last stop-over a mechanic had changed tanks, substituting an 85-gallon tank for one of 115-gallon capacity, without reporting it.

* * *

Dope, gun powder and lacquer are closely related, all being derivatives of cotton. If you wish to avoid a sudden aerial trip, keep lights and fire away from all three. Dope and lacquer are much more inflammable than ordinary paints.

* * *



> THAT FOGGY FRIDAY -

THE MECHANICS CREED

By AC/2 McCaskell

Maybe we're only the ground crew
 And perhaps we'll never fly,
 We only work on the grounded planes,
 To get them back in the sky.
 We don't get pretty golden wings
 And we lack the crowd's applause;
 We can't tell tales of fights and things,
 We just find what the trouble was.
 Maybe we won't fly the big ones,
 But you'll find us over there;
 Maybe we won't be firing the guns,
 But we'll keep the planes in the air.

* * *

A little boy was saying his go-to-bed prayers in a very low voice.

"I can't hear you, dear," his mother whispered.

"Wasn't talking to you," said the small one firmly.

* * *



AMONG THE SQUADRONS

Squadron 1, Wing 1

AC/2 Ollivier, S. J.

WE WIN THE TROPHY

Group Captain R. Collis made the presentation of the Commanding Officer's Trophy to F/Lt. H. N. C. Williams, Officer Commanding our Squadron.

Following a month of keen competition to win the coveted Trophy, and with the combined efforts of all sports housed in this section, we were able to come through with a winning effort to take the prize.

Presentation took place on Thursday evening, January 30th, in the Drill Hall, at the conclusion of a fine exhibition of boxing between Squadron 2 Wing 2 and Squadron 1 Wing 1.

Although Squadron 2 won the boxing competition this particular evening, our Squadron had piled up successes during the entire month and had a safe margin to work on.

To the individual winners of the boxing match went fine trophies of aeroplanes, which

will remain the proud possessions of the recipients. Each contestant of the team was congratulated by the Station Commander and with a hearty handshake they received their prize.

* * *

SPORTS

To all who participated in the sports and were responsible for the winning of the Commanding Officer's Trophy, we say, "Congratulations and thanks!"

We would include in this group captains of the Basketball teams, Volleyball teams, Hockey teams, Boxing cards, our Coach (Sgt. Hilton-Sargent) and any other person who may have aided in our success.

It will be noted with pride that every entrant made a decisive showing of sportsmanship, whether he came out the winner or loser, and that covers considerable territory.

All supporters and fans who made it a point to cheer for our Squad were provided with a full evening of entertainment and enjoyment and, although some of us came back very hoarse, we felt we had cheered them through to victory.

**ITEMS TAKEN FROM
OBSERVANCE DURING THE PAST
MONTH OR SO:**

We venture to prophesy that, during the next four months, the following incidents will have taken place here in St. Thomas:

- Snowdon of the 44th entry slept right through his final trade test.
- Anderson of the 38th finally washed his feet, or the rains came.
- Bell of the 44th just got promoted to right guide.
- Mike of the 37th is married and divorced twice since arrival in St. Thomas.
- Sardo of the 47th finally hand-sprung himself from his cosy little cot right smack into the hospital.
- Doc. of the 32nd finally married the girl "Dot."
- Houser of the 44th recuperating from a nervous breakdown after learning from some critter that there really was no Santa Claus.
- Lott of the 45th took trouble off one day to stay out of bed and find out what goes on here.

We Also Wonder Why ???

- Some person has not told Moscript of the 47th about "Ry-Krisp."
- Eldridge of the 38th does not start a private bus business of his own from here to Toronto.
- Beak of the 39th doesn't take up piano music and give his guitar a rest.
- Norman Brant of the 37th thinks so much about Saskatchewan; would be give us a few phone numbers if we go west.
- Rowell of the 44th is so allergic to lamp black. Also why he boasts about his wind pressure.

* * *

Squadron 2, Wing 1

By AC/2 Carswell, G.

* * *

WISE AND OTHERWISE

F/Sgt. M. J. Desjardins wishes to express his appreciation to Squadron 2 Wing 1, which made possible a donation of ninety-six dollars to the widow of the late AC Walters.

One airman reports that before he joined the Service he was a going concern. Now, he is concerned with going.

The kitchen staff is still trying to figure out whether it was a hint or not but this is how it happened: Recently, one of the airmen from the Squadron was seen walking down Talbot street very tenderly caressing a live chicken which snuggled in his arm. He cared for her exceedingly, so much in fact that he brought her back to the bay with him. Unfortunately, one of his fellow-inmates concluded that too generous imbibing was making him see things. However, the little lady survived to the extent of being placed on the table in the mess hall the next morning, still alive and ready to give her best.

We are wondering if one of the corporal instructors has been harboring political ambitions. The other day he very learnedly remarked that the oil in hydraulics is of greater "CONSTITUENCY."

* * *



The boys from the West seem to find much to criticize in Old Ontario. We have noticed, however, that there is one thing which the boys from the Dust Bowl appreciate, and that is the abundant bathing facilities of our Station. What is more, this is proof of the statement.

* * *

There are many entries on this Station which seem to delight in calling themselves the "Fighting This" or the "Fighting That," but when it comes to the actual right to carry the name "Fighting" we nominate the Forty-third Entry.

In this Entry there are four men who are rapidly making a name for themselves in the boxing circles of the School. They are Sanders, light-heavyweight; Carruthers and Cook, mid-

THE AIRCRAFTMAN

dleweight; and Lewis, bantamweight. We may be wrong, but we think that there is no other Entry on the Station which can equal this record.

* * *

Apparently, one of the boys from the West was a little tired of hearing the Eastern Blue-noses and Herring-chokers tell about the wonders of the Magnetic Hill, so he came back with this one:

Last summer a farmer in the West took his team and drove a load of grain to the elevator. He parked the team and load while he went in for a chat with the elevator manager. When he came out he could find no load and no team but—he did see two grasshoppers playing a game of horseshoes to see which one would eat the harness.

* * *

The Forty-third has a rather brilliant chap known as the Mad Genius. Many and weird are his contraptions but most of them seem to work. Of late, he has been walking around with a dreamy look on his face and rumor has it that he is now working on a silent whistle for his bay corporal.

* * *

SPORTS

When we approached the sports representative, Cpl. Maybie, concerning material for this section, we were instructed to give the following statement: "We are now in the third place for the Trophy for this month. At the end of the month we shall be in first place."

We certainly hope that the day when this magazine is published proves that the corporal is a prophet as well as a sportsman.

* * *

Squadron 3, Wing 1

"JEST RAMBLING"

By Cpl. Stanley, W. M.

In our last issue we bade farewell to our O.C. but failed to welcome F/O W. L. Marshall. In welcoming him, I know that I have the Squadron's approval in saying that we shall give him our fullest support. Along with our new O.C. we welcome F/Sgt MacPherson.

Mount Hope, Ontario, can now change its name to Mount of Luck for Sgt. Mayne has gone there. Number 2 Wing is lucky to have our friend, F/Sgt Matheson.

* * *

It would be a very good gesture on the part of any airman who would like to do a little

extra for the Empire to buy WAR SAVINGS CERTIFICATES each month.

* * *

A Plated Joke

A certain F/Sgt we know asked a trainee how he felt.

"Not so good," came the reply; "I have just had sixteen teeth out."

At this the Flight excused the man and allowed him to return to his bunk. The joke was on the Flight for the sixteen teeth were in a plate which was being repaired.

* * *

SPORTS

Chasing the Trophy

All sports teams of this Squadron are doing splendidly in their efforts; but what of the cheering crowd? Come on, get out and cheer and give your vocal support to your teams who are winning on the average of two-thirds of the games played.

* * *

IT MAY INTEREST YOU TO KNOW

That at one time, trainees on "B" routine started school at 1600 hours and finished at 2359 hours.

That trainees washed, waxed and polished all the corridors and did the kitchen work.

That trainees on "B" routine were allowed to be off the Station between the hours of 1200 and 1400.

That copies of the Aircraftman have been acclaimed in several parts of England.

That the name of our L. & P. S. station "Crafts" stands for "Canadian Royal Air Force Training School."

* * *

CARRY ON

May we send a word of comfort and congratulations to Judy Russell, lovely 15-year-old daughter of S/L Russell, late of this Station, who is in good spirits although confined to bed. Best wishes for your speedy recovery.

* * *

Fifty Nazi pilots knocked at the gates of Heaven and sought admittance. St. Peter waved them back.

"I'm sorry," he said, "but only six of you can come in."

"But there are fifty of us," the Nazi protested.

"Maybe," replied St. Peter, "but Field Marshal Goering's communique said that only six were shot down."

THE AIRCRAFTMAN

It is stated that strawberries contain a larger percentage of water than does milk. "Maybe more than cow's milk, but is it more than dairy milk?"

* * *

It is also stated that mistletoe contains active properties which are used in medicine to reduce blood pressure. I have seen it raise the pressure.

* * *

We have with us now the "Shockers." It is with the best of intentions that I say: I hope that they have left their faults across the Tank and have brought only their best. So welcome to you, boys.

* * *

Who is the elderly corporal on "B" floor who disguises his age every time he goes to St. Thomas, and where does he buy his hair dye?

* * *

Squadron 1, Wing 2

By AC/2 Yerec, G.

The Sports in the Squadron are improving every month. The Basketball, volleyball and badminton teams are now winning games that used to be sure points for another Squadron. With the new entries now being registered for the various sports, 1 Squadron 2 Wing will be on or near the top of the heap any month now.

Some vocal support from the rest of the Squadron would be helpful. A good burst of cheering is a definite encouragement when that extra point is needed. So come out and holler, boys.

* * *

"A FEW E SIXERS"

AC Johnston, Guelph, is looking for a painless method of removing shoe polish from his person.

* * *

Charlie Lawlor, Vancouver, would like to add up $\frac{1}{2}$ and $\frac{1}{2}$ and get the answer 1 instead of X.

* * *

Doc Emery, Toronto, would like to see a full-fledged drug store on the Station.

* * *

"Clarky" Clark, Montreal, looks forward to the evening so that he can write that certain girl.

* * *

"Dick" Draper, North Bay, who hopes to meet a girl who will love him for himself and not for his uniform.

"Whitey" White, New Brunswick, wants a good dish of codfish.

* * *

Fred Prudence, Hamilton; he's the little man who is always threatening the rest of C deck.

* * *

C. A. Walters, London, would like to discover an electrical law of his own.

* * *

Instructor: What are you thinking about?

Scrimshaw: Nothing.

Instructor: Take your mind off yourself and get to work.

* * *

Jack Warner: I bought a car from you and you said if anything went wrong you would replace the broken parts.

Dealer: Yes.

Jack: I'd like to get a nose, a shoulder blade and a big toe.

* * *

'Tis not by wishing that we gain the prize,
Nor yet by ruing,
But from our falling, learning how to rise,
And tireless doing.

The idols broken, nor our tears and sighs
May yet restore them;
Regret is only for fools—the wise
Look out before them.

* * *

Joe: "Do you remember that fright you got on your wedding day?"

John: "Remember her? I've still got her."

* * *

Some drivers are of the opinion that a locomotive whistles at crossings just to keep up its courage.

* * *

When the boys in Bay 2B returned from their 48-hour pass, from the 7th to the 10th of February, they found every bed made. This was done by one of the new recruits in the 39th Entry, which showed some of the old recruits that all angels do not have wings. How about a little more of this in other bays?

* * *

It wasn't an earthquake that woke the boys up on Floor B the other night. It was Buckle closing the windows in a very forceful manner, accompanied by a few unprintable adjectives about the fresh air and those that like it.

* * *

The shows that come here from London sure are appreciated by the Airmen in No. 1 Squadron.

* * *

At Quebec Manning Pool a rather funny incidence happened while some of the 39th

THE AIRCRAFTMAN

Entry was there. It seemed they were taking the old phones down at the barracks to replace them with new ones. An O.C., hearing a phone ring, asked a French-Canadian to get it for him. The French-Canadian, not understanding English very well, pulled the phone right off the wall and brought it to the O.C.

* * *

Squadron 2, Wing 2

Sgt. Carroll, A. W. L.

HERE AND THERE

Once again this humble scribe brings you cheery greetings from the armchair pilots of this Squadron and hopes that you will find a few minutes' relaxation in reading what we are happy to offer.

The "Squadron Orchids" this month go to No. 1 Squadron 1 Wing in winning the C.O's Trophy. We are pleased that someone picked up where we left off, but we hope to be back up there very soon—between you and me, we just dropped out for a breather. Anyway, three straight is in our humble opinion an enviable record.

An applicant being tested at a recruiting centre for A.F.M. was asked what he did in civil life to qualify him for A.F.M. Enlistment replied: "I tightened on nut No. 453 at General Motors for three years."

Chins up, you lads of ours who have found your way to the sanctuary of a Hospital Room. Although your lot may not be a pleasant or a restful one, it is at least quiet and we outside are not forgetting and are looking forward to your speedy recovery and return to your Squadron.

Our other lines of sport are coming right along. Keep up the good work, lads, and next issue we hope to be able to give an interesting summary on all events.

Here's a hand to each of the Captains of these teams for their hard work and consistent play.

* * *

"THE LIGHTER SIDE OF THINGS"

It would appear that the most of our lads are going poetic on us, judging by the amount of poetry handed in this month. We wonder whether it's the influence of the new Press Club or whether it's the fine Station Library, or is it "love"? We are sorry that space does not permit publicity of all that has been received.

"TO OUR FIGHTING PILOTS"

Reach up and high into the sky,
Over land and sea, take wing and fly;
Your courageous heart will never die
As long as we freemen are still alive:
Let our planes our fate decide.
Come, ye men of British soil,
And hearken to a battle royal;
Never let the good flag down,
Alert and upward, fight on;
Damn them with your bombs and guns,
Incessantly torment the Huns,
And let them know we're raring to go—
'Neath the clouds we'll steal the show.
Away, then, for bugles are calling,
Into battle we'll see them falling;
Rise, oh birdman, with speed appalling.
Fly then fast, oh mighty airman,
O'er land and sea, dive and attack them;
Reach up and high into the sky,
Count not the cost to do or die;
England expects . . . and we know why.

* * *

The closest resemblance we have to a London fog here is "a trainees' washroom in the Rigging Shop during smoke period."

* * *

What did the cigarette say to the smoker?
Ans.: "Put me out before I make an ash of myself."

* * *

Felicitations and salutations to our Brother Airmen who found time to "trip down" Altar Way these past few weeks.

* * *

Blue Monday comes around,
In class the boys do sleep,
Corporal becomes unwound,
And then our eyes uncreep;
Sometimes we hear a groan,
Another makes a moan:
If we could only keep awake,
The education we could take—
(Why can't we vote for Monday
morning as a half day of?)—
"That will be the day."

* * *

This I think good advice:
(You won't) Miss the Train
(If you) Train the Miss.

* * *

PRESS CLUB

The newly formed Station Press Club is meeting with great success and to those interested in learning more about writing it would be well worth your time to come around on Thursday evening to the club room under the Officer's Mess. Outside journalists are invited

in to speak and they know their stuff, so you can't go wrong. The Press Club's officials wish to thank Pilot Officer C. Defeux, F/L W. Light-hall and Mr. T. Keith of The Times-Journal for the addresses given to the club.

* * *

And so once again your humble correspondent draws his column to a close for this month—but before doing so I beg leave to pay tribute to a gallant No. 1 war-time pilot, colorful bush flyer, and lately captain of an important T.C.A. Flight who lost his life in the worst aviation tragedy in Canadian history, Captain W. E. Twist, who died at the controls of his big Lockheed on February 6th at Armstrong.

To you, "Pat," who has gone "West" to join your brother flyers, we who cherished your friendship, salute you—and bid you "Farewell."

* * *

Squadron 3, Wing 2

THE RESPONSE OF OUR YOUTH

By AC/2 McCaskell

When this war is over and the post-mortems are held, there is no doubt that many people, including one A. Hitler, will be faced with some very puzzling facts, foremost among which will be the way that the youth of the Empire and its sympathizers have answered the call of the British Commonwealth Air Training Plan.

If a few years ago such a plan had been broached it would have been termed fantastic, yet today it is a fact. From all over the English-speaking world have come thousands of men, young and old, who have laid down their civilian clothes to don "blues" and to pick up the tools of war to strengthen the R.A.F. in its part of the fight for liberty and right.

Those who in the past claimed that youth was going "to the dogs" should look around. They can see a generation that has taken up



its share of the fight against serfdom under the swastika. Granted that the call of adventure played no small part, but youth needed no second call, or no conscription to enlist. Our youth are truly proving their mettle.

* * *

THE 35th

About to pass through the portals of aeronautical learning at St. Thomas is one of the most colorful of all entries ever to study here. I inscribe a line to honor the famous 35th A.F.M's. I have the great privilege of offering our sincerest thanks to all concerned—who made our period of learning here a pleasant one. We are soon leaving. The most of us are happy in anticipation of the prospect of being posted nearer home, but wherever we go we only hope we find quarters as fine as we had here.

* * *

BAY 5 B - GOSSIP

It has been said E. Shute receives his inspirations from a certain picture.

* * *

It was a treat to see Joe Iaverna as he watched the Variety Show.

* * *

Watch Stachew's face when he sees a pick.

* * *

While in Brantford I saw the nurse who was taking care of Star. Now I want to be sick there, also.

* * *

Why is it that Ridge and Rochon are steering clear of a certain house in St. Thomas? "There is a phone call for Mr. Rochon."

* * *

I'm looking for the guy that said "Parting is such sweet sorrow." If I have to leave Brantford and vicinity, there won't be anything sweet about it.

* * *

"QUIBBLINGS"

By AC/2 Jorgenson, G. E.

It's one thing to go down and stay down and another to go down and come up fighting—I'm not talking about the Army vs. the Station bouts held here the first of the month. It's the Squadron 3 Athletic Union. Yes, we were down, far down, last month but at the time of this writing. . . . The long streak on the C.O. Trophy chart is no other than ours and it's our secret ambition to keep it there a good length against all comers.

* * *

"Senator" Jones of B2 Floor is chuckling over the fact that he has at last received an

answer to his request for sample Christmas cards. "Just two months to the day since I wrote for them," unquote. He is already capitalizing on his good fortune and is preparing for a big *card* campaign for the coming year.

* * *

A Dutch civilian, charged by the Gestapo with espionage, was found "not guilty" by a German military court. Foul play is suspected.

* * *

Why do the instructors go mad? This may be the answer. Some questions from trainees:

- Where is far away?
- What makes the wind?
- When was last night?
- Who took care of me when you were a little girl?
- Do you walk when your shot dead?
- Do my bones make my eyes wink?

* * *

Equipment and Accountant Training School

By AC/2 Gardiner, C. E.

The Fourteenth Entry to the Equipment Course settled down to work on the 20th of January, after a week-end of initiations into the mysteries of T.T.S. corridors and the delights of the neighboring cities of St. Thomas and London.

With lectures well under way and trainees rolling up percentages in the first weekly exam, interest was diverted sufficiently to enable F/Sgt. Sisk to enter a drill team in the competition for the C.O's Trophy.

After a very short period of training, the team turned out on the evening of the 28th of January and gave a "snappy" performance, which did credit to the capable instruction of the flight sergeant. The boys were pleased to hear that they had won highest points in this part of the competition. However, owing to the pressure of the evening study, it was not found possible to accumulate sufficient points in the sports events to gather in the Trophy itself, although a valiant effort was made.

Needless to say, every trainee is looking forward to the banquet and dance which is being arranged for the evening of the 25th of February at the conclusion of the course. A thoroughly enjoyable evening can be assured to everyone participating.

Headquarters

"OUR KITCHEN"

By LAC J. M. Boughner

Well, here we are at last, in the news, or what have we, in this month's AIRCRAFTMAN.

It seems as though the Kitchen hears most of the wailings and moans that seem prevalent here, but let us tell you a little bit about our organization, and then all will understand it is not "a path of roses" for the gang who peel the spuds, punch the dough, carve the meat, and the other duties too numerous to relate.

Before telling you about the "eats" let us mention a few facts about our staff. Heading our list, as Messing Officer, is our God-father, F/L V. P. Cronyn. Our own chief of staff, WO/2 "Major" Chippett, learned his profession in England and after many years as chef in some of the leading hotels in Canada, together with 9 years as chef in the Permanent Force of the R.C.A.F. at Camp Borden, came to us almost a year ago now, in April. F/Sgt. "Tommy" T. J. Acton is the chief over the Trainee Cooks, of which the Third Entry is now registered. There are some 40 men in a Cooks Class and they are taught the fundamental principles of Army Cooking within six weeks. Cpl. "Bill" Brant is the gentleman who can tell you all about how your appetite runs as he figures on the Rations, which are obtained through the Army Supply Corps Depot on the Station. There is Cpl. "Curley" Deverell, who has charge of the Butcher Shop and who it is rumored once hacked meat up at some fox farm. Cpl. "Eddy" Griffiths is in charge of all the fancy baking and is responsible for those nice puddings and cakes you get. But listen, if you want more vegetables, and it is rumored that you do, better put a flea in Cpl. Tolen's ear for he looks after the vegetable room. But who knows about all the sick parades, the hospital cases, the A.W.L's and, in fact, your life history? There is LAC "Jimmy" Boughner, the Kitchen Clerk. He keeps all the records, and he can even tell, so they say, the price of butter in London every day. Now if there are any complaints at any time, just tell your representative on your local Messing Committee and eventually it will arrive at the Kitchen through Cpl. Brant and LAC Boughner, who listen to all the complaints once a week down in the Board Room.

Few realize here the amount of "eats" consumed per day, and how we obtain them. There are actually 23 items on the Ration Indents, but only some of these can we request. There are extras provided such as ketchup, pickles,

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horseradish, ice cream, oranges, jellies, corn-flakes, etc., through the kindness of the Canteen Committee. So keep on supporting the Canteen well and through some of their profits we will keep you going with these items and others such as sauces on your puddings, icings on your cakes. Oh, the pancakes! Well, you get them only once a week because it takes from 10,000 to 12,000 to feed the gang, even on what we might call a light week-end. It takes the boys over 4 hours of steady plugging to make the pancakes. They are the early risers, for they must begin at 3 a.m. But there is an all-night staff that cooks your noon-day meal, the meat anyway. They cook the bacon, too. Darn near two ton of meat at noon is consumed besides the little bit of bacon, in the neighborhood of a quarter of a ton, for breakfast. It takes about half a ton of fish on Fridays besides some good Irish stew.

We have a large gang of civilians here who do the general duties in the Kitchen, such as keep it clean, and who look after the dishwashers. We will soon have three dishwashers going, and it will be welcomed by our staff. But there is no rest for the wicked, for as soon as one meal is done the next is under way, and so it continues for 24 hours, but the writer says he will call it a day, and if you want a glance at the Kitchen gang working real hard, pause sometime for a moment just before you go out those centre doors and look around. But don't try to sneak back for another helping for you had your chance once up at the Servery. And, oh yes, dont forget that's where there is mass production on the march.

* * *

THE POST OFFICE

Its full title is Military Post Office No. 101. In case you didn't know, it is located in the basement next to the Barber Shop and is open from 0800 hours to 1800 hours daily except Sunday. Five days in the week, from Monday to Friday, you can buy stamps there until 2000 hours.

Staff Sergt. W. H. Wray is the head man and is ably assisted by Cpl. J. J. Larkin. Staff Sergt. Wray comes from Victoria; Cpl. Larkin was postmaster at Fitzroy Harbor, Ont. Then there is Pte. J. E. Cassidy from Moncton and Pte. J. R. Corney from Duncan, B.C., both former postal workers who know the ropes.

The boys are just as anxious to see you get that letter as you are, so they offer you a few tips: Ask the sender to address your letter correctly, as per instructions, and remind them to put the return address on. Be careful about perishable stuff in parcels. Somebody sent a strawberry shortcake in a parcel to this Sta-

tion last July. Your imagination will tell you what condition it was in on arrival.

Mail goes out at 8.30 in the morning and 5.30 in the afternoon. Letters in by 5 o'clock can catch the air mail. An air mail letter, if directed to Vancouver, will be there before noon the next day.

In case you have some extra money you can bank it right at the post office, or you can buy war savings stamps—and, by the way, did you buy any yet?

* * *

THE QUIPSTREAM

By M. W. H.

We wish we had the dough W.O. Stubbs could make renting out his hound as a wash-board.

* * *

Is it true that a lad in Cpl. Bowen's P.T. class stood there scratching his head when Mac barked out the order to touch wood?

* * *

After all the practice they've had in Africa, we'd hate to tangle up with the wops in a track meet.

* * *

Howie has the barbers on a diet of cream puffs. Why?

* * *

. . . .Stal(1) in. . . .

* * *

Our training is beginning to have its effect on the R.A.F. blokes. Notice them calling a quarter "two-bits" and a Coca-Cola "a coke"? Next thing they'll be calling petrol "gas."

* * *

It won't be long now before Hitler announces the date when he will be eating his dinner in the White House. Remember, he had his dinner in Buckingham Palace some time last year?

* * *

Ill, Duce. And how!

* * *

JOKES ???

"My husband gets up in time for the health exercises on the radio every morning."

"I didn't know he took 'em."

"He doesn't, but the girl in the apartment across the court does."

* * *

When in Rome most men do as the Romans do—unless their wives are with 'em.

* * *

"And why did Noah take two of each kind of animals into the ark?"

"I guess he didn't believe that story about the stork."

RECREATION CALENDAR

MARCH

Activities In The Drill Hall

SATURDAY, MARCH 1

1930-2130 Hrs.—Cinema supplied by Canadian Legion.

SUNDAY, MARCH 2

0910 Hrs.—R. C. Church Parade.
1000 Hrs.—Protestant Church Parade.

MONDAY, MARCH 3

1900-2200 Hrs.—Scheduled inter-squadron games in the Commanding Officer's Trophy Series.

TUESDAY, MARCH 4

1900-2000 Hrs.—Scheduled inter-squadron games in the Commanding Officer's Trophy Series.
2000-2200 Hrs.—Cinema supplied by the Y.M.C.A.

WEDNESDAY, MARCH 5

1900-2000 Hrs.—Scheduled inter-squadron games in the Commanding Officer's Trophy Series.
2000-2130 Hrs.—Boxing in the Commanding Officer's Trophy Series.

THURSDAY, MARCH 6

1900-2000 Hrs.—Volunteer gym class.
2030 Hrs.—Variety Concert Troupe from London.

FRIDAY, MARCH 7

1930-2130 Hrs.—Cinema supplied by the Y.M.C.A.

SATURDAY, MARCH 8

1930-2130 Hrs.—Cinema supplied by the Canadian Legion.

SUNDAY, MARCH 9

0910 Hrs.—R.C. Church Parade.
1000 Hrs.—Protestant Church Parade.

MONDAY, MARCH 10

1900-2200 Hrs.—Scheduled inter-squadron games in the Commanding Officer's Trophy Series.

TUESDAY, MARCH 11

1900-2000 Hrs.—Scheduled inter-squadron games in the Commanding Officer's Trophy Series.
2000-2200 Hrs.—Cinema supplied by the Y.M.C.A.

WEDNESDAY, MARCH 12

1900-2000 Hrs.—Scheduled inter-squadron games in the Commanding Officer's Trophy Series.

2000-2130 Hrs.—Boxing in the Commanding Officer's Trophy Series.

THURSDAY, MARCH 13

1900-2000 Hrs.—Volunteer Gym Class.
Pay Night.

FRIDAY, MARCH 14

1930-2130 Hrs.—Cinema supplied by the Y.M.C.A.

SATURDAY, MARCH 15

1930-2130 Hrs.—Cinema supplied by the Canadian Legion.

SUNDAY, MARCH 16

0910 Hrs.—R.C. Church Parade.
1000 Hrs.—Protestant Church Parade.

MONDAY, MARCH 17

1900-2200 Hrs.—Scheduled inter-squadron games in the Commanding Officer's Trophy Series.

TUESDAY, MARCH 18

1900-2200 Hrs.—Scheduled inter-squadron games in the Commanding Officer's Trophy Series.
2000-2200 Hrs.—Cinema supplied by the Y.M.C.A.

WEDNESDAY, MARCH 19

2030 Hrs.—Variety Concert — Tweedsmuir Review.

THURSDAY, MARCH 20

1900-2000 Hrs.—Scheduled inter-squadron games in the Commanding Officer's Trophy Series.
2000-2130 Hrs.—Boxing in the Commanding Officer's Trophy Series.

FRIDAY, MARCH 21

1930-2130 Hrs.—Cinema supplied by the Y.M.C.A.

SATURDAY, MARCH 22

1930-2130 Hrs.—Cinema supplied by the Canadian Legion.

SUNDAY, MARCH 23

0910 Hrs.—R.C. Church Parade.
1000 Hrs.—Protestant Church Parade.

MONDAY, MARCH 24

1900-2200 Hrs.—Scheduled inter-squadron games in the Commanding Officer's Trophy Series.

TUESDAY, MARCH 25

1900-2000 Hrs.—Scheduled inter-squadron games in the Commanding Officer's Trophy Series.
2000-2200 Hrs.—Cinema supplied by the Y.M.C.A.

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WEDNESDAY, MARCH 26

1900-2000 Hrs.—Scheduled inter-squadron games in the Commanding Officer's Trophy Series.

2000-2130 Hrs.—Boxing in the Commanding Officer's Trophy Series.

THURSDAY, MARCH 27

1830 Hrs.—Drill Competition.

2030 Hrs.—Variety Concert provided by London Life Troupe.

FRIDAY, MARCH 28

1930-2130 Hrs.—Cinema supplied by the Y.M.C.A.

SATURDAY, MARCH 29

1930-2130 Hrs.—Cinema supplied by the Canadian Legion.

SUNDAY, MARCH 30

0910 Hrs.—R.C. Church Parade.

1000 Hrs.—Protestant Church Parade.

MONDAY, MARCH 31

1900-2200 Hrs.—Scheduled inter-squadron games in the Commanding Officer's Trophy Series.

* * *

« DO YOU KNOW? »

That a speaker who does not strike oil in the first ten minutes should stop boring.—(Readers Digest.)

* * * *

That Italy's fastest aeroplanes are much slower than the British, and that many Italian soldiers are excellent runners.

* * * *

That Turkey, guarding the Dardanelles, has 1,000,000 men under arms.

* * * *

That as a result of the work of Florence Nightingale the death rate in the Crimean hospitals during the Crimean War fell from 42% to 2% in less than five months.

* * * *

That the height and width of the battleships of the United States are governed by the height of the Brooklyn Bridge and the width of the Panama Canal.

* * * *

That sound travels through water at the rate of 4700 feet per second and through the air at the rate of 1090 feet per second.

* * * *

That animals reflect their surroundings: their faces grow refined or stupid according to the people with whom they live. A domestic animal will become good or bad, frank or sly, sensitive or stupid, not only according to what its master teaches it, but according to what its master is.

* * * *

That the newest entertainment fad for home parties is the U. S. Army Air Force balance test for aviators. First, place a candlestick on the floor with a box of matches a foot to the right of it. Then,

18 inches back of the candlestick, place a heavy glass tumbler upside down. If you can stand on the tumbler on one foot while you bend down, pick up the matches and light the candle, without losing your balance, you may have a chance to become a pilot.

* * * *

That the literal meaning of the word "dirigible" is "capable of being steered".

* * * *

That a naturalized citizen of the United States enjoys all the privileges of a native citizen except one. He cannot become President.

* * * *

That only one-twentieth of the world's population lives south of the Equator.

* * * *

That Germany, in order to keep up with her agricultural production, is now using part of her airports.

* * *

"PLANE FACTS"

By L/AC Harland, M. W.

As far back as November 13, 1833, Rufus Porter of New Britain, Conn., constructed a model flying machine which he exhibited in Washington and in the Merchants Exchange, New York. This machine completed 11 circuits of a large rotunda on its own steam power.

* * *

Modern aerial cameras have almost uncanny powers. They can see where the eye cannot, through haze, fog and clouds.

THE AIRCRAFTMAN

Leigh Brintnell, Canadian bush flyer, once had to fly with 400 lbs. of ice packed inside the structure of one wing. Thus handicapped, he piloted the aircraft 100 miles, manipulating his own weight and strength to minimize the lopsidedness.

* * *

It takes an AA shell almost one-half minute to reach an altitude of 25,000 feet.

* * *

Aerial history is studded with narrow escapes almost approaching the stature of miracles, such as this: In 1920 Major Rudolph W. Schroeder, U.S. Air Corps, climbed to the record altitude of 33,113 feet. In an open cockpit, he endured the terrific temperature of 67 degrees below zero until his oxygen supply gave out. Major Schroeder lost consciousness and the plane dived almost to the ground, but just in the nick of time he came to and landed safely.

* * *

The transcontinental record, from Los Angeles to New York, of seven hours, twenty-eight minutes, twenty-three seconds, made by Howard Hughes in 1937, still stands, unbroken.

* * *

A Wing Commander in the U. S. is a Brigadier General; a Group Commander is of lower rank.

* * *

The first parachute jump, at least on this continent and perhaps in the world, was made by Captain Berry of St. Louis, Mo., in 1912.

* * *

In June, 1915, the late Flight Sub-Lieut. R. A. J. Warneford sighted and attacked a zeppelin from above. Five of his bombs dropped clear through the ship without exploding; the sixth one exploded and sent it to earth on fire. This was at 10,000 feet. On the way down a gondola, occupied by Helmsman Muhler, became detached. It crashed through the roof of a convent killing two nuns. Helmsman Muhler lived to fly again.

* * *

The first enemy bomb ever to land on England was dropped on Dover, Christmas Day, 1914.

* * *

It was not until February, 1916, that night flying was considered at all practical. Until then night flights were made only when absolutely unavoidable.

* * *

For a time during the first world war the British navy bore full responsibility for the air defense of Britain.

* * *

From start to finish of the first world war 12,787 British officer airmen and 3,836 N.C.O.'s and men were casualties.

What Are Men?

Contributed by a Lady Member of The T. T. S. Staff

Generally speaking, they may be divided into three classes, namely: Husbands, Bachelors and Widowers. An eligible bachelor is a mass of obstinacy entirely surrounded by suspicions. Husbands are of three varieties: Prizes, Surprises and Consolation Prizes. Making a husband out of a man is one of the plastic arts known to civilization. It requires science, sculpture, common sense, faith, hope and charity — mostly charity.

It is a psychological marvel that a soft, fluffy, tender, violet-scented thing like a woman should enjoy kissing a big, awkward, stubby-chinned and bay rum-scented thing like a man.

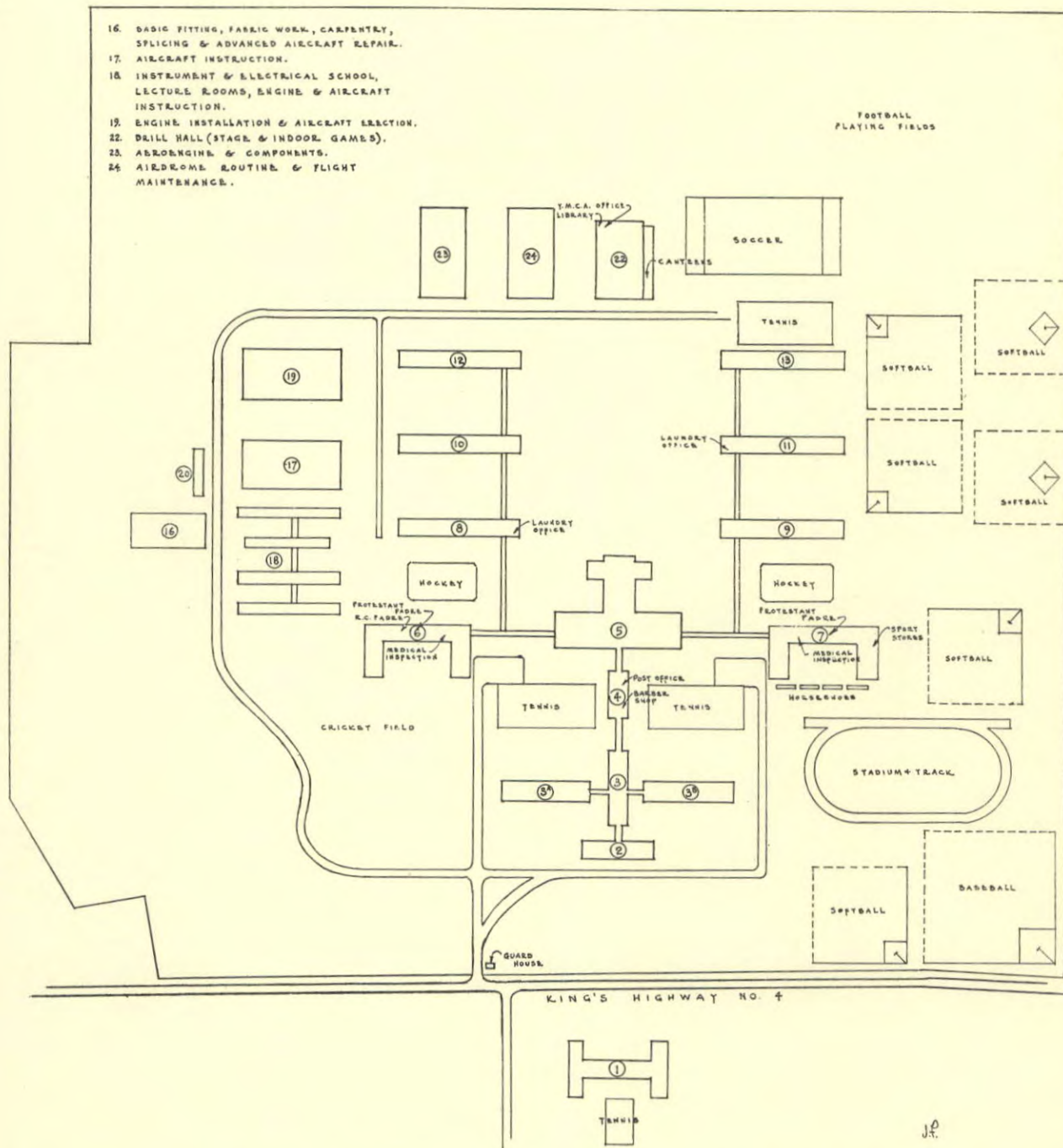
If you chatter to a man, it frightens him to death, and if you don't, you bore him to death. If you permit him to make love to you he will tire of you in the end, and if you don't, he will tire of you in the beginning. If you believe everything you cease to interest him, and if

you argue with him, you cease to charm him. If you believe all he tells you he thinks you are a sap, and if you don't, he thinks you are a cynic. If you wear gay clothes, rouge and a startling hat, he hesitates to take you out, and if you wear conservative colors and a tailor-made suit he takes you out and stares all evening at a woman in gay colors, rouge and a startling hat. If you join him in gaities and approve his drinks, he swears you are driving him to the devil, and if you don't approve and urge him to give up his gaities, he vows you are snobbish or too nice. If you are a clinging vine type he doubts whether you have a brain. If you are a modern, independent and advanced woman, he doubts whether you have a heart. If you are silly, he longs for a bright mate, and if you are brilliant, he longs for a playmate.

A man is a worm of the dust. He comes along, wriggles about for a while and, generally, some chicken picks him up.



THE AIRCRAFTMAN



PLAN OF TECHNICAL TRAINING SCHOOL

STATION COMMITTEES

* * *

P. S. I.

Squadron Leader N. McLeod (President)
Flight Lieutenant V. Cronyn (Secretary)
Flight Lieutenant H. N. Williams
Flying Officer W. L. Marshall
Flying Officer T. C. Shore

* * *

Airmen's Mess

Squadron Leader N. McLeod (President)
Flight Lieutenant V. Cronyn (Secretary)
Captain T. A. Sweet (Medical Officer)
Flying Officer J. D. Boyes (No. 1 Wing)
Flying Officer W. E. Tuer (No. 2 Wing)
WO/2 Chippetts (N.C.O. for Cookhouse)
Airmen Representative (No. 1 Wing)
Airman Representative (No. 2 Wing)
Airman Representative (H.Q. Squadron)

* * *

Library Committee

Flight Lieutenant G. W. Porter (President)
Mr. D. Stuart, Y.M.C.A. (Secretary)
Two Airmen Representatives

* * *

Canteen Committee

Squadron Leader E. Peacock (President)
Pilot Officer W. E. Tuer (Secretary)
Flying Officer E. D. Armour
Two Airmen Representatives

Sports Committee

Flying Officer G. A. P. Brickenden (President)
Flying Officer L. B. Merrell (Treasurer)
Warrant Officer L. S. Stubbs
Flying Officer J. D. Boyes
Flying Officer F. Green
Flying Officer E. D. Armour
Mr. E. McEwen, Y.M.C.A. (Secretary)
Sergeant F. C. Hilton-Sargent
Sergeant LaChance

* * *

Fire Committee

Squadron Leader N. McLeod (President)
Flying Officer O'Neil (Secretary)
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Officer Commanding No. 1 Wing
Officer Commanding No. 2 Wing
Squadron Leader H. S. Adkins
Mr. McLachlan (Station Engineer)
Sergeant-Major M. H. Mills (R.C.A.M.C.)

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Entertainment

Flight Lieutenant H. W. Williams
Flying Officer G. A. P. Brickenden
Flight Sergeant O. R. Alty
Warrant Officer C. Taylor
Flight Sergeant M. J. D. McGuire
Mr. E. McEwen, Y.M.C.A. (Secretary)

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Welfare Committee

Flight Lieutenant G. W. Porter (President)
Flight Lieutenant E. B. Howard
Flight Lieutenant M. C. Davies
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TECHNICAL TOPICS

CONSIDERATIONS OF WEIGHT-SAVING IN AEROPLANE CONSTRUCTION AND DESIGN

The importance of weight-saving in the construction of aeroplanes cannot be over-estimated. It is a prime consideration that enters into every phase of design and manufacture, from the initial layout down to the determination of the sizes of the most unimportant fittings or the thickness of a coat of wing dope. To this end is directed the skill, not only of draughtsman and technician, but also of metallurgists, engine designers and the suppliers of accessories and components.

* * *

The Suppression of Superfluous Weight

It is not perhaps generally realized what really startling results have been achieved in the suppression of the superfluous pound. For instance, a marine internal combustion engine, for which the weight question is not of supreme importance, to develop say, 2,500 h.p. would weigh about 80 tons. The engine with which Great Britain finally captured the Schneider Trophy in 1931 was made to develop exactly that horsepower for a weight of less than 1,700 lbs. This result was not accidentally achieved, but was the result of prolonged organized concentration on a particular objective.

One is, however, apt to forget that weight is not actually wasted in the marine engine; it is simply the result of sound design, in which refinements are "not worth while." The comparison is quoted here to illustrate the astonishing fact that when refinement is "worth while," 79 $\frac{1}{4}$ tons of the 80-ton engine can be discarded.

What Is Meant by Weight-Saving?

There is no similar basis of comparison for estimating the extent of weight-saving refinements included in the construction of the airframe itself. But the same amount of care and skill is devoted to its achievement and there is no reason to believe that it has been less successful. But in order to estimate the magnitude of the success it is necessary to understand what exactly is meant by weight-saving.

It obviously means something more than just building light aeroplanes. The most uneconomically designed single-seater or two-

seater is a "lighter aeroplane" than one of the Empire flying-boats, judged purely on the basis of total weight. There is clearly no direct standard of comparison between the two types.

Structure Weight

An accepted indirect standard exists and is commonly used, whereby different types are compared on the basis of "structure weight." For instance, an aeroplane whose "structure weight" is only 45 per cent. of its "total weight" is, other things being equal, a lighter aeroplane than one whose structure weight is 55 per cent.

Unfortunately, this is not quite all. It would be possible to go on adding non-structural weight to the second of these aeroplanes until the percentage of structure weight is down to 45 per cent. It would in all probability still continue to fly, at approximately the same top speed. The climb would be adversely affected, and, more important still, the minimum landing speed would be greatly increased. But the two aeroplanes, one of which is uneconomically built, would none the less show that same structure weight percentage—45 per cent.

The Landing Speed

Obviously the standard needs elaboration to cover this discrepancy, and the landing speed criterion affords a very convenient means of doing so. A certain rather arbitrary scale of landing speeds has come to be accepted as customary. Small single-seater aeroplanes are expected to land at not much over 40 m.p.h.; larger aeroplanes of all types lie within the zone of 55 m.p.h. to 80 m.p.h.; racing aeroplanes up to 100 m.p.h., or even more. These speeds are determined by the average size of aerodromes and by the general nature of their surfaces.

For this reason, marine types, which are not hampered during landing by the presence of boundary obstacles, etc., may be permitted a higher landing speed than land types.

Rate of Climb

These arbitrary landing speeds involve, in general, a satisfactory rate of climb. Although research has recently almost perfected various devices for lowering the safe landing speed, these low speeds are not necessarily accompanied by a corresponding increase in the rate of climb. A certain amount of caution must therefore be used in comparing aeroplanes on the basis of weight economy—the facts to be

considered being percentage structure weight, minimum landing speed and climb.

Slots and Flaps

The fact that aerodynamic devices, such as slots and flaps, may be employed to lower the landing speed immediately brings them under the classification of "weight-saving." They will not, however, be discussed in this article; we may perhaps be allowed to excuse the omission by terming them "lift-increasing," and thereby avoiding the issue.

The Process of Weight-Saving— Passenger Aeroplanes

The process of weight-saving proper begins with the original conception of the aeroplane or on the specification to which the original conception conforms. In the case of civil types for commercial use, certain concessions must be made to obtain a necessary standard of comfort for the passengers. If the minimum of comfort is not attained, passengers will not be induced to fly in them and companies will not be induced to buy them.

On the other hand, an excess of comfort may involve the use of more powerful engines and larger wing areas, with the consequent increased operating expenses and higher fare rates. The mean is determined by the fare-paying public, who rapidly make clear just how much they are prepared to pay for comfort.

Service Aeroplanes

With service types, weight-saving in its initial stages should begin with the reduction of equipment and of the weight of individual items of equipment, to the minimum consistent with the efficient operation of the aeroplane. This ideal state of affairs is not often realized, for when the design of components is in the hands of experts, practical considerations are generally overlooked. In addition, a great deal of equipment of problematic value must sometimes be included in the service load and a general tendency towards greater and greater complication is making the cost of high performance excessive.

These aspects of weight-saving must be considered in the very earliest stages of design and are of interest more to the economist and the tactician than to the aero engineer. Once the equipment to be carried has been decided upon, the question of the lightest method of installing it becomes an engineer's job; this will be discussed later.

Strength Requirements

The matter of strength requirements is next in importance in regard to weight and is, in most countries, out of the direct control of the aeroplane designer. For civil types the Air Ministry has laid down more or less permanent

strength requirements to cover the different categories; for service types, a book of design requirements, compiled by the Air Ministry, is supplemented by individual strength requirements incorporated in the specifications.

These latter strength requirements determine to a large extent the percentage of structure-weight in the completed aeroplane. They are based upon empirical figures relating to the aeroplane in various air manoeuvres, during landing and catapulting. The success or otherwise of a new type depends largely upon the wise choice of these empirical figures. If they are chosen too high, the structure will be heavy; if too low, then catastrophe may occur.

Up to this point, the designer has had to sacrifice weight to the demands of the economist, the tactician and the Air Ministry. He is now free to turn to those who can assist him in his struggle to make up the weight thus lost. His best friends are the engine designer and the metallurgist.

The Engine Designer

Every year the engine designer increases his knowledge and experience, enabling him to produce engines with a greater horsepower per lb. of weight than ever before. He, too, is assisted by the metallurgist, the physicist and the chemist who supply him with fuels and oils and cooling liquids to satisfy his requirements. This team has, as we have already noted, produced a special engine for the Schneider Trophy, developing 2,500 h.p. for only 1,700 lbs. weight. This, of course, was a highly specialized production, suitable only for the exigencies of wresting the world's speed record from our competitors. But the knowledge thus gained has put us within sight of the coveted attainment of 1 lb. per horsepower on an engine suitable for regular and continuous service.

The Metallurgist

The accomplishments of the metallurgist are hardly less astonishing and are certainly more mysterious to the uninitiated. For years the desirability of a high ratio of strength to weight has been recognized. The science of alloying steels and other metals had been desultorily investigated and certain advances made. The advent of the aeroplane made it in a single decade one of the most important branches of science. Steels of any desired combination of strength, ductility and hardness can be produced almost with mathematical precision.

Specific Strength of Metals

The most important, for the aero engineer, of these improved properties is what is termed the "specific strength." This is the ratio of

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"strength" (in lbs. per square inch) to "weight" (in lbs. per cubic inch). This gives a number which denotes, in the proper units, the length of wire or bar of constant section which can be suspended before its own weight breaks it.

For instance, an ordinary 50-ton steel (i.e., a steel which can support 50 tons per square inch in tension) has a strength-weight ratio corresponding to $6\frac{1}{4}$ miles; in other words, it is possible to suspend $6\frac{1}{4}$ miles of 50-ton steel before its own weight breaks it.

Comparison of Steels

It so happens that all steels of whatever strength have roughly the same weight per cubic inch (about 0.283 lbs.), so that the specific strength of steels may be suitably compared by reference to their simple strength, e.g., 35 tons, 50 tons or 85 tons. Steels have indeed been produced having a strength of over 100 tons per square inch (specific strength of $12\frac{1}{2}$ miles).

How Metals Are Compared for Aeroplane Design Purposes

For aeroplane design purposes, the simple comparison of strengths of materials without reference to their weight is of no value, especially since the introduction of the light alloys of aluminium and magnesium. The aluminium alloys (dural) weigh only about 0.101 lbs. per cubic inch, yet their strength is about 25 tons per square inch.

Comparison of Dural and Steel

In order to compare the qualities of dural with those of steel we need to work on the basis of specific strength. A 25-ton dural has a specific strength of $8\frac{3}{4}$ miles, which is about equal to a 70-ton steel. On this showing, dural is as good as steel for the manufacture of aeroplanes.

There are, however, certain practical difficulties connected with the use of dural, and its corrosion-resisting qualities are not perfect, owing to the fragility of its protective anodic coating. Taken all in all, there is not much at present to choose between steel and dural for structural purposes. This fact, in itself, is a triumph of the metallurgist, in increasing the strength of aluminium from only 10 tons per square inch until it is able to compete on level terms with steel, the strongest of the known metals.

It is now the province of the designer to ensure that the advances thus made in the struggle to save weight are not lost by failure to comply with the accepted principles of good design. Whether the aeroplane is destined for commercial or for service use, the Air Ministry sets forth certain minimum strength requirements, beyond which attempts at weight-saving

must not go, but down to the very limit of these requirements must the structure of the aeroplane be designed.

The Reserve Factor and What It Means

For the purpose of determining at a glance by how much any member of the structure exceeds the minimum strength requirement, its calculated strength is quoted in the records in terms of a reserve factor. This factor shows by how much the member exceeds the permissible minimum strength.

For instance, a member that has a reserve factor of 1.1 is 1.1 times as strong as it need be theoretically; or, in other words, it exceeds by one-tenth or by 10 per cent the minimum strength required. This method of quoting comparative strength provides the designer with a sort of persistent finger-post, pointing the narrow way that lies between "not light enough" and "not strong enough."

The perfect aeroplane, designed strictly in accordance with theoretical principles, would have reserve factors of exact unity at all points on all members when in their most heavily loaded conditions.

Apart from the dangers of designing aeroplanes in this exact manner, practical considerations determine that reserve factors shall often exceed unity by as much as 100 per cent or even more. For instance, consider a horizontal tube, supported at each end and carrying a weight suspended at its mid-point. The minimum strength required of this tube is very high in the middle, falling away to practically nothing at the ends.

To design this tube to fulfil these requirements with no waste of weight would necessitate tapering the tube in diameter or in thickness or both. Since, however, in the interest of economy, the tube must necessarily be purchased out of some manufacturer's stock, it must in general be a plain cylindrical tube, of constant thickness, based on the required minimum strength of the tube at the centre of the span.

Further, since the tubes are not available in an infinite range of thickness but are produced only in conformity with the standard gauges, it is only by chance that a tube may be selected to give a reserve factor of unity even at the centre point only.

Materials Must Be Subject to the Closest Scrutiny

It can, therefore, be seen that the designer's efforts to save weight must be subject to the size and thickness available in the structural material. He still, however, aims at the ideal of "reserve factor equals unity," and in accordance with the ordinary laws of chance he some-

times attains it. Hence it is evident that the materials which he employs must be continually subject to the closest possible scrutiny by independent judges. For who can say whether an apparently slight defect in some item of material may not bring some vital part of the structure below the minimum safe strength?

The Aeronautical Inspection Department

These independent judges are officers of the Aeronautical Inspection Department—the A.I.D. These men, highly skilled in the testing and examination of materials and completed parts, are stationed at all approved firms producing materials or components destined for use on aeroplanes, and in the actual aircraft factory as well, where they are free to examine every item before, during and after its assembly into the aeroplane.

When Material Is Found To Be Below Specification

Any batch of material or manufactured article that is found to be in any way below specification is reported by the A.I.D. to the manufacturer or (in the case of service types) to the Air Ministry's accredited representative, the resident technical officer. Enquiry into the ultimate destination of the item may reveal, on the one hand, that the defect will reduce some reserve factor to below unity, in which case the item will be scrapped; or, on the other, that the strength, even including the defect, may be satisfactory, in which case a special concession is issued to enable the item to be used.

The Value of Impartial Supervision

The very complicated system of inspection which must be organized to deal with the procedure laid out in the preceding paragraph has often been blamed with increasing the ultimate cost of aeroplanes, and with delaying the completion of important contracts. Whether or not that is true, it must be remembered that it is only strict, impartial supervision that enables designers to pare away excess metal, and to machine down structural parts to the ultimate limit of safety. It contributes, in fact, an important element in the cause of saving weight by permitting the reduction of strength requirements to the lowest figures consistent with safety.

The foregoing paragraphs have been devoted exclusively to the study of weight-saving in its broader aspects. It has been seen that the eventual weight of an aeroplane is going to depend upon the original demands of the specification as regards load, accommodation and comfort, upon the strength requirements as laid down by the Air Ministry, upon the success of the engine designers and metallur-

gists and upon an impartial system of inspection. Each of these falls, strictly speaking, outside the immediate scope of aeroplane design. We will now turn our attention to the design considerations involved, dividing them into two groups—structural and detail.

* * *

STRUCTURAL DESIGN

There has, of recent years, been a marked swing-over in the trend of aeroplane design from biplane to monoplane. It is interesting to note that this swing-over is not due to any fundamental change in the problem confronting the designer. Now, as always, the aim is to produce high speed aeroplanes of low structural weight. And yet, where a few years ago there seemed to be an almost general acceptance of the biplane as the more efficient structure, the general acceptance of the monoplane is today almost as complete.

The Monoplane-Versus-Biplane Controversy

It is not proposed to enter fully into the pros and cons of the monoplane-versus-biplane controversy, nor to analyze the conditions which have brought about the swing-over to monoplanes; but one aspect of the question illustrates very aptly the point at which the designer has to start to compromise in the science of saving weight.

Why the Biplane Is Structurally More Economic

Structurally, the biplane is more economic than the monoplane. The wings are supported upon a deep base, composed of the upper and lower pin-joints, and the spars themselves are supported each at two points, the inner and outer wing joints. The base upon which the monoplane wing is supported consists of the upper and lower booms of the spars and is limited by the depth of the wing section. In addition, the wing, if fully cantilever, has only one point of support—at the root. If semi-cantilever the wing is, indeed, better supported, but the external bracing struts involved greatly diminish the cleanness of design.

It therefore appears that a monoplane wing must be thicker than a biplane wing in order to be able to utilize the deepest possible base at the root; it must also be deeper and more strongly constructed throughout in order to take care of the additional loads due to the cantilever system of support. On both of these counts, the monoplane wing must in general be heavier than a pair of biplane wings.

High Speeds Have Led to the Adoption of Monoplane Construction

Judged on a weight-basis, this would normally exclude monoplane construction from

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practical consideration, and until high speeds became obtainable the biplane did, in fact, hold almost undisputed sway amongst non-racing aeroplanes. But high speeds have completely changed the outlook; for the drag set up by the struts and bracing wires of biplanes became of such magnitude that the additional horsepower required for a given speed more than absorbed in the form of additional engine weight the savings that could be effected by using biplane construction.

At this point the reign of the biplane ceased and is not likely to recur. Perhaps for the slow transport of heavy freight and similar purposes they may retain a humble place, but if advance continues along the existing lines, there would seem to be no hope for the biplane in the more aristocratic classes.

This apparent diversion has been introduced to illustrate the two sides of design, i.e., on the one hand there is the scientifically conceived economic structure which will support a greater load than any other type of structure of the same weight; on the other, there is the purely practical structure conceived with full appreciation of the ultimate effect of its various features.

The Design of Braced Fuselages

A similar problem presents itself in the design of braced fuselages. Theoretically, a braced fuselage could be designed of such a form that the weight for any given length and enclosed volume would be a minimum. Such a theoretical structure forms a sound basis upon which to develop a practical fuselage, but it will normally be so modified in the process that the original form will be unrecognizable. The external shape will be altered to conform with the general streamline: the internal bracings must be moved or modified to make way for accommodation of passengers, crew or equipment. Also, struts of more than a certain length are rendered inefficient by eccentricities involved in their manufacture; and tubes with very thin walls are unsuitable on account of the likelihood of secondary failure. All these points must be considered, yet each deviation from the theoretical structure inevitably leads to some increase of weight.

It is upon such considerations as these that the nature of the aeroplane structure must be determined, and upon them also depends the material employed.

Two Main Groups of Metal Structures

Roughly speaking, metal structures are divided into two main groups, viz., (a) frame, and (b) monocoque or stressed-skin. The framed structures are again sub-divided into two further groups, (a) welded, and (b) non-welded.

None of the above-mentioned types can claim any clear predominance over the others on the basis of overall strength/weight ratio. Theoretically, a case can be made out for monocoque construction, but the calculated minimum thickness of the plates is often too small for practical use, the resulting structure must in consequence be built up of plates whose thickness is determined not so much from strength considerations as from suitability for manufacture and general handling. This clearly indicates that for aeroplanes which exceed a certain gross weight, monocoque wings can be built to give a satisfactory efficiency as regards weight and strength.

The Question of Material

When, therefore, the type of structure has been decided, there remains the question of the material which is to be used in its development. Nowadays, wood has been almost entirely superseded by metal, but it is worth while noting that supersession did not take place on account of the inferiority of wood when judged from the point of view of weight. The deciding factors were primarily that the supply of wood suitable for the purpose was both inadequate as regards quantity and unreliable as regards quality. After a certain point, it was certain that aeroplanes were destined to be built almost entirely of metal, of which the quality and strength can be controlled and improved and of which the supply is practically inexhaustible.

Of the metals, a good deal has been said in a previous paragraph regarding the comparative strengths of steel and aluminium alloys. It was shown that on the basis of specific strength, duralumin is more suitable than steel for the production of aeroplanes. It is, however, a fact that aluminium, which occurs naturally in inconceivable quantities as a constituent of clay, is yet far more expensive than steel.

Inherent Disadvantages of Aluminium Alloys

Expense alone would not, it is true, account for the very wide use of steel in spite of the apparent advantages of aluminium alloys. The true reasons are to be discovered in certain inherent disadvantages of aluminium alloys, notably the large amount of distortion that occurs under load and also the liability of the material to local failure when used in the form of thin-walled tubes and thin sheets. In addition to this, they may not be cold worked except within a short period after heat-treatment, this introduces a certain amount of additional complication in workshop practice.

These, and certain other aspects, must be considered before the decision can be made between steel and dural or other aluminium

alloys. Between the steels themselves similar decisions must be made. It would obviously be satisfactory, other things being equal, to employ the steel having the highest tensile strength in order to produce the lightest structure. For all steels, of whatever strength, weigh roughly the same, so that of any two members of equal strength, the lighter will clearly be that made of the stronger steel.

But, unfortunately, the strongest steels are very unsuitable on account of their extreme hardness, which renders them difficult to work with ordinary workshop equipment. They may not be heat-treated for bending or other purposes without special precautions and special equipment. Steels of somewhat lower tensile strength are not subject to these disabilities, but they may not be welded, which puts a restriction upon their use. It is therefore clear that, in order to effect the maximum possible saving in weight, the materials of construction must be selected with considerable care and with a complete knowledge of the difficulties and disadvantages which attend the employment of each one of them.

* * *

DETAIL DESIGN

The final stages in which weight may be saved occur during detail design; this must be taken as covering the design of both structural and non-structural components. It is clearly useless to go to great lengths to design a light structure, if the weight saved is to be thrown away in careless installation of equipment and secondary parts, such as tanks, instruments, wireless, or accommodation.

Structural Components

Let the structural components be considered first. As an example: For consideration we will confine ourselves to tubes, but the conclusions arrived at will be equally applicable to most other stressed parts.

When the Load Is One of Tension Only

Suppose that a member is to carry a certain maximum load, say 8,000 lbs. If this load is one of tension, the member never being subjected to a compressive load, the problem is immediately simplified. The strength of the member can be determined immediately from its minimum cross-sectional area. Since the weight of the end-fixings will be least when they are most compact, it will be necessary to give the tube the least possible outside diameter. In short we are able to use a wire. This is the ideal as regards efficiency, the total weight of the member plus end-fixings being less than any other type of member carrying a similar load.

When the Member Is Subjected to a Compressive Load

If, however, the member must sometimes be called upon to carry a compressive load, even though the maximum load is tensile, a wire will no longer do. A tube must therefore be selected whose area is just sufficient to carry the maximum tensile load, but which is also sufficiently stable to be able to carry the maximum compressive load. This stability depends upon the ratio between the length of the tube and its radius of gyration (which is a fraction of the diameter). In other words, the stability depends upon a value derived from the ratio length/diameter approximately—the greater the value of the ratio, the less is the strength of the tube.

Since the length of the member is generally determined by the geometry of the structure, the lightest member is one that has the greatest diameter. And since the minimum cross-sectional area is already determined, the wall thickness will decrease as the diameter increases. The limit of increase in diameter is set by the necessity of devising the end-fixings to be as compact as possible and also by the unsuitability of very thin-walled tubes. The choice is further limited by the diameters and thicknesses which are available "from stock" at the manufacturers. These limits so circumscribe the choice that there is usually an obvious size and gauge for the best design of any specified member.

It may transpire that a member has been originally designed to be of such a length that the necessary diameter and gauge (wall thickness) must be so increased that the weight becomes prohibitive. In this case it may often be found that, by redesigning the structure and thereby shortening the members, even at the expense of increasing their number, the weight of the total structure will be reduced.

Plug-Ends and Sockets

As regards end-fixings, plug-ends and sockets, these are clearly dependent upon the internal and external diameters of the tubes, respectively. Every practical refinement which will eliminate unnecessary weight should be incorporated in the design.

This will include tapering the wall-thickness of plug-end shanks, bevelling or complete elimination of the shoulder, rounding of the lugs by means of spherical machining and the reduction of the radius on milling tools to a minimum. None of the above seem to be of any separate importance, but in the aggregate many valuable pounds may be saved.

Bolts or Rivets

As regards the bolts or rivets with which

the tube is attached to its end-fixings. The details of the system of bolts or tubular rivets, used in conjunction with ferrules and distance tubes, are considered. By this system weight is saved not so much by the virtual reduction of shank diameter (between the inner ends of the ferrules) as by the smaller nuts and bolt heads which are required.

The use of high-tensile steel bolts effects further saving in exactly the same direction; this steel is also widely used in order to afford a reduction in size of the fork-ends and shackles used in conjunction with swaged rods or streamline wires. The fork-ends and their pins are manufactured to standard shape and sizes, specially designed to effect the greatest saving in weight consistent with the required strength.

Reinforcement

Up to the present, consideration has been given only to the various methods of saving weight by elimination of superfluous material. A second method is available, which consists in utilizing members that are not of themselves sufficiently strong at all points in their length and reinforcing them at the points of weakness. This method is very generally employed for wing spars, metal wing coverings and other long members, which are ordinarily subjected to loads of varying intensity along their length.

The Cantilever Wing Spar

In the case of a cantilever wing spar—to quote the simplest example—the loads, due to bending in the booms, increase from zero at the wing tips to a maximum at the wing roots. If the booms were to be designed with constant section of a strength throughout sufficient to carry the maximum load, a great deal of weight would be thrown away by making them unnecessarily strong near the tips. On the other hand, it is not normally feasible to attempt to make spar booms that taper in either diameter or thickness—in other words, from a practical point of view it is almost a necessity to manufacture booms from parts having a constant section (such as tubes of some sort of constant diameter and thickness or plates of constant width and thickness).

This quandary is overcome by making the main part of the boom just sufficiently strong to carry the load at a point, say, half-way out along the wing. From this point inwards the boom is strengthened by means of a secondary

boom telescoped over or into the main boom (in the case of tubular booms) or firmly attached outside the main boom (in the case of plates). As the load increases towards the root, further reinforcements may be applied as above. As a result, the strength of the boom at any particular point never greatly exceeds the minimum strength required; hence the weight of the complete spar approaches closely to the minimum attainable.

This system of reinforcement is employed also to strengthen thin-walled members at points subjected to severe local loads, such as at the attachment of struts or bracing.

Non-Structural Components

So far as non-structural components are concerned, common sense is of more immediate importance than technical ability. Apart from making all attachments, etc., of scientific construction, attention should be given to the following points:

It must first of all be proved beyond all doubt that the component under consideration is a necessity, or, at the very least, that the advantages accruing from its presence more than compensate for the additional weight. As an instance, it would be foolishness to add a retracting gear to an undercarriage unless the increase in speed be appreciable.

Secondly, a fair estimate should be made of the loads likely to occur in the part, and the conditions under which these loads operate. The part should then be designed accordingly.

If it is a matter of fitting equipment, due regard should be given to the position in which it is placed in the aeroplane, as in this way the length of operating mechanism, etc., may possibly be reduced. The position of the centre of gravity of the complete aeroplane must, however, be considered in connection with locating equipment; the latter should not be in such a position that ballasting will become necessary.

It is further advisable to make every effort to utilize existing structure for the attachment of equipment wherever possible or alternatively to locate it so that the least amount of subsidiary structure is required. At the same time, the main structure should not be so weakened by the attachment of secondary components that strengthening has to be employed—though it must be admitted that this state of affairs is sometimes unavoidable.



