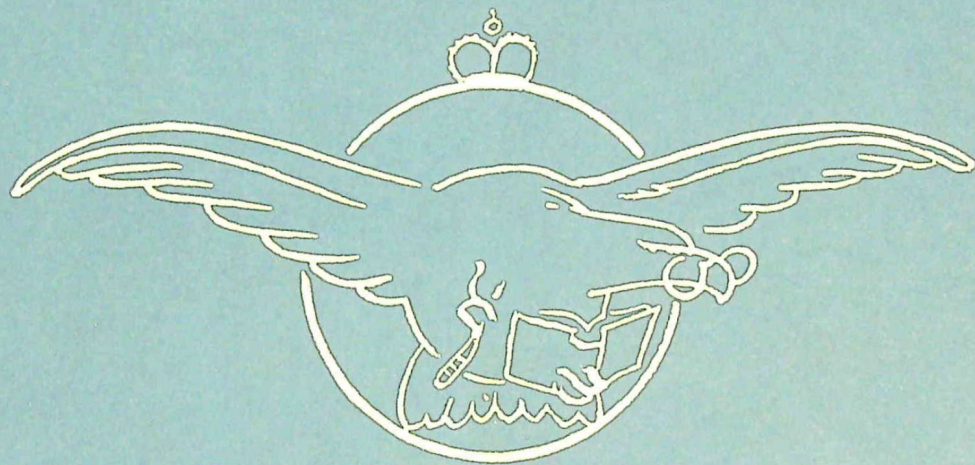


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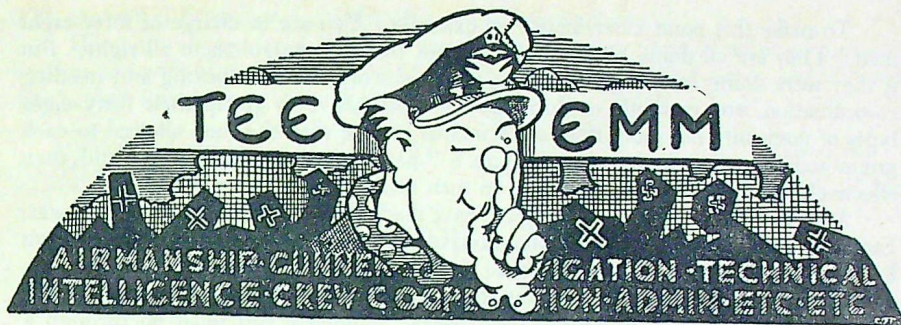
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*Pilot Officer Prune says—
 "Take Tee Emm regularly!
 Prevents that Thinking
 f'ling!"*



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.

Porter.

Air Chief Marshal, Chief of the Air Staff

ORGANISATION WITHOUT TEARS

III

IN our two earlier articles we tried to show how jobs and problems had to be broken down and tackled one at a time—methodically and rapidly. Now let's have a look at how an organisation works and is controlled.

It's done, as usual, by "breaking down." The requirements of the R.A.F., for instance, have been broken down into certain wide, fundamental headings—each looked after by a member of the Air Council. Each in turn has broken his work into parts, and each of these has been broken into smaller parts until you reach the base of the organisation. This process of division is known as the Scalar Principle and it can be put down on paper in the form of a genealogical tree known as an organisation chart.

This principle shows how it is possible for one head—such as the Secretary of State—to have hundreds of thousands of men under his control. It also enables a single line of authority to run from the rarefied Air Rank of the top to the veriest Erk at the base.

Furthermore it enables *you*—who are in the position of having men under you—to control them. It is, however, an axiom that no man can directly control more than six subordinates whose work interlocks; so take care not to have more than that.

To make this point clear, here's an example: You are in charge of forty-eight men. They are all doing simple work, and so you can control them all right. But if they were doing forty-eight different kinds of work, all interlocking and needing co-ordination, you certainly couldn't do it. You'd have to group their forty-eight types of work into not more than six principal groups with the men allotted to each group according to requirements. With a "head man" in each, you could then effectively control the heads, and they in turn could control the men beneath.

After this had been done, you should have made it clear to all what the set-up was. Each man should know his duties, should have been told who was his boss, and whom he was bossing. You, yourself, should ensure that the line of control is held to. Any instructions you want to give the men should be put through the heads of the groups. You shouldn't go behind their backs. Similarly you must go through a fellow officer if you want to contact the men under him. You should not approach them direct (except by consent).

So far, fairly simple; but if you look round in the Air Force you'll probably see not one line of control but several, and apparently conflicting, lines.

Well, this is what is happening. There are at least four different forms of control, but only two need concern you here. These two are Line Control—which is the direct line of responsibility, of discipline, and of carrying out the work for which the unit exists; and Functional Control—which covers specialist requirements.

This example shows the difference:

Take a flying school. It is commanded by a Station Commander. He is the boss. Among his subordinates are squadron commanders whom he commands. He knows all about flying, all about what they have to do. He has at one time done it himself.

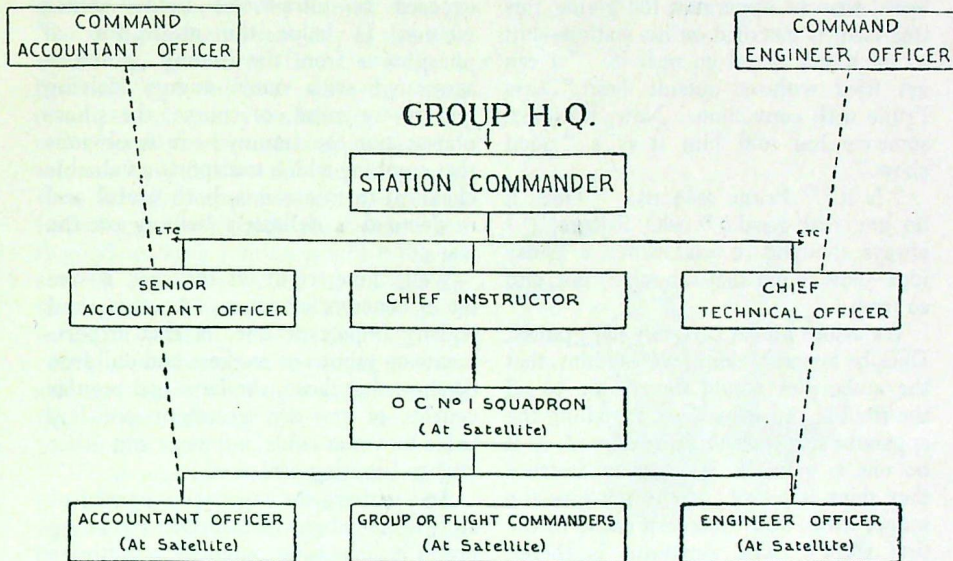
But he has other subordinates, such as the Senior Accountant Officer. Now though the C.O. knows as much—or as little—about accountancy as the next man, he has never specialised in accountancy. So the Accountant Officer has a second boss way up at Command (the Command Accountant Officer) who has Functional Control over him—not for station discipline or co-ordination, but just for those specialist (*i.e.*, accountancy) matters. Similarly, Equipment Officers, Engineer Officers and other specialist officers are *line* controlled by the C.O., but are *function-*



P.O. Prune now knows quite a bit about Organisation.

ally controlled by senior specialist officers in higher spheres.

Here, if you are interested, is a simple organisation chart of a bit of a parent station and a bit of satellite showing this. The solid line means "Line Control," and the broken line means "Functional Control."



Now we have mentioned all this because, without it, there may be aspects of control in your own unit which seem inexplicable. And you should know it—only to enable you to get a fix on the position—whatever it may be—to which it has pleased the Deity, your C.O., and the Establishment to call you.

Finally :—(a) Remember that you have to organise subordinates, divide the work between them, and see that their duties are clearly defined. All matters of direction must go through YOU : YOU must co-ordinate and control their work and be responsible for it to your superior.

(b) Support your subordinates by never dealing direct on matters of importance with *their* subordinates—unless by mutual arrangements on routine matters.

(c) Give them a diagram of your set-up, so that they know the chain of command and lines of communication.

(d) Ensure that each man has one man—and one man only—who is his "line" boss, and that he knows who it is.

(e) Study the lines of control in your unit so that you do not go, unwittingly, behind some other fellow's back.

As you are promoted, your responsibilities will grow. *Be deeply and sincerely conscious of the need for good organisation on your part. It is your duty.*

P.O. PRUNE WANTS TO KNOW

PO. PRUNE has asked us to tell him about artificial sunlight. He has heard that an apparatus for giving this treatment is installed on his station—but so far hasn't dared go near it. "I can get fried without outside help," says Prune with conviction. Now, however, someone has told him it is a "good show."

"Is it?" Prune asks us. "Does it do any real good?" asks Prune. "I always thought it was rather a pansy idea—how to get that schoolgirl tan, and so forth?"

We assure him it certainly isn't pansy. Does he honestly think, we ask him, that the authorities would have gone to all the trouble and expense of installing the apparatus if it doesn't do real good, or if no one is going to go near it, because they think it pansy? Why not give the money away to a deserving cause in the first place? The apparatus is there: it's Prune's job to go and use it.

"Oke," says Prune, "then it does do real good. How does it do it?"

Well, off we go!

If the evidence that artificial sunlight does a lot of good is as clear as the evidence that a bomb does a lot of damage, there would probably now be a scheme to give ultra-violet light treatment (which is all artificial sunlight really is) to everyone in the country—much as one is vaccinated or inoculated on joining the Service. The trouble, however, in bringing forward actual proof is that not even to-day is it thoroughly understood just how it does produce its beneficial effects. It is known, however, that it hooks up with vitamins—yes, those

ubiquitous vitamins!—for certain parts of the skin produce Vitamin D when exposed to ultra-violet light. Since vitamin D helps the absorption of phosphorus from the tummy, which is associated with one's energy driving power—we mean, of course, the phosphorus not the tummy!—it is obvious that anything which transports a valuable chemical to where it is both useful and in demand is definitely helping on the war effort!

Well, there, right off the reel, is one bit of concrete evidence. Another, and equally important one, is that experiments on groups of workers and children do show that those who have had regular courses of sun-ray treatment are less liable to winter colds, influenza and other vitality-lowering afflictions.

And perhaps the most telling proof of all is that sunlight installations are being put in in increasing numbers in factories and works, and treatments are officially *given in working hours*. If hard-headed business men, types who don't throw money away uselessly, think it worth doing this, then it means they think they've "got something there."

Now, even though pilots and crews are not factory workers, they are people whose jobs make a heavy call upon their nervous energy, and whose work is carried out under abnormal conditions. So, as such, there's a very strong case for artificial sunlight treatment for the R.A.F.

"Oke," says Prune, "what's the best way for getting the best out of the treatment?"

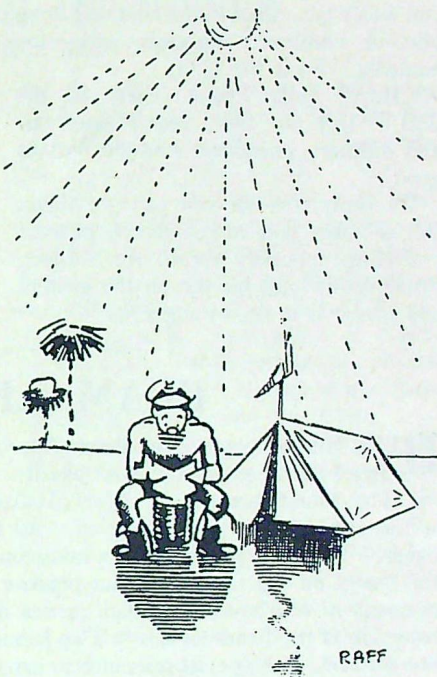
The answer, we are empowered to tell him, is a regular and steady course. If

you decide to go in for it at all, therefore, you must make up your mind to take it really regularly. It's not a long job in itself: the treatment can be given quite quickly by an M.O. or trained orderly. Nor is a treatment every day in the least necessary, but three times a week is practical, and shouldn't make too much of an inroad upon your leisure. On the other hand once a week is about as much use as a burp in a bottle: just a waste of time for all concerned—and a waste of fuel if you like to look on it that way! A good working routine would be thrice a week for three weeks then twice for two weeks. Then cut the stuff out for a fortnight—during which the skin becomes sensitive again to small doses—and start again, keeping it up all through the winter. Doing this you can't fail to benefit.

"You mean it really peeps you up?" asks Prune. Peeps you up, we reply, why, not only does it help to keep you fit and on the top line for all your operational stuff, but it also helps you to keep on the top line for all your non-operational recreation, such as parties—instead of feeling too tired.

This certainly gets Prune's interest. "I like *that* bit," he says. "But do you mean that everyone in the R.A.F. should do this?"

No, there should be a priority—roughly thus: bomber crews, night fighters, those who have long spells in closed cabins such as Coastal crews, and then the "underground" workers, those whose job is continuously in artificial light. Generally crews can attend officially together as a team on duty, but the others will have to make a bit of an effort, for it may mean going some distance at



"This artificial sunlight idea seems rather a good show. Wonder if I can put in for a course . . ."

! — ! — ! —. We have just put this in to show that we understand just what those of our readers in the Middle East are thinking after reading the above. *Artificial sunlight*, by Gosh! We know what they're telling us to do about it.

an inconvenient time or when they have leisure and would prefer to do something else. This, however, is where the C.O. of a unit comes in. If he realises the benefit of the treatment, and is obviously in favour of regular courses, in other words, if "it's the thing to do"—and, quite frankly, we have noticed that when the Station-Master *is* in favour of a thing it frequently *is* the thing to do!—then

you won't get valuable installations lying idle, or employed uselessly and hazily. So if the C.O. . . .

"Hoy," yells Prune, "less of the C.O.! Tell me this, aren't open air and ordinary uncanned sunlight just as good?"

We reply, yes—if you can get them. But so often you can't. Next, please?

Feeling delicately round the subject, Prune scuffs with his toe on the ground and asks, "is it—er—dangerous?"

No, you're under skilled control. You won't be over-cooked, the lamp won't be suddenly turned up to give you too strong a dose, you'll be placed at the right distance, and you'll have goggles for your eyes.

"Hum," says Prune, "I might give it a whirl if I can find the time, and if——"

We tell him it's free. And that it would cost him two guineas a go in civil life.

"I will give it a whirl," says Prune.

BEAM APPROACH

HERE'S some gen on the Beam Approach Course at No. 1 B.A.S., which may be of use to pilots about to take it.

The course lasts seven days. It has a total of ten hours' dual instruction, at least one hour of it night flying. All the flying is counted as dual instrument flying. There are also five to six hours on the Link, the general idea being to learn the theory on the Link and then practise in the air what you've learnt, where, of course, you will have the added burden of coping with drift and possibly difficult reception of the Beam signals. Two lectures are given, one on Beam apparatus and one on Met, with special reference to icing conditions.

One word of advice—pep up your *hood* flying. It's amazing what the psychological effect of this torture chamber can be on the toughest veteran, and as 80 per cent. of the course is done under it, you have won half the battle before you start if you are hot on instruments! Beam approach depends entirely on good safe I.F., so go to it!

You have to do P.T. once or twice while you are on the course,—but keep your seats, it's not too bad; for the N.C.O. i/c goes all out to make it unusually interesting and lively. But we just mention it so that you can remember to bring your P.T. kit with you.

A very important point is to arrive *early* for the course. Not only is it an order, which you must obey, but you have to get cracking at 9 a.m. on the day the course starts. And lest there be any excuse such as, "I was only given a few hours' notice to come here," will Station Adjutants PLEASE give prospective pupils as much notice as they possibly can.

And don't get browned off at the idea of coming on the course. It is interesting and useful and everyone of those that have been on it already who did arrive browned off, left saying how they enjoyed it.

So turn up expecting to enjoy it. You won't be disappointed.

LETTERS TO AN AIR GUNNER

FROM ONE WHO HAS BEEN THERE

V

DEAR SERGEANT BURSTE,

In my last letter I promised to talk about some of the things that you might do should you have the pleasure on a Night Op of actually affiliating with Master Hun. What you do during the few seconds for which a combat probably lasts is, of course, the end and aim of all your training and hard work. But there's no reason why the meeting should not go off to your entire satisfaction, provided you get certain points into your head.

A lot has been said, I know, about not opening up too soon. It's quite true that if your guns are fed from magazines or small containers, you would feel more than somewhat embarrassed if you'd got off all your rounds when the Hun was at 600 yards, and then had to change a magazine just when he was at a nice range—nicer for him than for you. That advice was all very well in 1066 when I first took up Air Gunnery. But nowadays, when you are well supplied with belted ammunition, you needn't be afraid to give him a squirt at 500 yards or so: indeed, it's a very good thing to do. You probably won't knock him down, but you may well discourage him or crack his windscreen so that he can't see you. Once he has closed to 400 yards or less, you can give good long bursts of 30 rounds a gun, or so—provided, of course, that your sights are still on him and you aren't firing wildly. The effectiveness of a .303 gun—which remains very effective—is largely dependent on the number of rounds it can deliver in a short time.

But you have something to do besides

fire your guns. You must let the captain know where the fighter is and tell him what evasive action to take. That's why you must get his confidence.

If you have that and use your head, you needn't be alarmed by the prospect. The Hun is as frightened of your guns as you are of his; he has just the same aiming difficulties; and he has to fly the aircraft as well. Your job is to exploit his difficulties and to see that your aircraft is so placed that you can fire at him more effectively than he can fire at you.

The manœuvres a bomber can take when attacked are few and simple. To be effective they must be taken at the *right time*. If you take evasive action *before* he is committed to his attack, he can break away and come in again at a reduced range and favourable angle. But if you make your manœuvre *after* he has started his attack,—after he has decided the amount of deflection and thinks he has his sights on,—he is very easily put off, and his confidence isn't likely to be increased by the burst of tracer with which you will be warming him up. It's often difficult to tell just when the fighter is starting his attack, but a good general rule is to tell your captain when he's between 500 and 600 yards away, so that he can get the aircraft into a good tight turn by the time the range has fallen to 400 yards.

The manœuvre that the captain takes will involve some sort of a turn. *Never* do a straight dive. Any fighter can out-dive any bomber, and, in a straight dive, he'll have a closing speed that'll allow him to keep his guns on for the maximum

length of time. *Always*, for a beam or quarter attack, turn *toward* the attack. If you do, you make his deflection problem more difficult, and you force him to bank more steeply, which is hard, instead of flattening out, which is easy. If you turn away from the attack, you cross his line of fire and give him that lovely point-blank shot that he's looking for. For the same reason, don't reverse the turn while you are being attacked. If you don't understand all this, ask your Gunnery Leader to explain it with models.

It is well for the pilot to make his turn as violent as possible and to dive a little at the same time. A fighter has a bad field of vision underneath, and you have a good chance of losing him altogether.

Turning, however, is all very well as a manoeuvre on a dark night, when the fighter has difficulty in seeing you, but it has this disadvantage in daylight or brilliant moonlight, that you are turned away from your objective. If you are attacked repeatedly from the same quarter, you may find, instead of grinding your way to the target with characteristic determination, you are being urged gently back to base. Even Sgt. Winde can see that this is A Bad Thing. The method of overcoming it is the corkscrew. To corkscrew, the pilot has only to turn and dive for about 500 feet and then, opposite bank and rudder, and climb back again more or less on to course. If one application is insufficient, repeat the dose. It is almost bound to clear you of fighters. In most aircraft it's best to start the corkscrew downwards and so gain enough speed to climb up again. If the engines should cut, you needn't worry. But note this, my dear Burste: always tell your captain to start his cork-

screw *toward* the attack, just as with turning. *Don't* cross the fighter's line of fire. Corkscrewing is also good if you're blinded in searchlights. It won't clear you of searchlights, but it will make it almost impossible for the fighter lurking outside the cone to get in an effective burst.

A manoeuvre that has been successfully practised both by the Hun and by ourselves is throttling back. The fighter will very probably overshoot while presenting a convenient target for yourself. See TEE EMM for May, 1942, page 50, for a very pretty example of this. It doesn't work with all aircraft, however, and you should talk it all over with your captain in conjunction with the affiliation exercises that your Gunnery Leader has, doubtless, arranged for you.

But enough of this. In my next letter you shall have One More Word,—as the speechmakers say when approaching the last 40 minutes—on a subject that has already been brought to your attention, namely, sighting.

Yours sincerely,

A. G. BARRELL-FFOULLYNGE, F/Lt.



Sgt. Winde can hardly wait for the One More Word.

I VISH . . .

TEE EMM is proud to announce the appearance in its pages for the first time of a contribution from Germany. It is by Ober-Leutnant Otto Schitzenheimer of the German Air Force.



With large steins of lager beer (Ersatz) in view,
 Two Jerries sat talking—the subject was *YOU*.
 One said, "Fritz, you know I'm a night-fighter guy,
 And nightly to strafe British bombers I try,
 But I *wish* they'd fly level and straight as can be—
 It makes things so very much simpler for me.
 I *wish*, when I shoot at them, quarter or beam,
 They wouldn't turn in, dodging my bullet stream.
 I *wish* they'd all turn away *from* my attack—
 There'd be more British bombers who wouldn't get back.
 I *wish*, when their gunners are weary of eye,
 They wouldn't still search every inch of the sky.
 I *wish* they'd *all* bomb from incredible heights,
 I shouldn't have nearly so many blank nights.
 I *wish* they'd not *all* fly along the same route—
 I've a weakness for stragglers, they're easy to shoot.
 Ven the moon on the clouds makes the background all vite,
 I *wish* they'd hug cloud-top, that suits me just right.
 I *wish* they'd ignore what the 'old hands' all say—
 They'd be easier targets—I *like* it that way."



“ It probably won't happen. . . .”

There are times, says A.S.R.S., when one is justified in trotting out the above rather fatuous remark. There are also times when it may have a very definite ring of Famous Last Words. Of course if you were a Boy Scout you'd never have heard of the phrase. You'd be far more familiar with your own motto “ Be Prepared ”—which in point of fact is just the opposite. . . .

This abrupt mention of Boy Scouts is not a sign that we, in A.S.R.S., are going back to second childhood ; it is just that the other day we had the privilege of watching a Boy Scout taking his 2nd Class Badge. Amongst other things, in order to get his badge, this scout had to tie various knots blindfolded. That is, of course, similar to working in the dark, and it struck us that working in the dark is a thing that a large number of air crews have to do. Indeed in these days of night operations a large part of the air crew's work takes place in the dark.

Now a Boy Scout may be able to tie his knots when he can see everything he is doing, but can he tie those knots in the dark ? The answer is : “ Yes, if he's practised them thoroughly—if, in short, he is prepared.” Similarly you may think

you know your ditching procedure and dinghy drill, but can you do them in the pitch dark relying only on the sense of touch ? The answer again is : “ Yes, if you've practised them.”

You have seen our film (we hope) called “ Prepare for Ditching.” The hero of that who knew his ditching drill was only afloat five hours. Others have been afloat as long as five *days*, or six, or even fourteen. We don't, of course, mean to imply that if you know your ditching drill you will *ipso facto* be afloat only a very short time. Your drill may be perfect, but you may have bad luck, bad weather, and so on. But what we do say is that if you *don't* know your ditching drill you are far more likely to be longer in the drink—you have, say, forgotten the Verey pistol, or the pigeons, and have a worse time—you are injured perhaps from not bracing yourself or relaxing after the first impact only. In other words, perfect drill can't *lengthen* your dinghy hours and *may* shorten them. So do you ever practise your ditching drill ? And do you ever do it in the dark, simulating the conditions under which you'll probably have to work ? Or do you find that just about the time it's dark enough to simulate those

conditions, it is also just about the time the bar is open, and "Oh! anyway it probably won't happen. . . ."

Unfortunately it *may* happen, and it *will* probably be dark.

Come up and read our reports sometimes; you will see, time after time, sentences like "As we ditched, we were well braced and no one was much hurt, *but all the lights went out and the darkness was intense. . . .*" "*We groped about wasting valuable seconds. . . .*" "*I had not got my G.E.C. floating torch and could not see a thing. . . .*" "The flak had destroyed the lighting circuit; it was *pitch dark.*"

Perfect Dinghy Drill would make your movements quite automatic. You should be able to find any equipment, open any hatch, quite confidently, even when blindfolded. As a small helpful hint we suggest that in any night ditching all bright internal lights should be put out and only the amber lamps used. This will accustom the eyes to the external darkness.

But *do* try doing your dinghy drill blindfolded sometimes! It's blind man's buff, but the reward may turn out to be your life. Like the Boy Scout, see if *you* can tie your knots blindfolded.

THIS MONTH'S PRUNERY



THE MOST HIGHLY DEROGATORY ORDER OF THE IRREMOVABLE FINGER (Patron: Officer Prune) is this month awarded to P/O — for completely Superfluous Devotion to Duty.

This officer on returning at night from a bombing raid in very poor visibility discovered he had accidentally set red on black and so had for some hours been flying on a reciprocal instead of the course for home. Realising his mistake he then set course for base (270°) expecting to get no further than Holland if lucky. When the fuel at last gave out—as he anticipated—he made a good forced landing and at once set fire to his aircraft to prevent it falling into enemy hands. He and his crew then made a quick escape across the countryside—only to find themselves almost immediately opposite the "Rose & Crown," Little Muddycombe, England.

TEE EMM'S COOKERY NOTE

A PUPIL asked to describe a SYKO machine did so quite efficiently, but finished up: "Codes are printed on rice paper to provide food for the navigator in case of capture!"



TEE EMM'S Brains Trust

Tee Emm, being an official publication, everything in it appears with the approval of the Air Member for Training and represents official views on policy. This page, however, we reserve for occasional unofficial correspondence—criticism, comments, suggestions, queries, and so on—to which we have tried to dig out an official reply.

LETTER. "I have just read all you said about inertia weights in the July edition of TEE EMM. When our inertia weights were fitted, we called them 'steam hammers,' and vowed that they were only another plumbers' conspiracy to fox the pilot! After hearing all the arguments in favour of the weight we do not agree that they are logical. They are the argument of someone who is trying to prove two angles of a triangle equal, by saying they look equal.

"That just can't be done. No pilot except Prune will pull out of a fast dive so rapidly that the wings fall off. If this does happen so easily then surely the wings should be stuck on more securely, not the aeroplane made less manœuvrable. To be able to whip into a steep turn with the Hun about requires constant trimming of the elevator control if it is going to be done snappily.

"I am afraid we dislike our 'steam hammer'; the weight has, however, been reduced from $6\frac{1}{2}$ to approximately $3\frac{1}{2}$ lbs., for which we are thankful."

REPLY. *It is no doubt true that only Prune would pull his wings off while coming out of a dive, but we find he has done so on a number of occasions. Although this officer is himself indestructible—or at least perennial—a poor view is taken of this manœuvre as Spitfires are valuable.*

It isn't the steady "g" in the pull-out which is dangerous, since the Spitfire is so designed that it will stand as much steady "g" as the pilot can and a comfortable bit over. The effect of "g" on the pilot (black-out and so on) is, however, slightly delayed while its effect on the aircraft structure is very prompt. This makes it possible if the elevator is sensitive (and it will be, on an unstable machine) for the less experienced pilot when pulling out of a dive to overshoot momentarily the value of "g" which his aircraft can stand and so rip his wings off before he has realised what is happening.

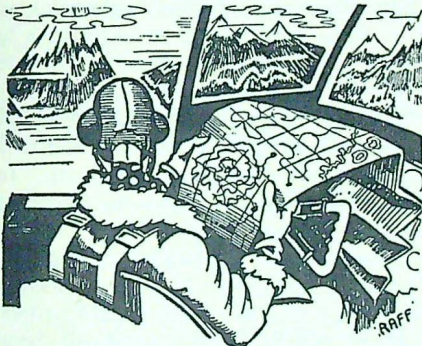
Another important point is that the Spitfire without an "inertia weight" will often break itself if the stick is abandoned in the dive—for instance, if (as has happened quite a few times) the pilot loses consciousness through failure of his oxygen supply. Tests have proved that a Spitfire with an inertia weight will pull out of quite fast dives safely when the stick is abandoned—even though it is trimmed for top speed level flight.

If the wings are made stronger the weight of the machine must increase, and this would have a regrettable effect on its rate of climb and ceiling. What is more, this additional strength would be useless in ordinary manœuvring unless the pilot is strengthened too. It is therefore best to attack the trouble in the logical way—at its source—by curing the instability.

It isn't easy to make changes to a machine in full production, so stop-gap methods must often be used because they are simple. We know that your "steam-hammer" doesn't feel very nice when you are taxi-ing, but neither is it pleasant to see Prune coming down to earth without his wings. We don't even like it much when he comes down with them bent up a bit more than the designer intended.

MAP READING FROM THE WORD GO

MAP reading is simply *recognising on the map* what you can see on the ground. Not the other way round. For—if your map is of the proper scale—you always have less ground to study than you have map; and so it is obviously not much good selecting a bit of map and trying to make it tally with the bit of ground you can see beneath you. It's quite probably not in sight. On the other hand, the bit of ground you're flying over *must* be somewhere on the map. Unless, like P.O. Prune, you've got the wrong map altogether!



"That doesn't look like the Cotswolds," says
P.O. Prune.

Remember, there is only one bit of map which corresponds exactly repeat exactly with the bit of ground you are trying to place. Don't delude yourself into thinking they're *practically* alike and so they must *be* alike; or that the map is wrong in some little detail; or that (Prune again) the ground is wrong according to the map. The map may be incomplete in detail, but the ground is *always* right, detail and all.

The first thing, therefore, is to get a complete mental picture of your bit of ground, or rather of the features that go to make it up. Remember that in poor visibility the main features frequently look slightly different, and also you can't see so many of them, and this often induces in observers and map-reading pilots a certain amount of mental panic, during which the features don't always register correctly. To avoid this, first relax; then concentrate on the distinctive properties of the ground beneath you. That extra five seconds will make all the difference to the mental picture. The chief fault of Prunes is to spend all their time on the map, letting the world go by beneath them. And don't forget that, as in nearly everything else, practice makes perfect: in good visibility constantly practise at getting longer and more detailed mental pictures.

Now for some more practical stuff:

First, it is terribly important, when you are a beginner, to get your map oriented properly, *i.e.*, so that the track line points in the same direction as the aircraft. Then the angles of railways, roads and so on are seen on the map as they actually are on the ground.

Some people prefer to hold their maps right way up, *i.e.*, with north always at the top, so that place names, etc., are easily read without constant turning of the map, and they have trained themselves to make the mental adjustment necessary. But this is not recommended; mistakes can so easily be made. With the track line and the aircraft's direction always aligned, the features on the right or left of the

track are on your right or left on the map.

Next, it is not enough to grope your way from feature to feature like a blind man from corner to corner, or a man who wants to get blind from pub to pub. You should learn to read by mental-impression pictures. The *main features* of a bit of ground are like headlines in a newspaper: They are the framework; and from the letter-press, or the ground detail, you fill in a mental picture of what the written article, or the ground has to tell you.

Main features on the ground all have distinctive properties which you must look for in order to recognise them. We'll set them out under, with their properties:—

Railway lines are either single or double, and they have *Direction* with reference to the aircraft's heading. They have also junctions with other lines, curves, and there are frequently other main features—rivers, roads, towns, woods—on or near them.

Main Roads also have *Direction* in the same way. They have straight lengths, or curves, or bends; and they, too, have other main features near by. Don't be fooled by dusty tracks; they often look like main roads.

Woods have definite *Shapes* and *Sizes*, and again can be checked by adjoining main features. Remember the shapes may change from parts being cut down.

Towns have *Shape* and *Size*. They have *Direction* of railways and roads entering them, and they may have position relative to contour lines on the map, *i.e.*, to hills and valleys on ground.

Rivers again have *Direction*, and, in particular, distinctive *Curves* ("Oi, keep

it clean," says Prune)—often made more distinctive by villages on the bank, or bridges across.

Lakes have *Shape*, and they have features close by; but don't mix up a real lake with a flooded area in winter time.

Hills have degrees of *Steepness* or *Height*, for which you should know how to read contours on the map correctly; while ranges of hills have direction. Don't muddle hill contours on the map with their opposite numbers, that is—

Valleys, which have definite *Direction* relative to the Aircraft's heading and often have distinctive features—rivers, railways, and towns—in them. Valleys are quite important and useful main features, which are often neglected.

Always pick the best main features to study. For instance, don't concentrate on shapes and sizes of woods, or directions of railways, in a thickly wooded area, or a district with so many railways as to look like a plate of spaghetti. In such cases go for towns or rivers or valleys.

Should you then wish to read detail, either on ground or map, it is *essential* to work from the nearest main features. Only if you do this can any small detail be really easily and accurately picked up on the map, or pin-pointed on the ground.

Estimating distances correctly—for which you must practise continually—is often of great value. If you pick up two distinctive features on the ground and can estimate reasonably how far apart they are, you can verify them on the map—as long as you remember to check-up on the map scale. But we don't recommend this for pin-pointing—merely as a stand-by in case of need.

BOMBING ERRORS

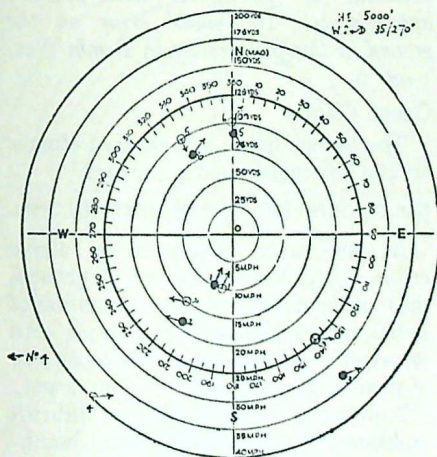
OR CRIES OF NO! NO!

II

WE hope you've digested what we said last month about the value of Grouping Exercises. This month we are going to discuss the different types of Groups and what causes them—complete with pictures and no extra charge. The pictures, by the way, are of real exercises and they show both the pupil's and the quadrant's plots. The pupil's are open dots—the quadrant's are closed dots. The former show where each pupil thought his bombs hit, and are his 3073 plots; the latter, the closed dots, are the actual results recorded by the quadrants.

No GROUP

The bombs are just distributed haphazard over a wide area. (We bet Prune had a hand in this somewhere!)

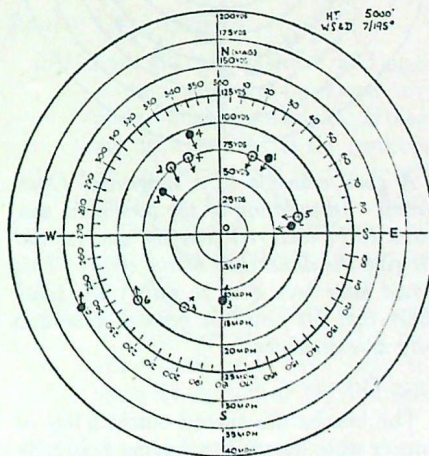
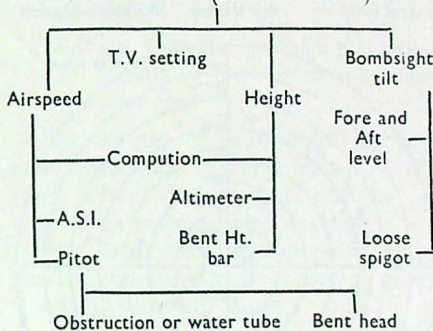


Gusty weather conditions and intermittent low cloud prevailed during this exercise. The bomb aimer's plots were good.

OPEN GROUP (RADIAL TYPE)

The bombs are distributed systematically "over," or "short," relative to the mean point of impact. Main causes:

OPEN GROUP (RADIAL TYPE)



A good example of an under-shooting Open Group. Cause was attributed to a faulty air-speed indicator, but the Instructor did not give the quantitative figure of the error and whether or not it accounted for the total error.

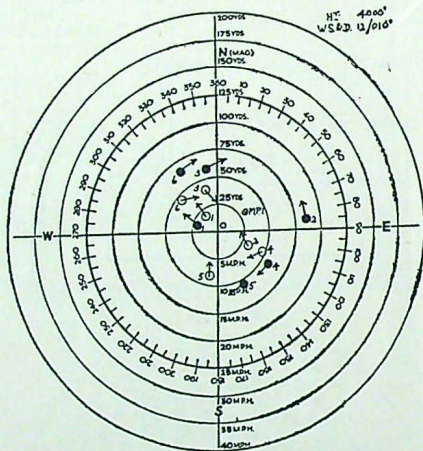
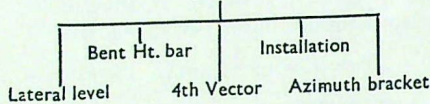
TEE EMM

December

OPEN GROUP (TANGENTIAL TYPE)

The bombs are distributed systematically to the left or right of the mean point of impact. Main causes :

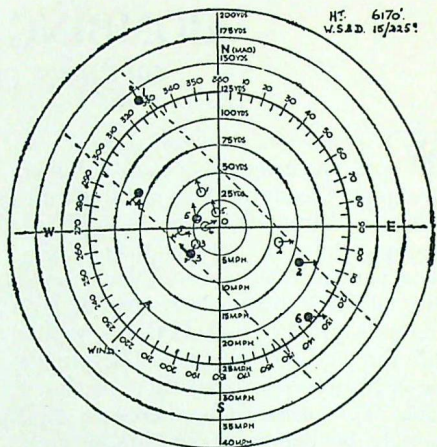
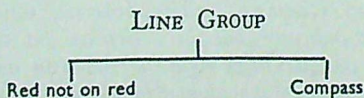
OPEN GROUP (TANGENTIAL TYPE)



A good example of a tangential Open Group. Installation of the bombsight was found to be incorrect, but the analyst did not give the dimensions of the error. This should have been done to satisfy the bomb aimer that his resultant ground error was fully accounted for.

LINE GROUP

The bombs are spread out in a line of considerable length but having relatively little width. Main causes :



A good example of a line error due to a defective compass which had a deviation of up to 30 degrees, according to the direction of attack.

Note the fact that the line error is at right angles to wind direction, and that a deviation of 30 degrees will produce approximately 100 yards' error on the ground in this instance—vide Bombs Nos. 1 and 6.

CLOSE GROUP

The bombs fall in a haphazard cluster around the mean point of impact.

FOR DIAGRAM SEE FOOT OF NEXT COLUMN.

A combination of any of the above errors will produce variations of groups, the most common being a combination of radial and tangential open groups. An incorrect wind component will cause any of them to be displaced from the target.

Now comes the important and difficult question of how to analyse these bombing groups. This is where an instructor must use his own initiative. For instance, he should make a distinction

between a pupil's first exercise and later ones. In the first one the fellow is naturally flustered and makes mistakes : with more experience he should have got them out of his system.

Here is an outline of the usual procedure. Note that it's essential that the Bombing Plot and all information supplied by the Bombing Ranges should be available as soon as the aircraft lands.

In conducting his investigation—sounds like Scotland Yard—the instructor must be mainly guided by the general "picture" which the Bombing Plot gives. Where there is some underlying cause for the appearance of the picture which the instructor can't immediately get at, he should ask himself the following :

- (a) What sort of grouping did the pupil have on previous exercises ?

- (b) Which pilots did he fly with at the time ?
- (c) What results have other pupils had with the same pilot, aircraft, and sight,—under similar conditions if possible ?
- (d) What results have other pupils got in the same aircraft with the same sight, but with other pilots ?
- (e) What were the prevailing weather conditions for the various exercises above ?

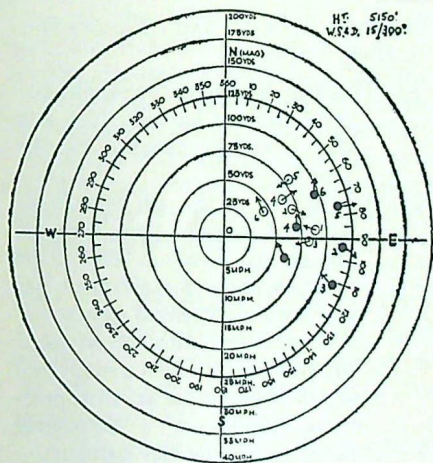
The answers to these questions, and others which a competent instructor will think of, will show on what lines he can work out a more detailed analysis.

Now here's an outline of points to be studied according to the types of group which we discussed above.

RADIÀL OPEN GROUPS

- (a) Check all computations * and sight settings recorded on Form 3073 and set on the bombsight. If there are errors, calculate the resultant ground error and apply to the bomb plot. Make the Bomb Aimer do this so that you can watch his handling of computers, etc.
- (b) The bomb aimer may not have levelled fore and aft on his first attack and may have kept the same wrong setting for following ones.
- (c) If there are still systematic errors, though all settings were correctly

* Special bomber's and navigator's word apparently—does not appear in the dictionary. Does Mr. A. P. Herbert know what's going on ?



A good example of a close Group with a vector error. No other comments necessary, and it is unnecessary to analyse each bomb relative to the MPI.

made, check the bombsight with the Test Rig in the plotting office. If the bombsight is correct, have the air speed indicator, the altimeter, and the thermometer checked by the Instrument Section.

TANGENTIAL OPEN GROUPS

- (a) The Bomb Aimer may not have levelled laterally on his first attack, and may have kept the same wrong setting for following ones.
- (b) The bombsight may have been wrongly installed. If so, the magnitude of the resultant ground error should be calculated; so as to satisfy the Bomb Aimer that it wasn't his fault.
- (c) The height bar may have been strained laterally. Check it by Test Rig.
- (d) The azimuth bracket spigot may not have been centralised during the whole exercise. Although unlikely this is possible if the bracket has a stiff azimuth bearing, or the tension screw is tightened.

LINE GROUPS

Most Line Groups you'll find occur at right angles to wind direction and are due to compass deviation of some kind. The main causes are :-

- (a) Sticky pivot of compass needle.
- (b) Magnetic field of compass magnets deteriorated.
- (c) Abnormal swirl caused by steep turns during the approach—this gives rise to compass "chasing."

(d) Bombsight compass not swung, or incorrectly swung.

(e) Bomb Aimer failing to keep "red on red."

This last one should always be suspected last, because far too often it's made the excuse for line groups.

Swirl can largely be eliminated if the pilot tells the Bomb Aimer of the course for the next attack. The Bomb Aimer sets this course against the bombsight lubber-line and this will leave only small corrections to make when the aircraft has settled down on this course.

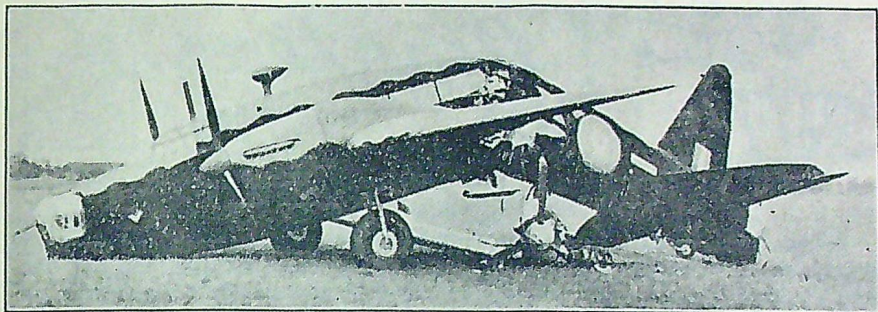
You may find "false" line groups if attacks are made up and down wind only, when the lateral dispersion may be due to steering or piloting errors, or to hazardous lateral levelling errors, so be sure to differentiate carefully between a false and true line group.

COMBINED RADIAL AND TANGENTIAL OPEN GROUP

- (a) This may be due to the height bar being strained laterally fore and aft. It can be checked by the Test Rig.
- (b) Any setting of the 4th vector attachment may also cause this. If the enemy direction bar is at right angles to the airspeed bar you'll get a tangential group. If it is coincident with the airspeed bar you'll get a radial group, and so, if between these two positions, you'll get a combined radial and tangential pattern.

We'll finish up this series next month with some further notes on human and mechanical causes and how the range staff can help in the analysis."

Is Your Accident Really Necessary?



How to waste man-hours—

**When Prune
Meets Prune**

NEW SMALL SCALE PLOTTING CHARTS

The introduction of a $\frac{1}{2}$ million plotting chart (Series G.S.G.S. 5012) is announced, the first sheet of which (N.W. 46/8) is now available on demand, covering an area from Dublin to Königsberg (8° west to 21° east). As with the G.S.G.S. 4080 series, the scale is correct at 56° north.

2. The coastal outlines are heavily emphasised, spot heights—with hachuring—are shown in metres, and isogonals are spaced at intervals of 1° as before. A new departure is the addition of statute mile scales in the body of the sheet as well as at both sides. No radio broadcast stations are marked as the localities of these are not permanent in wartime. The shapes of towns have been considerably improved and closely approximate their actual shape shown on topographical maps.

SOMETHING DIFFERENT

On November 21st the R.A.F. Journal changed into battle-dress—in other words, it has altered its large flat size, suitable for lying on mess tables, to a small compact size, suitable for going into men's pockets.

It is also appearing once a month only instead of twice, but with a distribution of one copy to every fifty people instead of to about every two hundred. In short, it's an entirely different Journal. It aims at putting into the picture the "ground staff," that vast body of men and women who do so much for the few. And so here's luck to it.



*They've got something
there.*



NO. 5. PILOTS CAN CO-OPERATE

When, as sometimes happens, an aeroplane is right off its track, and even after checking courses and fixes there still seems no reason for this, it is then that the awful doubt creeps into the navigator's mind: Is the aircraft being accurately flown?

For accurate flying is essential when getting loop bearings or making drift or astro observations. At such times a pilot should ask himself very seriously whether he really is maintaining a steady course and airspeed. Is he keeping the compass from wandering off during beam shots? Is he keeping the airspeed steady for fore and aft shots? The accuracy of the navigator's observations, in fact, depends almost certainly on his pilot.

Again, do you, as pilot, *always* tell the navigator *immediately* you alter course and airspeed, even if it's unintentional on your part. If you allow the course to change by even 2° or so during an observation, don't keep it a secret, between you and your Maker; tell the poor guy with the sextant, and then he won't be puzzling over an unaccountable 20 mile error. He may be able to take another sight right away, while he still has the sextant in his hand and may even thank you for telling him. But he certainly won't thank you if you keep the information tight under your helmet till he has carefully stowed away his sextant and got back to his table.

In brief, keep your course steady for loops, drift, and astro beam shots; keep your airspeed steady for astro fore and aft shots; and if you notice either course or airspeed (or both) wandering off slightly during an observation, try to make it wander back at about the same rate, so that everything may even itself out. And then *tell* the navigator exactly what you have done.

Do you think, Prune, that this is all bull? Then hand over to your second pilot and just try sighting stars with the astro-compass. When you've had two or three shots at this in a wallowing aircraft, you may or may not still have your eyeballs intact, but at least you'll have some idea of what your navigator has to do—and you may even be anxious to help him do it. It's *your* flying that counts.

NAVIGATION NOTE

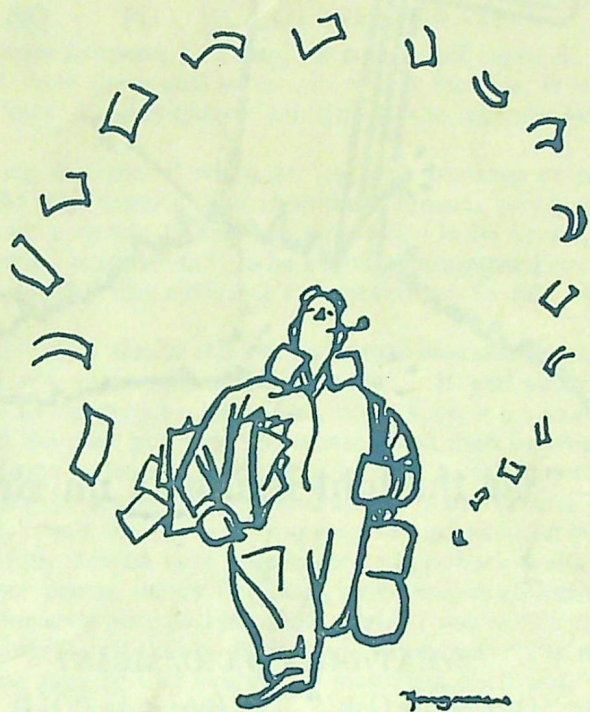
The qualifying examination papers, with model answers, for the new series Specialist "N" courses, opening at Cranage, are now available. They may be had on demand from Group Navigation Officers. A. M. O., A 817/42 refers.



“He thought Red was on Red.”

WHAT DOES O.U.O. MEAN?

It means for “Official Use Only.” TEE EMM is an O.U.O. publication. This— if you follow our reasoning—means TEE EMM is for Official Use Only. And this means that those not entitled to see it are not to see it. It is primarily a Training Memorandum for air-crews, instructors and all those in the Air Force connected with these jobs. It is *not* for civilians, or people who feel they'd like to see it because they've heard it's interesting, or because they have a boy who's thinking of going into the Air Force but isn't in it yet, or whose friend is in the writing business and would love to have a look at a copy, or, etc., etc. It is a Service Training Memorandum written *for* the Service and issued *by* the Service in the person of the Air Member for Training.



NOT to be taken into the air