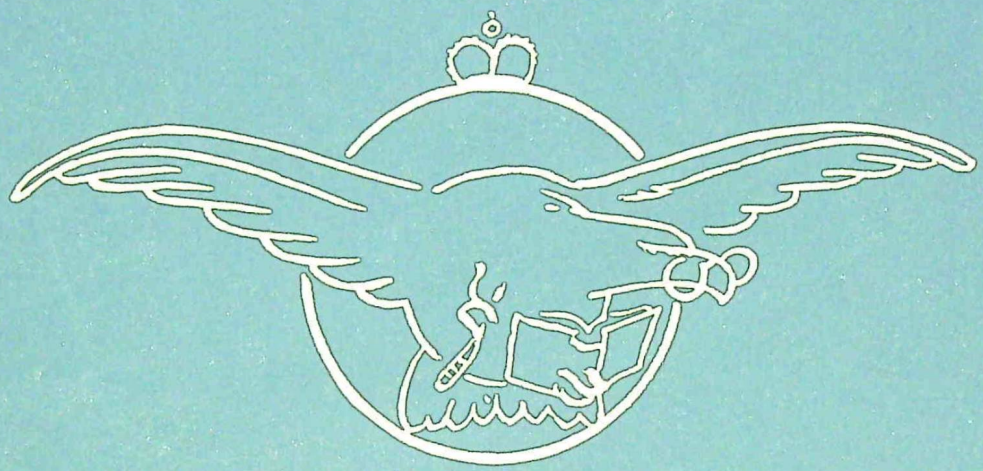
TEE EMM



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Pilot-Officer Prune says—
"Take Tee Emm *regularly! Prevents that Thinking feeling!"*

I hope that these Training Memoranda will be widely read and studied, since I am certain that they will help us all to improve our efficiency, not only in our training but also in operations against the enemy.

Air Chief Marshal, Chief of the Air Staff

SHOWING OFF

SOME while ago a certain young man distinguished himself by making a parachute descent on the flat top of an inaccessible mountain in the United States. " How daring ! " " How clever ! " shrieked the populace. Then it turned out that he couldn't get down ; nor—for after all it was an inaccessible mountain—could anyone be expected to get up to rescue him. Aeroplanes and airships had to be employed to drop supplies of all kinds and to try to take him off, and after much trouble, expense, and waste of many people's time, skilled mountaineers managed at last to scale the mountain for the first time and got him down at great risk of their own lives. " How ruddy silly ! " shouted the populace. This time they were dead right.

What was at the back of this damfool stunt, in which, mark you, the hero didn't risk merely his own neck or own money ? Nothing, when you come down to it, but a desire to show off. Exhibitionism.

Now the lines between pure, reckless exhibitionism and daring, and between daring and reasonable regard for safety, and again between the latter and excessive caution, are all very thin ones. But the gap between the first and the last, between sheer recklessness and over-caution, is big. Both are bad habits for anyone, and particularly for pilots flying aircraft. The really good pilots are always found somewhere in the gap. Both the wildly reckless pilot and the super-cautious pilot are bad pilots.

We aren't out to talk here about the over-cautious pilot. He is not so noticeable ; because he isn't pulling his weight and so doesn't have to be noticed, he is not such an obvious menace. Nor are we out to talk about the pilot who is recklessly daring in the course of actual operations, or in properly authorised low-flying practices, such as low flying against ground targets. But the Exhibitionist, the show-off, the pilot who takes wild chances with his aircraft, with his life, and frequently with the lives of others, just in order to prove to the world at large, or to some friend or relation in particular, that he is able to fly—he is just dying to be noticed, and doesn't in the least mind breaking the regulations to get that notice. Just like our mountain-squatting idiot, he thinks that, as he dives proudly on his home village, earthbound civilians are saying, " How clever ! How well he flies ! " Does he ever think at the same time that other earthbound civilians may be saying, " How dangerous ! " And that any expert who sees him may be saying, " Ruddy young fool ! Hasn't he been told how much a modern aircraft sinks when it is pulled out of a dive, or how quickly it stalls in a turn." And that the sick people in the Cottage Hospital are not as appreciative as they might be ? And that the blitzed-out evacuees do not at all care for the sound of aircraft just overhead ? And that the two soldiers on convalescent leave who had ten days' dive-bombing in Crete are not having their health or temper improved ; in fact, are feeling they'd like just to get their hands on him for a few minutes ? Does any of this penetrate to his mind ? It cannot ; he is too well armoured in his own conceit.

Indeed, he is only thinking of the time when he will get leave, and the girl friend at the end of the road will say, " How marvellous ! I *never* thought you were going to clear those trees ! " And his mother will say proudly in his presence, " That was *my* boy flying over here the other day ! " And his aunt will say, " How beautifully you've learned to fly in such a short time ! " And his small brother will say, " I hope I can soon be a *real* pilot like you ! "

Real pilot be sugared. Real little show-off, more like ! A real pilot is an experienced craftsman who plies his trade honestly without endangering other people's lives in the aircraft he is paid to fly. He doesn't think of jeopardising that aircraft or his training, both of which have taken a lot of skilled men's time and taxpayers' money. He realises his proper duty to them, not his self-deluding duty to his own ego. For if he does not, one day he'll have a rude awakening. Not such a hero then—assuming he's alive. *Sans* rank, *sans* aircraft, *sans* everything to show off about, he'll be just a foolish little figure who didn't realise there was anything better to do with an aeroplane than to use it as a sop to his own conceit.

Here's a question—for those to whom the question applies : You wouldn't deliberately kill an air crew and bust up an aircraft just to show the world what a cracking fine fellow you are ! Why then *risk* doing it for the same inadequate reason.

ASSESSING YOUR WORTH AS A FIGHTER PILOT

Prune knows his *worth.*

Before the war the training of the fighter pilot in fixed gun sighting was almost entirely done by air firing against towed targets. In those days the performance of our fighters was only about half what it is to-day, and although targets could not be towed at even those speeds the discrepancy was not great enough to prevent effective training. But to-day we have fighters with top speeds of more than 350 m.p.h. and they are firing at targets which cannot be towed at speeds much over 160 m.p.h.

Now firing at towed targets gets a pilot used to firing his guns and teaches him that to hit a target in the air he must aim ahead of it, unless he is directly astern or ahead ; but that's about as far as it goes. The amount of deflection needed for a towed target simply cannot compare with that for an F.W.190 ; nor will the approach you make be much use in tackling a Do.217.

The obvious answer, of course, is to make the T.T. go faster, but it's not a good answer in actual practice. Faster towing aircraft and better towing gear are being developed, but it is almost impossible to make a target which is big enough to be fired at and yet can be towed at anything like the speed of the present day fighter. All the same a fighter pilot *must* practise under conditions as nearly real as possible, if he is to have a chance in his first combat, and it is for this reason that the cine-camera-gun was first developed. To-day it is the primary instrument for training in fixed gun sighting.

Though the supply of these cameras has been slow, every fighter now at last has one, and the quantity of film taken, both in training and in actual combat, is considerable. While of course this is a Good Show, it is quite apt to become a Bad Show ; for unless a pilot learns something from his films, all the time and money which have gone into providing him with the cine-camera will have been wasted.

The film which the camera produces is capable of telling the pilot everything he wants to know : the range at which he opened fire, the length of the burst, whether he missed or hit, where he aimed, where he should have aimed. In the past the accuracy with which all this has been got from the film has depended to a great extent upon the experience of the assessor, and unfortunately the answers have not been much more than general ones—differentiating the good from the bad, rather than the hit from the miss or the intention from the performance. But this wasn't due to any lack of keenness on the assessor's part ; rather was it the lack of any simple yet accurate means of assessing. Now at last we have it.

The cine film assessor fixed gun, to give it its official name, will be issued

within the next few months on the basis of at least one per Fighter Command Station. We can't here go into a long explanation of how this gadget works: first of all, we're not sure if we understand it ourselves, and secondly not only will full instructions be issued with each one, but there will be somebody on your Station who'll know how to use it. So when you first see it please don't go all contemptuous and think of it as just another doodinkus far too complicated to be bothered about. Film assessing accurately *is* a complicated business, but this instrument will do it as quickly and simply as it is possible to do. Of course, you may say that it's really unnecessary to know the correct deflection to within a few feet, but experience has shown that a pilot's error tends to be systematic. He is liable to make the same mistake over and over again, and after all a few feet is quite a lot, when you're trying to hit a pilot or an engine.

So get assessor-conscious right away—ready for when it comes. It will show you why you missed that 109 the other day; or, better still, it will teach you to put it right next time. Make use of it! Never take a film without having it assessed or assessing it yourself. This may take up more of your time at first than you like, but remember that all your time should be devoted to making yourself into an ace pilot. The whole of a fighter-pilot's training is directed towards the moment when he has the enemy in *the right place* in his sight and is about to press the button. It's up to you to know the right place.

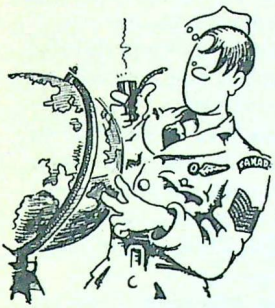
And after all, if you are casual enough or lazy enough to leave fixed gun sighting until your first combat, not only will you be a menace to yourself and your Squadron, but you will have let down all those who have struggled over many months to make you an efficient fighter pilot.

THIS MONTH'S PRUNERY

THE MOST HIGHLY DEROGATORY ORDER OF THE IRREMOVABLE FINGER (Patron: Pilot Officer Prune) has this month been awarded to Pilot Officer —— for Conspicuous Procrastination.

This Coastal Pilot, when due to take off on a practice flight, found that the safety pins had not been removed from his practice bombs. Thinking that the responsibility for the task rested with the ground crew, he waited for one hour till an armourer was available and then carried out his flight. In point of fact, the responsibility rests with the Bomb Aimer, who in this case was himself.

CREW NAVIGATION



The navigator knows the world.

The Navigator is, or thinks he is, the " key man " of the crew. Maybe he's right. After all the main idea of a bomber is not merely to fly, so much as to fly *somewhere* and then get home again. *But* navigational problems can be much more easily solved if navigators let the rest of the crew help them.

Let each chap feel that he takes some active part in the navigation. As indeed he should. After all, you depend on the pilot's careful flying for Astro and loop, on his accurate courses, heights, and airspeeds, and on many other things that he can do for you. Loop work and the odd Q.D.M. should come from the W/T.Op., and your rear gunner should be able to cope with drift taking. Your gunners and pilot should also be able to give you a hand with map-reading, but don't forget that if you are the only man (in the kite) who has a set of maps, it's up to you to verify all pinpoints. This isn't being a doubting Thomas ; it's merely using a bit of commonsense, and you need all of that you've got. The main thing is that if you're going to get help from the other lads in the aircraft, it's up to you to make the best of it. Above all, be versatile yourself. There are a lot of ways of navigating these days ; you ought to be on the top line in them all.

But the pilot can help.

The basis of everything of course is, as we pointed out in our article last month, sound D.R., and this you should have from the Navigation School and O.T.U. Some of your training stuff you can apply completely to operational work, but some you'll have to modify a bit. No doubt you do keep an Air Plot, but do you do it merely because there's a stink if you don't ? Why not try to keep one just to please yourself, and so realise what a help it can be ? It's a good thing to plot the courses in a different colour from the tracks, but the trouble with trying to keep the Air plot in colour is that few coloured pencils can be kept sharp enough for accurate work. One easy way is to draw your tracks in colour, and use ordinary pencil for the courses. An average Air Plot wind from Base to Target can be used with great success on the return trip, but as Prune says, " What about evasive action ? " Admittedly an operational Air Plot can't hope to compete with a Dry Swim, but unless you have the mad sort of chauffeur who tries to roll a Wimpey, you won't be too far wrong, so that's really up to your own particular chauffeur.

In case you're still not sure about an Air Plot on Ops., remember the case of the navigator who gave the pilot the ground speed to steer, having had a hurried look at the flight plan after leaving a hot target ! On plotting this out on the chart, sanity

returned before any damage had been done. The use of drifts is often forgotten, but with practice your rear gunner can give you great help with flame floats in the sea ; or, when over enemy country, with single 4 lb. incendiaries—in which case there's always the added advantage of its possibly landing on some Hun.

Astro, for long the mumbo-jumbo of navigation, has at last risen to its rightful place at the top of the tree. (Even Prune apparently decided to have a crack at it, but was seen to open a sextant case and hurriedly shut it murmuring, " So *that's* an Oxometer.") The trouble about Astro is that most people find it so hard to believe. There seem to be three schools of thought. The first uses Astro regularly, and with the greatest possible success. The second is quite competent, but just can't believe that alone they've done it ; by some strange twist, however, these same types put implicit faith in a W/T fix—HULL—3rd class. The third school takes the bare minimum of sights as a sop to their Navigation Officer.

Any Observer who qualifies for a place in the last two schools should get cracking till he can join the Navigators in the first. There are several ways in which confidence can be cultivated. Take sights on really good nights, so that your fixes can be checked with your known position. Don't be content with a single set of sights, as, though it will no doubt be right, you probably won't believe it. Take two or three sets of sights one after the other; and see how closely they agree. Average them out and use the result honestly. It's just too easy to edge your Astro fix a bit nearer to your D.R. position, but that's almost sure to be wrong in any case.

Here's a good tip to save yourself a running fix. First take a set of sights on star " A," then a set on star " B " and finally another set on " A." Provided the time interval between the sights is approximately the same, you can average the altitudes of " A " and use this direct with the altitude found for " B." Don't forget to make " A " the star which is the most nearly on your beam. Be sure that you know all there is to know about the Sextant and the Astrograph, and take the greatest care of them and of your watch. Work away at Astro till you can stake your life on your results, remembering that you may be staking the lives of five other fellows too.

Don't neglect your loop work ; for where the W/Op. uses the set he has plenty of time to give you any amount of help. He'll get the bearings for use, but it's up to you to tell him what stations you want him to work, and roughly when. Try out the whole bag of tricks, running fix, cross-bearing fix and homing, and don't ignore the single position line, as this may be married to some other information you have to give you a fix. Remind the W/Op. that he must tell the pilot when he's taking loop bearings, so that a steady course may be held, and find out what this course is. It will often differ from the course you gave some time before. Some navigators find it so easy to add the magnetic course instead of the true, that it's not a bad idea to put down the course you add in its proper column alongside the bearing. It's you job to apply the Q.E. after the W/Op. has handed you a bearing, but make certain you come to the arrangement with him that you are going to apply this correction. Otherwise both of you may do it—or else both of you may think the other guy is on the job.

Keep your W/T traffic down to a minimum, as some poor lad may be needing it urgently, so don't butt in except as a last resort. Make sure you know the safe range of Q.D.M.'s. It can be actually dangerous to get them too soon, owing to the skip distance effect, so if you must deal in them at all, wait till you are well within 100 miles of Base. Always lay off Q.D.M.'s and Q.D.Y.'s as true bearings on your chart. If you do this a Q.D.Y. will lose much of its terror, as you'll be able to see just exactly what to do, and you may see that you have the balloons behind you, which according to Prune is a " good thing." The Lorenz beam is a perfect way of approaching the aerodrome itself, but don't be content to let it do all the navigation for you. If you're homing on Lorenz, keep the D.R. going to the bitter end, and don't get yourself led off on to the wrong beam. Apart from the loop, it should be your ambition to bring the chaps back regularly without any radio aids at all.

Finally, do use your imagination in navigation. Here are some ideas : (You can add to them yourselves ; and when you do, chuck the information about. Don't hoard tips. They'll help others as they've helped you, and the stakes we all have to play for are rather higher than a round of drinks.)

When you cross a coast line and cannot pin-point it, use it as a position line, and if need be transfer it in the usual way. Most of the coast from Helder to Boulogne can be used in this way, and many navigators don't realise that on this stretch, the bearing of the coast line itself will give you a position ; very rough but at times even that is helpful. Mix your fixes ; by combining Astro and Loop, or either of these with a coast line. If you're really pushed and the M/F sections are overworked, use Q.D.M.'s to give you a running or cross bearing fix, but only do this as a last resort. One bright lad, attacking Brest on a night when the weather was good on the other side, but bad on the English coast, waited till he was some fifty miles on the way home, and then took a back bearing on the flak with a hand bearing compass. On that particular night his plane was one of the very few to cross the home coast at the right place ; others, less ingenious, took to the balloons. If you do try this method of finding your track made good, be quite sure that you're taking a bearing on the right flak ! ! You can't do this very often, but it's a fair shot to have in the locker.

The rear gunner can, of course, read a map.

Well, if you can get, and keep, all this in your nut you may soon be in the same happy position as the man in the advertisement—" They laughed when I sat down at the chart table, but their faces changed when we got back to Base."

And the W Op. has his Astro taped.

ISOLATION—IS IT NECESSARY?

" Can't you hear me, mother ? "

Do you ever stop to think what communication means to you in a bomber or fighter ? You're lost without it, isolated like a man on a desert island. Why does your R/T break down at times ? Well, some of the time it is through your own neglect, neglect of the most vital part of your equipment—your helmet.

How many times do you leave your helmet in the cockpit where it will get damp ; or sling it in your locker, with your parachute or dinghy on top of it where the leads get strained ? If you do this often enough you will, next time you're up, quite possibly find yourself isolated. It is not an exaggeration to say that you should treat your helmet like a good soldier treats his rifle. For your R/T is only as good as your helmet, and if your helmet is u/s, then your wireless mechanics have wasted their time checking and rechecking your R/T set.

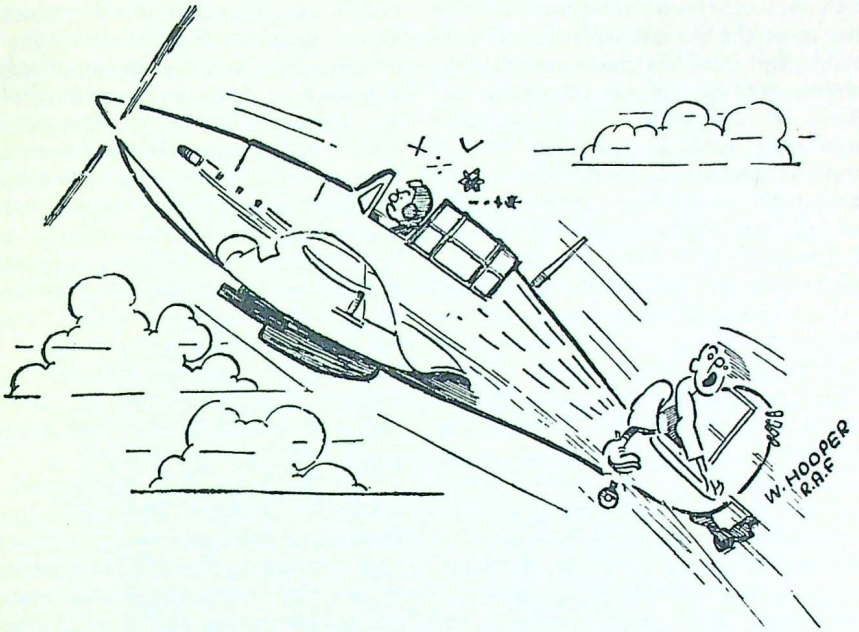
If you're in doubt about any possible peculiarities of your helmet the Signals Section will be only too pleased to help, and will test it free of charge. It's their job ; moreover, it'll save them time and trouble in checking your radio, after you've been binding about some supposed fault or other, when all the time it's your helmet.

When you leave your aircraft, don't leave it behind in the cockpit, remove it by hand ; it will come with you if you just pull—it's designed to do so. Pull the plug, of course, not the lead—except in an emergency when it doesn't matter if a wire comes off.

Now a word to the R/T people. You're probably saying, " Once the aircrew know how to treat their helmets, that'll save us a hell of a lot of trouble : we've got nothing to worry about at all." That's true up to a point, but still check the helmet thoroughly and see that the cords on the earpieces are doing their job of relieving the tension on the wires and terminals. Always remember the importance of megger-testing the insulation and the drying out of all parts of the assembly, by means of a hot air blower. Also have a look at the plastic cover of the plug ; if this is cracked or broken, the locking ring may come out and R/T trouble will result because the plug has not locked into the mic.-tel. socket. The rubber taping of the end prevents cracked covers, but see that this has not perished when you're testing periodically. The pilot, of course, should see that his headset plug is firmly in, for a little foresigh will save lives and certainly help to put an end to those " R/T Failure " reports.

So much for isolation !

INERTIA WEIGHTS



The Flight Commander is definitely going to speak to his rigger about the trim when he gets back.

A DEVICE known as the " Inertia Weight " is now being tried on the Beaufighter and Spitfire, with the object of improving their flying qualities. The operational fighter pilot naturally wants an aircraft that is easy to fly so that he can look around him, easily manœuvreable so that he can throw it about when necessary, and yet strong enough to stand all the " g " to which he is likely to subject it.

Now trying to satisfy these different requirements obviously presents a bit of a problem to the designer. For to enable the pilot to be ever on the alert for the enemy and to sight him steadily when close up, the aircraft must be stable: if he trims it to fly at a certain speed and power it should stay at that speed despite bumps—particularly important this for night-fighters. But if the aircraft is very stable and so does not want to change its course, the stick force needed, say, to take violent avoiding action may be much too great, unless care is taken by the manufacturers to make the elevator light. On top of this the fact that the aircraft may have to be gradually strengthened to carry heavier loads or added equipment must be also taken into consideration.

Now a compromise between stability and manœuvreability would not be

difficult if both were not affected by the distribution of the load to be carried. But they are. If the weight is moved up to the nose, the aircraft will become more stable, but it will be less manœuvreable, and it may be difficult to get the tail down when landing. If, on the other hand, the load is moved too heavily towards the tail, the aircraft will become less stable though more manœuvreable, so that the pilot in rough weather will feel as though he is walking on a tight rope that is being jerked about. (Indeed there was a case on record in which a Spitfire pilot, who accidentally took off with an airman clinging to his tail said that he found the aircraft so unstable as to be almost impossible to fly. History does not relate what the aircraftman said!) Unfortunately as we continue to improve our aircraft it is found easier to add new equipment at the back, because the front of, say, a Spitfire is already crowded. Thus a well-designed aircraft which started life behaving perfectly may, by the constant addition of weight to the tail, lose its reputation owing to growing instability.

It is also essential that aircraft shall be able to stand any likely amount of "g," for while a good pilot may be able to do all that is necessary by smooth steady manipulation, there are occasions when instinct is stronger than training and the result is a sudden violent pull. While this could generally be met by making the aeroplane very strong, a pilot can, however, still misuse the elevator so as to apply high "g" momentarily to a very manœuvreable aircraft. To make an aeroplane strong enough to stand up to this sort of strain, the structure must be much heavier, with a consequent sacrifice of performance in take-off and climb; or the load weight, such as fuel, bombs and ammunition, must be reduced. If, on the other hand, the stick force is increased so that the pilot cannot apply too much "g" the manœuvreability will be reduced. Unless, therefore, some device is fitted which increases the stick force at high "g," an aircraft in which the elevator is made light to give manœuvreability may be broken up by very coarse use of the elevator—for instance in trying to pull out of a fast dive near the ground, by taking very violent avoiding action, or by trying at high speed to turn behind an aircraft going more slowly.

This, therefore, is why the inertia weight is being tried on the Beaufighter and the Spitfire.

The Beaufighter is at present rather unstable at moderate and low speeds. This forces the pilot to pay a good deal of attention to his instruments when flying at night, and also makes the aircraft tend to tighten up in turns and possibly to stall. A new tail plane has been designed and tested which cures this instability, but it will not be possible to provide enough to modify present aeroplanes for some time. In order to make some improvement in the meantime, we have the inertia weight. This consists of a moderately large weight on an arm at right angles to the stick in such a way as to pull the stick forward. This pull is trimmed out in flight. The weight does make the machine less unstable; it reduces the speed at which the pilot has to attend continuously to his instruments; and it lessens the danger of tightening up in a turn. Unfortunately, it cannot be made big enough to make the aircraft com-

pletely stable, and the pull of the weight on the stick is rather unpleasant on the ground when taxying.

On the Spitfire V the weight serves a double purpose. This aircraft has a very light elevator and is very manœuvreable, which means that it is within the pilot's strength to apply excessive " g." Moreover, with the increase in the equipment carried, the load towards the tail has also increased, and the result is that it is now slightly unstable, which makes it also inclined to tighten up in turns and " snap " out of a dive. One or two accidents have in fact occurred in which the wings have come off under very high " g," and following on these a small inertia weight is now being used, which not only prevents the tightening up but makes it rather more difficult for the pilot to apply too much " g " by accident. It is not attached to the stick itself, but to part of the control circuit in such a way as to have the same effect.

That's all for to-day about Inertia Weights !

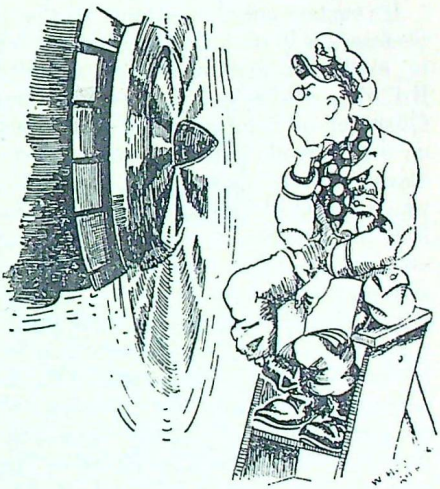
A NOTE ON ELECTRIC PROPELLERS

(FOR THOSE THAT CAN UNDERSTAND IT)

SINCE America came into the war the R.A.F. has become increasingly conscious of electric propellers. Several new types have appeared, but the layout of all of them seems, so far, to be the same, and as their use is becoming more general it is worth while having a look at them.

In the boss itself there is a two-way motor of about ⅓ h.p. By means of a series of gears this finally transmits a tremendous torque to the blades of the propeller itself and is the basis for increasing, decreasing or feathering the propeller.

The angle of attack of the blades (and therefore the revs. of the engine) can be controlled by the pilot in one of two ways. The first of these is a three-way selector switch on the instrument panel. Actually it has four positions and will stay put in two of them. By holding the switch in either of the other two positions the pilot increases or decreases the revs. As soon as he takes his finger off it springs back to the central fixed pitch position. So far, so simple.



P.O. Prune can't !

To know what happens when the pilot uses the switch to increase or decrease the revs. needs a little more understanding of the motor in the propeller boss. This has at the front a brake plate which is held by springs against a similar brake plate. These two, forming a sort of clutch, lock the propeller in the desired pitch. When the pilot pushes his manual switch in the cockpit he completes the electric circuit ; and on goes the motor—after the solenoid has been energised and has drawn its brake plate away from that of the motor. You must, of course, remember that the motor can't move until this has happened, so if you have forgotten to switch on the battery or if the safety switch is off, the current will not get through to the motor or the solenoids and you won't be able to alter the pitch.

If constant speed is wanted, all that is necessary is to push the three-way switch to automatic and select the required R.P.M. on the C.S. lever. This Governor or constant speed unit works on the principle of the old steam roller's Governor with a couple of brass balls which swing out with centrifugal force. It is driven direct from the engine and uses engine oil to work a servo piston with an electrical contact on top. If the engine goes too fast then the servo piston is forced up with the oil pressure let in by the Governor Unit and makes a contact with the electric motor to coarsen the blade angle so that the engine revs. drop proportionately. Similarly, if the engine goes too slowly the Governor Unit cuts off the oil pressure and the servo piston falls till it makes the reverse contact so that the motor will decrease the blade angle and up will come the revs. That is to say you pre-select the engine revs. on the C.S. levers and this puts a tension on the top of the Governor Unit to hold it balanced at the chosen revs.

That is a slow motion picture of the activities of the C.S. Unit. In actual flight the movements are so slight that you can't see the result in the rev. counter but it is functioning all the time, keeping the revs. constant and making and breaking and so causing the electric motor to work the whole time.

Some of the advantages of this C.S. Unit are as follows : When cruising in fixed pitch, lack of power through mucky plugs or any other cause will immediately be seen on the Rev. counter and heard by the change of engine note. Again, if the Governor Unit should go haywire then you merely pull the little switch down to fixed position and all is well. This means that you are now completely independent of oil pressure from the engine and can feather a propeller or alter pitch even if some ill-disposed Hun has lobbed a foreign body into the oilpipe or engine. On all electric propellers we have met (except on single-engined aircraft) there has always been a quick feathering device. This has an advantage on multi-engined aeroplanes, as one can feather a dud engine in about six to eight seconds when in trouble.

It may be suggested that being electric this type is, in common with all things electric, capable of fusing, crackling, sparking, arcing, burning out joints and getting its contact stuck. However, these things are fortunately rare and the makers have devised a cunning safety switch which pops up when there is a short and the propeller is automatically locked in whatever pitch it was when the short occurred. As this safety switch is

just a thermal one (*i.e.*, it works only when things get hot) it is often found that after a couple of minutes it can be pushed down and all is well again—for long enough anyway to allow the pilot to alter the pitch to whatever he wants.

It is, of course, still possible to take off and land with the propeller in fixed pitch. This is *bad*, but good cockpit drill should overcome it.

Another possible disadvantage may be that, as the propeller is purely electric, any lack of current is fatal to the pitch being altered or for feathering. This is important because on many types of aircraft the revs. can be brought sufficiently low to cut out the generator and so to stop the accumulators from being charged.

Finally :—

Do always take off and land in "Automatic," and with battery switch and safety switch on.

Do always cruise when possible in fixed pitch, as this saves much wear and tear.

Do as much one-engined flying as you like, but feather the airscrew on the manual decrease switch to save extra load on the battery.

Do always keep the airscrew bosses covered and dry on the ground.

Do keep an eye on the Selector switch.

And—

Don't ever run up to maximum boost in fixed pitch.

Don't ever take off in fixed pitch.

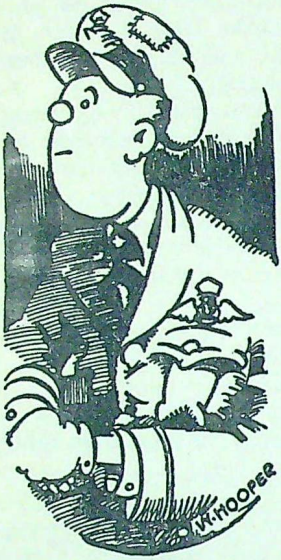
Don't ever practise quick feathering with a flat battery, or more than three times in a flight

GOT YOUR WHISTLE?

A fighter pilot came down in the drink the other day and, though comparatively near land, he yet floated round for fifty-seven hours without being picked up. A small thing like a dinghy is difficult to see; indeed baled-out crews have had the experience of actually being nearly run down by ships without being seen or heard in spite of their shouts.

This fighter pilot might well have floated round much longer than fifty-seven hours but for one little thing—his whistle. He was not seen, but his whistle was heard. So always make certain before going out on ops. that you have your whistle—and your floating torch as well. You are entitled to be issued with these and your Equipment Officer will give them to you if you ask.

ELUCIDATION FOR PRUNE



P.O. Prune understands every word of it.

The amount of time spent by all and sundry in trying to teach that dumbbell Pilot Officer Prune the rudiments of his job would if laid end to end—sorry, we've started wrong! The number of people who at one time or another have tried, vainly, to teach Pilot Officer Prune the rudiments of his job, would if laid end to end reach across a full size aerodrome—and look damn silly, too! And when they'd got up again and were rather sheepishly brushing themselves down, they might begin to wonder whether anything of what they told him ever stuck in his mind. Except that Prune is somehow, rather miraculously, alive, there seem to be no grounds for believing so.

P.O. Prune came into our office the other day and started browsing through back numbers of TEE EMM. He seemed to be looking for something particular and it turned out that the previous week he had run out of petrol and while waiting in his dinghy for the A.S.R.S. to turn up he had recalled an article about aircraft range and speed, which he had skipped at the time because it looked pretty grim. He now felt it might have had some sort of message for him; he wanted, in fact, to go so far as actually to read it.

We found it for him—"Speed and Range of Aircraft" in No. 6, Vol. I., issue. He buried his nose in it as deeply as if it were the first half-can of the day, and presently came up for breath, looking rather worried. His general trouble was that he had just switched to Wellingtons and thought his petrol consumption too high. (Hence the dinghy.) The specific points which worried him were:

(1) What is the best climbing speed and the way to climb?
(2) When to change gear with the two-speed blower?
(3) When and at what speed to cruise, when heavy or light?
(4) Where the hell *does* all the petrol go?

He asked us. *We* didn't know. We know nothing whatever about aircraft. But luckily at that moment a bloke from Bomber Command strolled into our office—Piccadilly Circus at 6 p.m. is a desert compared to our office when we want to work—and so we suggested he should sit down and answer Prune's queries. We warned him to be brief, as Prune, who has a habit of listening to brainy explanations with his eyes shut and a thoughtful expression, has frequently been known to drop gently off to sleep at the most important points.

The Bomber Bloke listened to the first question and said: "For a Wellington III? Climb at 140, in 'M' blower, 2,500 revs., zero boost and weak mixture.

You won't hurt your engines provided you keep their temperatures within the permissible limits." Prune asked if you did this by opening up your gills, and the Bomber Bloke replied, " No, by levelling out and putting up the I.A.S. for a few minutes." Prune said " Izzatso? "

To the second question the answer was : " Change the blower to " S " gear when the boost has fallen to —2. This *ought* to happen at about 13,000 feet, but this height may vary with atmospheric temperatures." Prune said " Cor! "

To the third question the B.B. said : " Like any aircraft with a heavy load, you must come back slower than you go out—in order, of course, to get the longest range for the fuel carried." Prune said *his* theory was that if he had carted a load of eggs all the way to Berlin, surely he was entitled to hurry back and get in on the bacon and eggs before the other guys. The B.B. countered with : " Just remember that the lift-over-drag ratio varies according to weight." Prune looked a trifle pained and extremely blank and the B.B. simplified things by saying that it was his earnest hope, nay, even desire, that Prune would remember to cruise *out* at 150 and *back* at 140 I.A.S. if he was out to economise fuel. Of course, when the enemy took a hand, he would have to cruise at any speed in any direction – better to get an aircraft back *somewhere* with only a pint of petrol than to be shot down while economising petrol according to the rules.

Prune said " Ah! " and made a stupendous note in his pocket book. The B.B. waited politely till he had finished and was aurally operational again and then stated firmly that he must also keep his boost levers as far open as possible in the C.B. position and weak mixture and use his revs. to maintain his I.A.S.

As to the fourth question, the B.B. pointed out that his most valuable asset on the way home was the fact that he had 15,000 or so feet to lose and could save his petrol enormously by using gravity to keep his I.A.S. at 140. . . .

We woke Prune up and the B.B. told him that on a Brest " do " (the one on which we did *not* sink the *Scharnhorst*) he personally used 340 gallons to get there and 80 gallons to come back. This figure he could guarantee. Prune was amazed, and said so. The B.B. said it just proved what could be done if proper use was made of gravity, *i.e.*, height, on the way home.

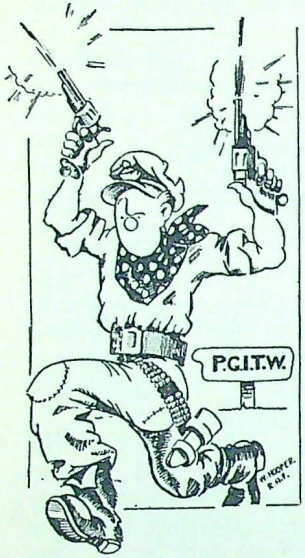
Then they went out to have one.

One thing that was left in our minds was that all the information the B.B. gave to P.O. Prune could be found in the wall diagrams issued by Bomber Command, or in Pilots' Notes.

NOTE

We have recently sent out at the request of units—presumably to stick on Crew Room walls and possibly other places—many copies of the " Ten Little Fighter Boys " and " Ten Little Bomber Boys," which appeared in our January and February last issues respectively. Also of " TEE EMM'S Fragrant Minute " and the poem " Somebody Said That It Couldn't Be Done," both in the latter issue. We still have a few left if anyone wants them. Don't all speak at once!

ARE YOU A FIGHTER PILOT?



P.O. Prune says he's going to get into this shooting war.

Here's a question for you!

Take a man who is a crack flier and give him the latest type of aircraft, but no ammunition because he can't shoot; take another man who is a crack shot and give him all a Spitfire's battery of armament set up on the ground, but no aircraft because he can't fly. Which is likely to be of more value in bringing down Huns?

Obviously the man with the weapons. As a crack shot he can at least deal effectively with anything that he can lure within range; all the other fellow can do is to take avoiding action. Remember Kipling's "*Just So Stories*" —Stickly-Prickly and Slow-and-Solid?

"Can't fly, but can shoot—
He still can be a bit of a brute.
Can fly but can't shoot—
For him the Huns don't give a hoot."

In other words what we're trying to say is this: if you are a fighter pilot it is important that you should be able to fly well; but it is even more important that, when by your skilful flying you have got the bulge on the enemy, you should be able to shoot him down with the minimum of time and trouble. To do this you must be a crack shot with your armament: to be a crack shot you must practise and practise, and learn and learn from those who know—until every pilot in the squadron has the same high standard of shooting as the next man; and all have a very high standard indeed.

To this end a new series of courses have been started at the Central Gunnery School—at what is called, at some length the Pilot Gunnery Instructors Training Wing, but more commonly known as the Fighter Wing, C.G.S. Here pilots are to be trained—so the syllabus states—"to attain personally a consistently high standard of Air-Firing in up-to-date air combat conditions: to instruct at their units" and incidentally to learn *how* to instruct: to "stimulate interest in Units, and to advise C.O.'s, in all Air Firing matters," particularly gun-sighting and training; and so on. In other words they are not only to be trained to fly and shoot, but to be trained so well that they can return to their units as experts ready to push over the gen.

Now that's what the syllabus says. We don't propose here to go too deeply into the actual workings of the course—we hope to have another more detailed article at a later date—but briefly it has two main parts. It teaches the Operational Approach and the "curve of pursuit"—in other words all the flying stuff which enables you to get into position to kill the Hun; and it teaches the best way to kill, that effective shooting

which is comprised in three words—range, line, deflection. The teaching of both these—flying and shooting, is done by actual air-firing with live rounds at drogues, and by air-combat against other aircraft, fighters and bombers, with cine-gun. These two sides are tackled alternately throughout the course, the intention being that you don't get the idea you are always either shooting at something that doesn't matter with something that does matter, or else always firing at something that does matter with something that doesn't—if you get our meaning! Everything you do, in fact, aims at getting as near operational conditions as possible.

All sorts of gadgets and synthetic devices are used during the course from the cine-film assessor (we have a special article about this on another page) down to the Fisher trainer which lets you sit in a "Link" and shoot at a model aircraft travelling around the room. A nice toy this: you fire the gun, which shoots a light, which hits the target; and then rings a bell. Or doesn't.

So much, briefly, for what it's all about. Now here are some points we want to make.

First, let's remove from your minds any lurking suspicion that this is a "ground" course, or that you'll lose your unit if you go on it. Eighty per cent. of the course is done in the air: indeed, the second set of pupils who arrived talking largely about being "grounded," went away complaining of "flying strain." The courses, in fact, give more actual practice in firing and in air combat tactics than most people get in two months of operations. And as for losing your unit, the course only lasts a month anyway, and the whole idea is to send you *back* to your unit to carry on the good work there.

Second, you are being instructed by people who Have Been There. The five flying instructors have seventy Huns to their credit between them, and the O.C. (who goes by a nautical nickname familiar to all) has two decorations both won twice over in this war. There should be a general impression, therefore, that he knows what he's talking about.

Third, while it is an admitted fact that many who turn up for the course find by the first results of their drogue firing or by the critical eye of the assessor, that they are not proved half such good marksmen as they thought they were. ("can't *understand* why I don't hit" is a common remark), the object of the course is *not* to prove this to them, with a hearty laugh, but to give them the answer. The course is not destructive: it is helpful. It aims at increasing your personal skill, at finding out your weak points and eradicating them; it aims, in short, at co-operating with you as a potential expert "air marksman." To become this you need skill in combat and accuracy in shooting. To achieve these you need training. Do you realise why the Battle of Britain pilots got such good results? Because the majority of them were peace-trained: they had had the time and the practice which it has not proved possible so far to give to the present-day pilot.

The School, in short, tries to do for your markmanship what the Central Flying School does for your flying; and to send you back to your unit ready and able to pass on the doctrine. Your unit is the bread: the Fighter Wing is turning out the yeast.

Quite why, by the way, it is called the

Pilot Gunnery Instructors' Training Wing, or P.G.I.T.W., we don't know and it's not for us to criticise. To us it seems the hell of a mouthful and to the average Prune the word " gunnery " instantly conjures up hours of class-room work taking oily guns to pieces and hoping he'll get them put back right, while " I.T.W." sounds like going back to the bottom form in school once again. Even " P.G." sounds like " Paying Guests." Air Firing School or Air Fighting School, or even Hun Destruction Instructors' School might have been better. But bearing in mind that the ultimate aim of the School is that the Prunes of the squadron should be taught to fly better and shoot better and so take a more effective part in the present hostilities, the initials P.G.I.T.W. *might* stand for " Prunes, Get Into The War !" As we go to Press we hear that steps are being taken to change the name to something a little more human. Good show !

We'll finish up with a few verbatim words from the O.C.—who as we said before, knows what he's talking about : " When I see a Hun at first I'm flying. I'm manœuvring. I'm pitting myself against him. I'm going to beat him to the position where he's my target ; not me his. And as I get there I'm thinking all the time : ' Close range ! Wait till you see the whites of his eyes ! Then short bursts ! ' When the moment comes, I, so to speak, stop flying. At least I fly quite automatically, my whole attention on aiming. My actions are all automatic. I'm mesmerised for two vital seconds. Two hands to the stick ! I'm now *shooting*, not consciously *flying*. My machine is just a gun platform."

Well, there it is, straight from the horse's mouth.

Finally, remember the term fighter-pilot has *two* halves—" fighter " and " pilot." It's no good being a skilful pilot if you aren't a successful *fighter*. It's no good outflying the Hun if you can't shoot him down.

A.S.R.S. SPEAKING

HINTS ON DITCHING

THE following hints are not concerned with S.O.S.'s or pigeons or crash stations or dinghy drill or any of the other things by which a crew ultimately makes the job of the Air Sea Rescue people easier (we hope). They are simply intended to give you the latest " griff," gathered from experience, on how best to get your aircraft down on to the sea as safely and effectively as possible.

Now the first question that crops up is : " To flap or not to flap." After a good deal of controversy it has now been generally accepted that flaps must be used, in order to reduce speed of approach and touch down. But you are advised to lower them only to a medium setting. This is better than lowering them fully, as it gives almost the same reduction of speed without that steep nose-down which is often so dangerous if the sea is met sooner than expected. (Pilots' Notes for each type of aircraft

give the recommended flap angle. Evidence now shows that flaps do not cause any appreciable diving tendency, with the possible exception of the Hudson which has strong and effective flaps. On the other hand, the evidence also shows how important it is to reduce speed to the minimum, especially in the case of the single engine fighter.

Assuming that symmetrical power is not available—which is a grand way of saying one engine isn't doing its stuff, or that both engines are dead as mutton—the normal glide approach speed should be used. This ensures both control and a certain margin of speed after flattening out to allow the pilot to choose his place for ditching on the swell. Towards an oncoming swell top is best.

Apart from choosing the best point at which to ditch, the pilot should hold off until he loses all excess speed above the stall and so strikes the sea at the normal three-point landing attitude (slow landing attitude for tricycles).

Now for the best use of engines. If one engine of a twin-engine aircraft is available, a little power should be used to flatten the approach, but not to such an extent that the aircraft cannot be turned against it right down to the stall and with a margin of rudder power in hand. On no account, though, should the engine be opened up during the final stages of ditching. The power that can be used will depend on the type; on some it may be best not to use the engine at all.

If two engines are available on one side, the inner engine only should be used, but if the power is in an inner and the opposite outer, it will be possible to use a considerable amount by adjusting the throttles so that little rudder is needed.

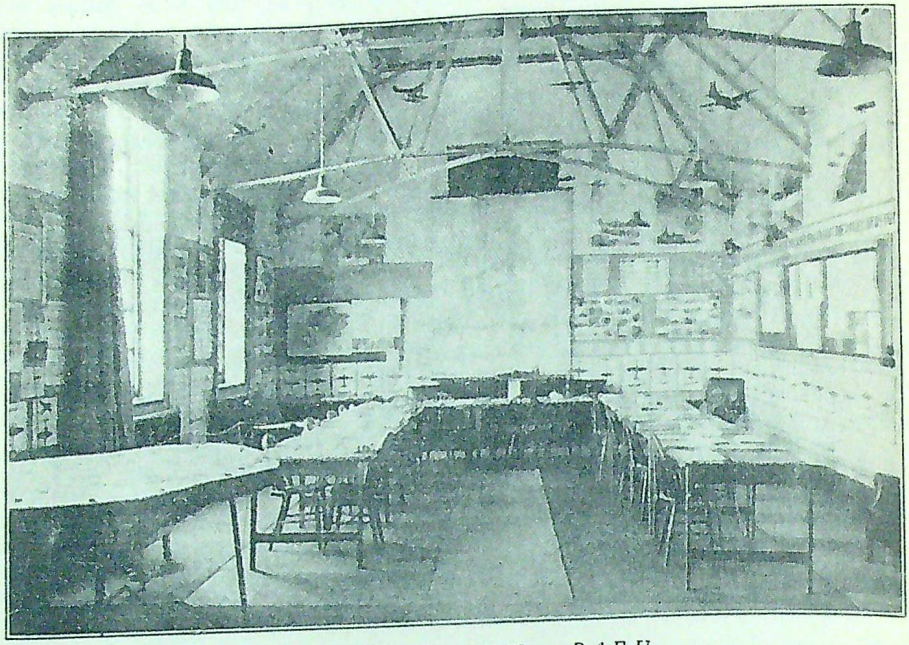
If power is available symmetrically, it should be used—to the full if necessary, with two engines out of four—to secure the flattest possible approach and the slowest possible touchdown. The slipstreams over wings and tail will help in reducing speed and retaining control. The value of power ditching is so great that the pilot should always ditch before fuel is quite exhausted, assuming he is certain he cannot reach the home coast.

In a steep swell the pilot should generally ditch along the top of the swell and disregard the direction of the wind, but if ditching along the swell means alighting with a very strong cross wind, he should ditch into wind. In any ditching across wind along the swell top the drift should be taken off as the sea is approached by sideslipping up wind, and the aircraft should be ditched on the upwind slope of the swell. In a long ocean swell the pilot can always ditch upwind.

The aneroid altimeter is quite unreliable as an indication of close approach to sea. The trailing aerial, however, can be used, the wireless operator signalling the captain when the current drops as the weight hits the sea. An alternative method is to engage the aerial with an insulated hook held in the hand, when the impact of the weight on the sea will be felt, but this can only be done when the W/T set is near a suitable ditching station.




INTELLIGENCE LIBRARIES



The Intelligence Library at No. 5 P.A.F.U

HAVE you got an Intelligence Library at your Station? If so, is it a good one? If not, are you doing anything about getting one organised? They're most useful places really, of great value to all who want to sit and study anything, sit and learn anything, or just sit. They should of course vary in their character according to the function of the particular unit or units concerned; moreover, whoever is in charge will probably draw on his own ingenuity and initiative in fitting them up; but to show what can be done we reproduce above a photograph of the Intelligence Library at a Pilot Advanced Flying Unit. (It's not really as neglected as it looks; they kicked all the seekers after truth out while they took the photo.)

By way of giving you an idea of its scope here is some of the stuff it contains: Maps of Europe, Asia, etc. and all war maps: periodicals varying from Flight and the Aeroplane-Spotter to the Air Ministry Weekly News-letter and the Soviet War News—and, of *course*, TEE EMM: A.M. Publications and pamphlets, such as the Manual of Air Force Law, Air Navigation, Meteorological Handbook, Cloud Atlas, Instructions on Falling into Enemy Hands, Beam Approach, Air Sense, Air

Tactics and Notes on German Aerodromes : and diagrams such as Star Charts and Moonlight Diagrams.

The books available cover a wide range, and are of course continually being added to : All the World's Aircraft, Fighting Ships, Through the Overcast, Weem's Navigation, Fighter-Pilot, Bomber Command, Elementary Meteorology, and Mathematics for the Million are some of the titles. Under the general heading of Intelligence come Command Operational Summaries, Air-Sea Rescue Maps and Notes, A.M. Intelligence Summaries, Target Maps, Synthetic Training Committee's Papers and Flak Maps. And finally the general equipment includes Aircraft and Warship Models, Synthetic Training Devices such as the Lamp Signalling Trainer, the Shadowgraph, Astroscope and Loop Trainer ; also Drill-purpose Vickers and Browning Guns, a Planisphere, Security Teacher, and, lastly, items of equipment from German Aircraft which are pleasantly noted as " when available."

So if the above has given any ideas to those who already have Intelligence Libraries, or who don't happen to have but are now thinking of starting one—well, you're welcome.

ANY MAP-READING IDEAS PLEASE?

EXPERIENCE has shown that aircrews trained overseas are frequently not quite up to scratch in their map-reading. The weakness is perhaps understandable, because, after all, Europe is constructed rather differently from the training areas of the Empire. At the same time, it is a weakness which must be remedied. Extra emphasis, therefore, must be given to map-reading at all stages of training ; and to help on the good work many different synthetic devices have already been introduced. These include the Map-Reading Tutor, the D.R. Instructor, the Practice Drift-Recorder, and a new Map-Reading Film. In addition, cadets at Initial Training Wings get personal issues of Map-Reading Notes which give full details of the best methods of map-reading one's way over all types of country. (It is even also hoped to produce an interesting map-reading game in the near future, which just shows you !)

The Navigational Training Branch at the Air Ministry, however, are still looking for new ideas. So if you've got any of these send them along to TEE EMM and we'll be responsible for pushing them over to the right quarters. Any idea you have which will help to train up and produce the Perfect Map-Reader will be welcome.

One word of warning : The T. Nav. Branch say they already have had the idea of taking photos of the countryside and marrying them up with similar areas on a map. So don't send that one up—you'll only be wasting your time. And ours !

LETTERS TO AN AIR GUNNER

FROM ONE WHO HAS BEEN THERE

I

Sergeant Burste takes it all in.

DEAR SERGEANT BURSTE,

In a few days you will be leaving your O.T.U. to join an operational squadron. As I hope to see you make a success of the job and be a credit to yourself, your Squadron, and all those who worked hard to teach you what you should (and, I hope, do) know, I feel that perhaps an occasional letter of advice, as from one air gunner to another, may be helpful. In this first one, as you are no doubt feeling very satisfied at finishing your training (although, in fact, you're only just starting it !), and possibly somewhat excited at joining a squadron, I am going to give you a few tips as to what to do on arriving.

In the first place you will be told to report on a certain date. Now don't be casual about this. You may think this warning unnecessary, but, believe me, you'd be surprised if you knew how many people *do* turn up late. So be *punctual !* And for Heaven's sake arrive looking smart ! Not only does it create a good first impression—very valuable this—but, generally speaking, a man who takes pride and care in his personal appearance also takes the same care of his aircraft and his equipment and so will be in every way a better and more efficient member of an aircrew.

Having reported to your Squadron Commander, listen to what he has to say, and if there is anything you are not sure about, ask him. He, like all his officers, is flat-out to help you make your operational career a success and welcomes any problems that you put to him. Therefore never be afraid to ask questions. You may have arrived at your squadron thinking you are a pretty good guy and know all about it, but, I'll tell you here and now, you don't. You are only just *starting* to know something. The only way to learn is, first, by experience, and secondly, by benefitting by other people's experience. And the best way of doing this is to ask questions of those people who have been at the game much longer than you and who probably know most of the answers.

Well, you have arrived at the squadron, smart and punctual, and have reported

to your C.O. Usually you will then have the first day free, to find your way about and draw any outstanding items of equipment, etc. Now you, as a gunner, have three other people in the squadron with whom you must always keep close contact. These are your Flight Commander, the Squadron Gunnery Leader, to whom you are responsible for everything to do with your gunnery training and efficiency, and the Squadron Armament Officer, who is himself responsible for the efficiency of your turret and gunnery equipment generally. So make yourself known to these three as soon as possible ; and remember that the Gunnery Leader is there to advise you to the best of his ability, and that it is to him you should go in cases of difficulty. In fact, it is a good rule always to go to your Gunnery Leader *first* with any problem ; if it is one for the Flight Commander or Armament Officer to deal with, he'll tell you so.

Quite early on, your Flight Commander will allocate an aircraft to your crew. Waste no time getting out to it and learning the whole thing off by heart. Find out what everything is for, and what it does. It is not enough to take an interest only in your own particular turret and guns. One day something may happen and you may have to take over some other place in the aircraft, probably at night ; so you see how important it is to know your aircraft from end to end, backwards and forwards, upside down and sideways, in day or in dark. And take particular trouble to learn—if you haven't already done so at your O.T.U.—just how each member of the crew does his job. It might be most helpful in an emergency.

Now, as you know, each aircraft has its own ground crew. Get to know these fellows. Make friends with them. When you see them working, ask them what they are doing, and why ; offer to help, if you have time.

As a gunner you should make a very particular friend of the armourer. Don't pretend you know all about guns and turrets. You don't. Your armourer has had a longer and harder training than you have and knows far more than you do. Therefore, seek him out, talk to him and help him. I have seen many cases of Air Gunners, flying day after day, going out day after day to do their inspections and cleaning, and never so much as a " Good morning " to the ground crew. This is both stupid and churlish. Your life is in their hands and you must work with them and never fail to let them know that you appreciate their skill and what they are doing. When you come back from an op. tell them all about it. You didn't really do it all by your own unaided skill, did you ? And if anything in the aircraft isn't working properly don't curse them for slackness or inefficiency. Tell them about it and talk it over, and you'll find your ground crew are just as keen as you to get it put right.

Now I hope you don't think I have been too long-winded or have been telling you things you already know. Read carefully everything I have said ; for it is so important that when you arrive at the Squadron you should start off right. If you get to know the right people you will for the rest of your stay always be sure of their help, and that's a large part of the battle. In my next letter I shall tell you about preparing for your first operational flight.

Yours hopefully,

A.G. BARRELL-FFOULYNGE, F/LT.

ARE YOU A THROWER-OFF OF BOMBS?

Are you one of that unenlightened gang who believe that when they're running up to bomb and find they're not quite " on,' they can, by getting the pilot to do a snappy turn away at the last moment, *throw* the bomb on to the target? If so, you don't know the facts of life. You ought to dedigitate. Some one ought to take you away into a corner and explain gently that turning away only makes things *worse*.

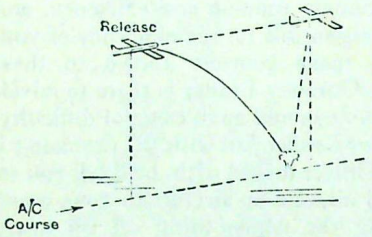


Fig. I

When a bomb is released in straight and level flight, it falls downwards with increasing speed due to gravity, and at the same time continuous moving forward in the direction the aircraft was going at the moment of release. Fig. I shows this, but actually it's a law of nature.

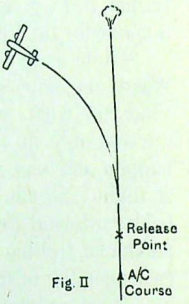


Fig. II

Now as long as the bomb is on the aircraft it is naturally affected by any turns the pilot makes, but the moment it is released it goes straight on, though if immediately after this the aircraft turns, the bomb-aimer sees it moving *outwards* away from underneath him, because the aeroplane has turned away while the bomb has gone on to a straight line (see Fig. II). This straight line is defined mathematically as the " tangent to the curve at the point of release."

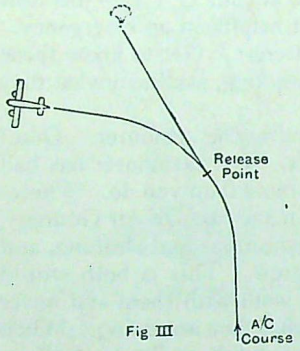


Fig III

Even if the bomb is released in a turn, it goes on in the direction the aircraft is moving at the moment of release. But at each instant during the turn, the aircraft is moving in a new direction; therefore when a bomb is dropped it carries straight on in the new direction at the moment of release (see Fig. III).

If you, as bomb aimer, therefore, watch a stick of bombs on a turn you'll notice that they appear to move outwards. But when they hit, they form a *curved* stick because each was sent off a little later in the turn (see Fig. IV).

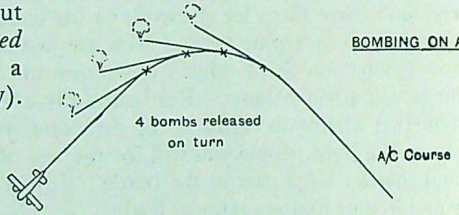


Fig IV

So in future please don't think that by a sudden turn away at the last moment you can throw the bomb on to the target. In point of fact, you'd actually do better if you started a sharp turn TOWARDS the target just prior to the moment of release.

"He didn't bother with Dinghy Drill."

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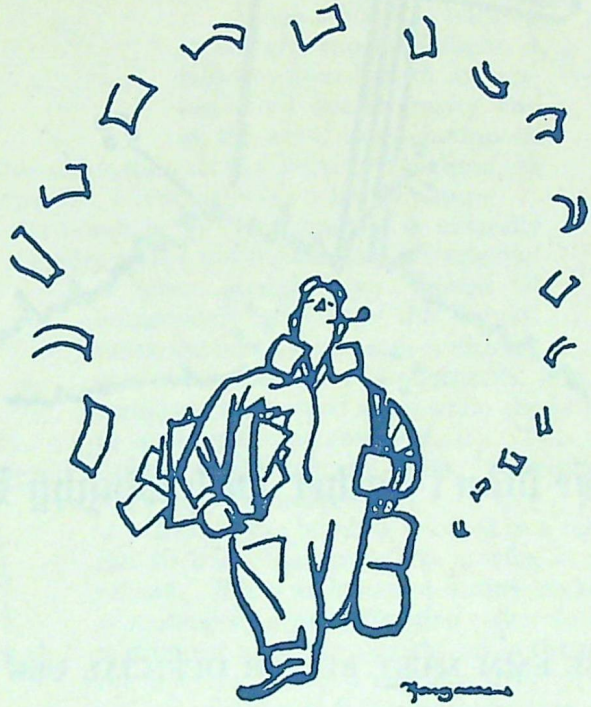

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