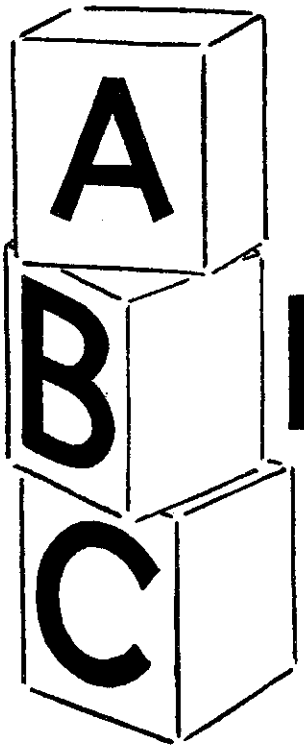
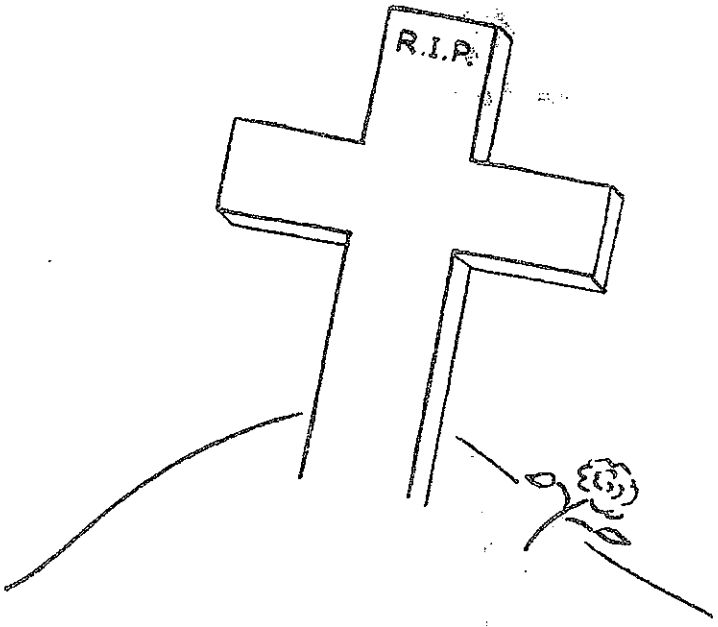
F/O MACKRETH. D.
SOUTHALL.

A B C of MAP-READING in the U.K.



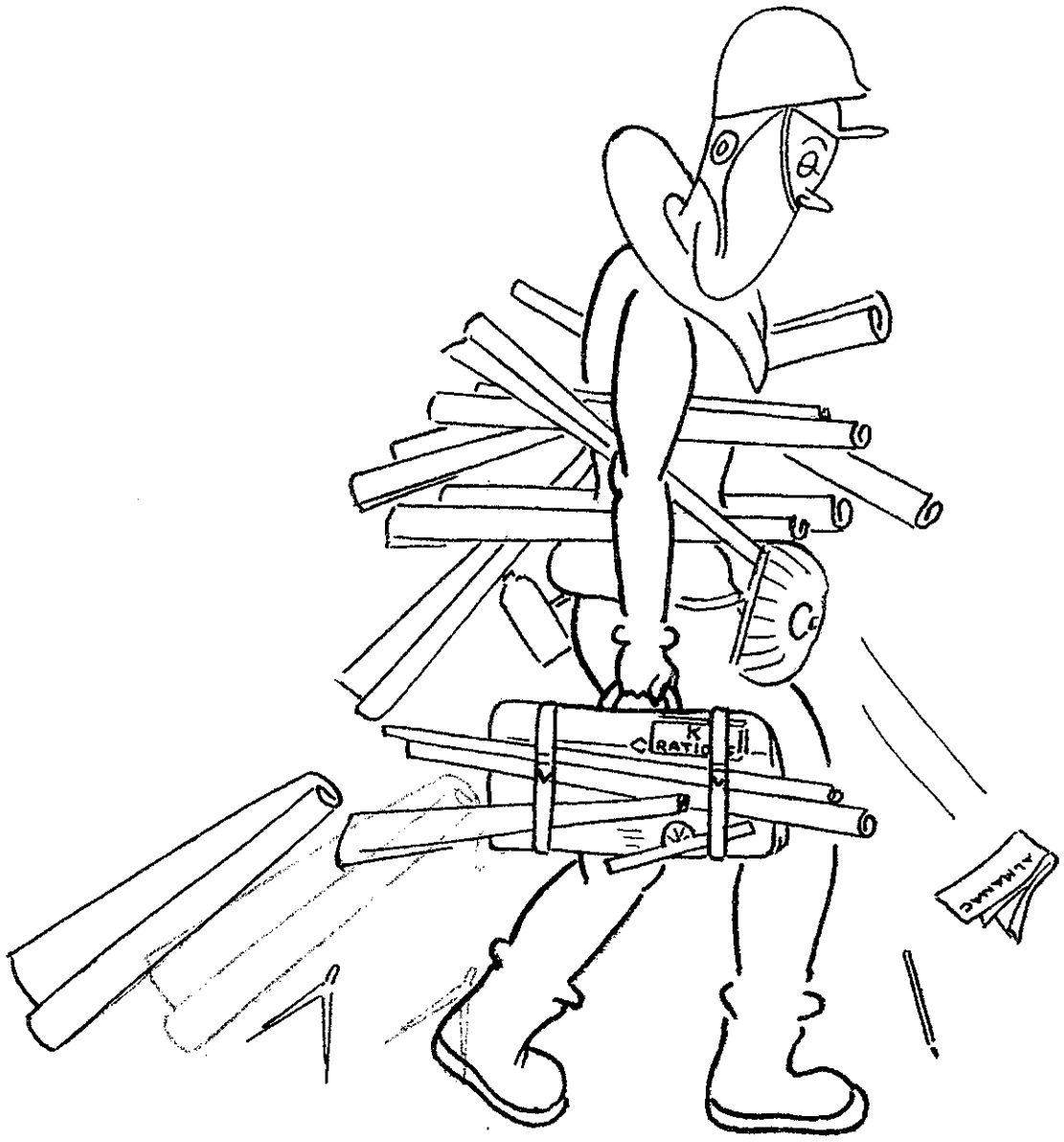
PREPARED BY A-3 NAVIGATION SECTION
HEADQUARTERS 2D BOMB. DIVISION
8TH AIR FORCE
APRIL 1944

REPRODUCED BY 342ND ENGR AVN. TOPO. BN.

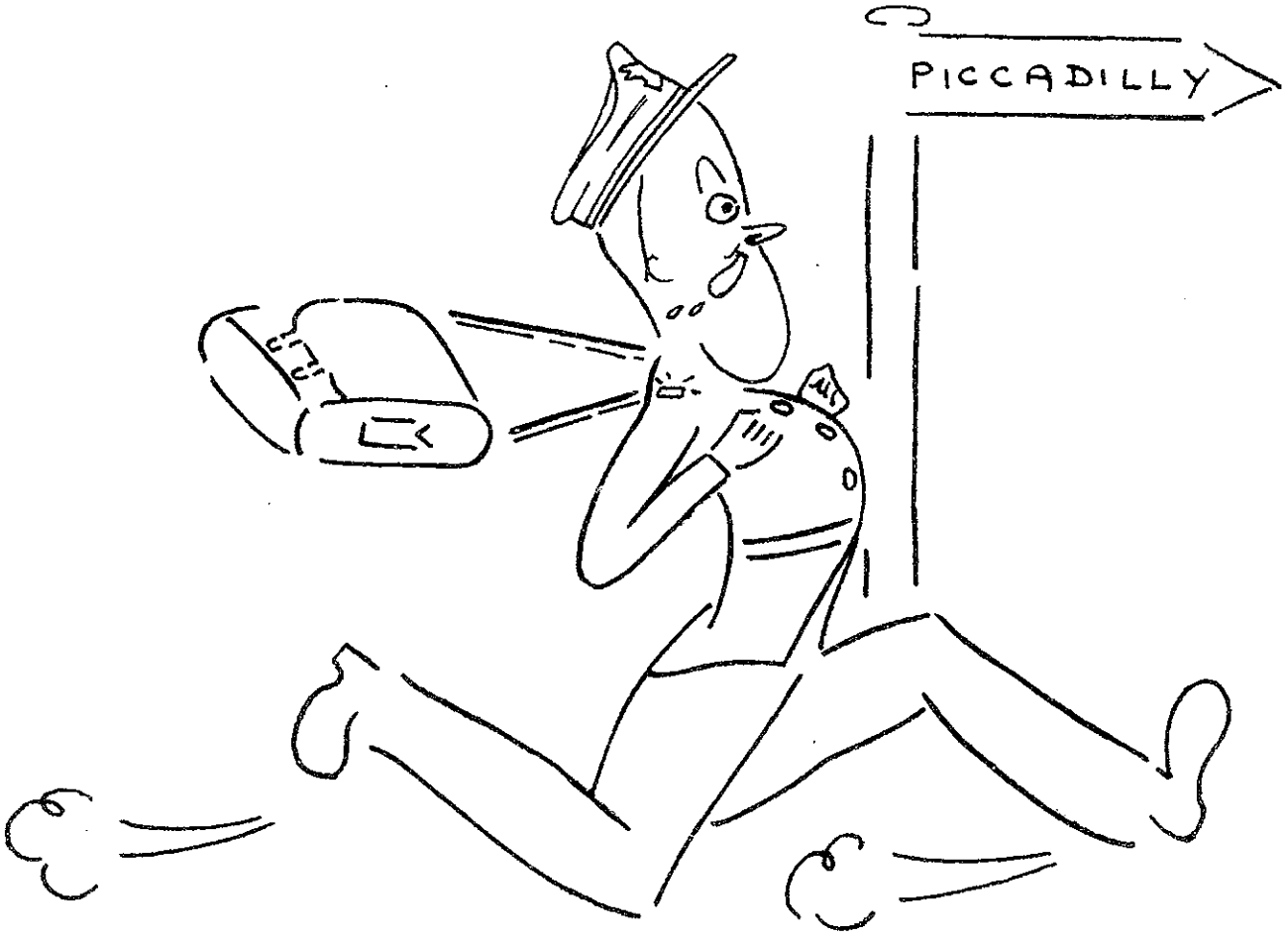


Here lies a man in his permanent station,
Whose wartime job was navigation,
He leaves behind a sorrowing wife,
'Cos he couldn't "Map-Read" to save his life."

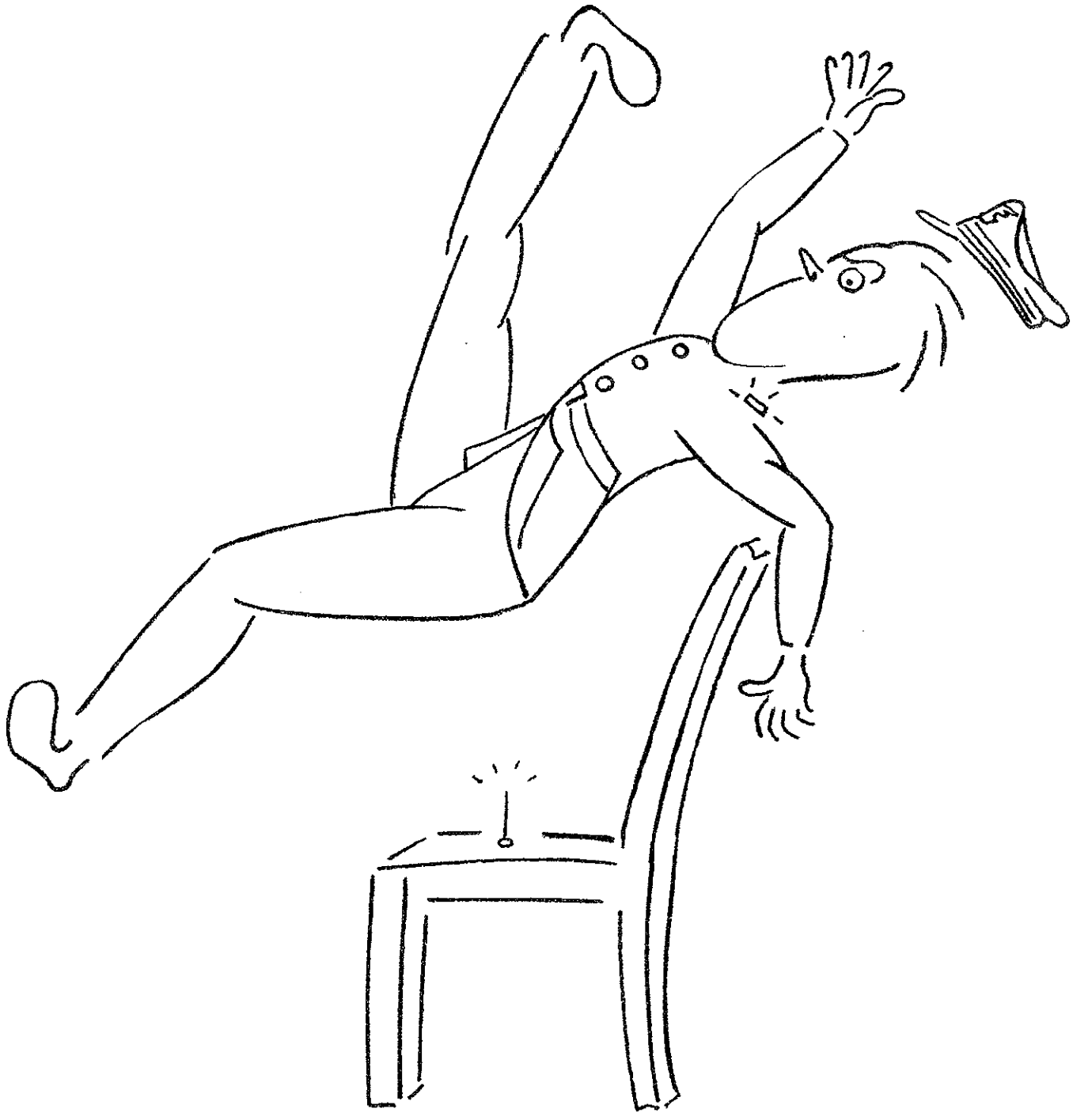
ARE YOU A MEMBER OF THIS PROFESSION?



ARE YOU NEW IN *the* U.K?



HAVE YOU EVER BEEN STUCK ON A "PIN-POINT?"



IF SO!

FOLLOW THIS UP

And Begin Here

These

POOP-SHEETS

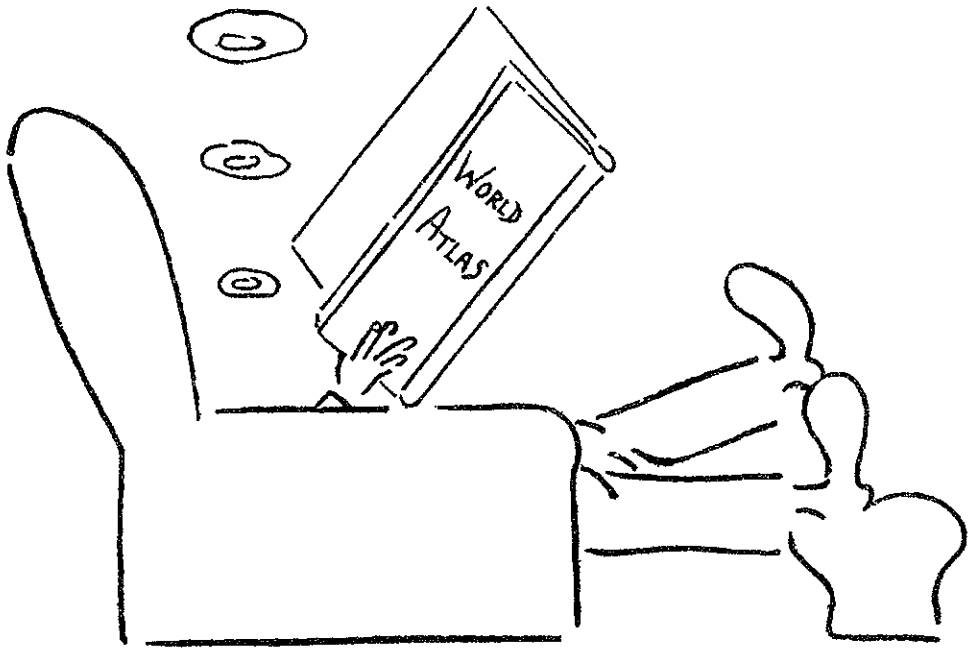
HAVE BEEN PREPARED

TO HELP

YOU

TO IMPROVE YOUR

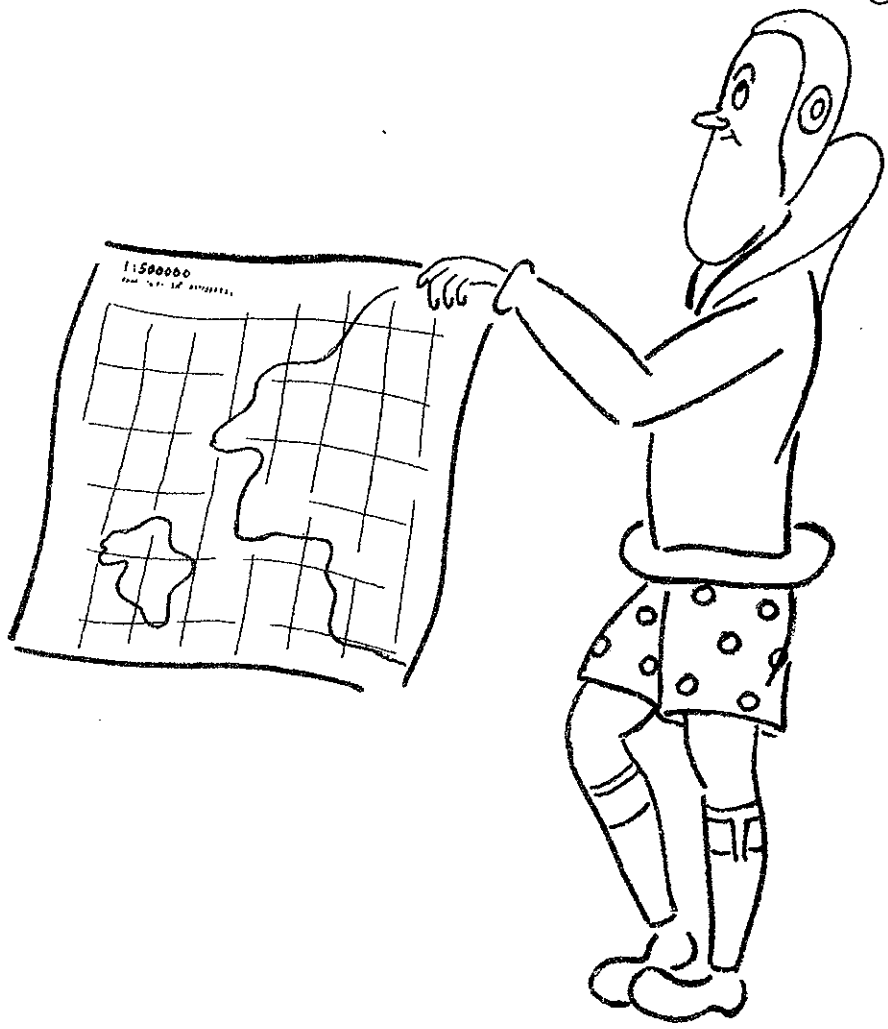
MAP-READING



I. INTRODUCTION

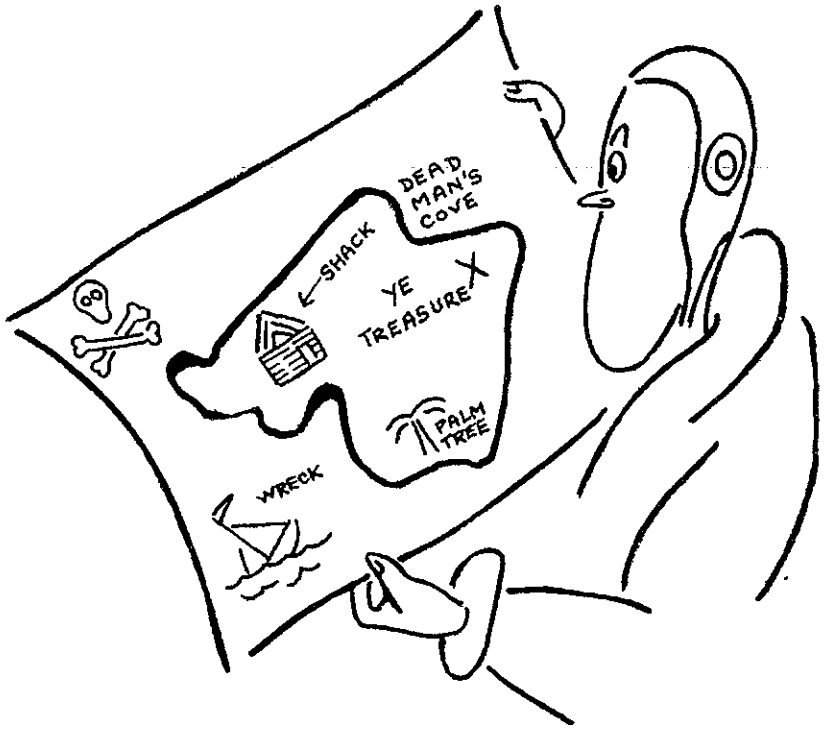
The first requirement of the would-be MAP-READER is that he should have a MAP.~

Naturally **YOU** *wouldn't forget to take your* **MAPS** *with you.*



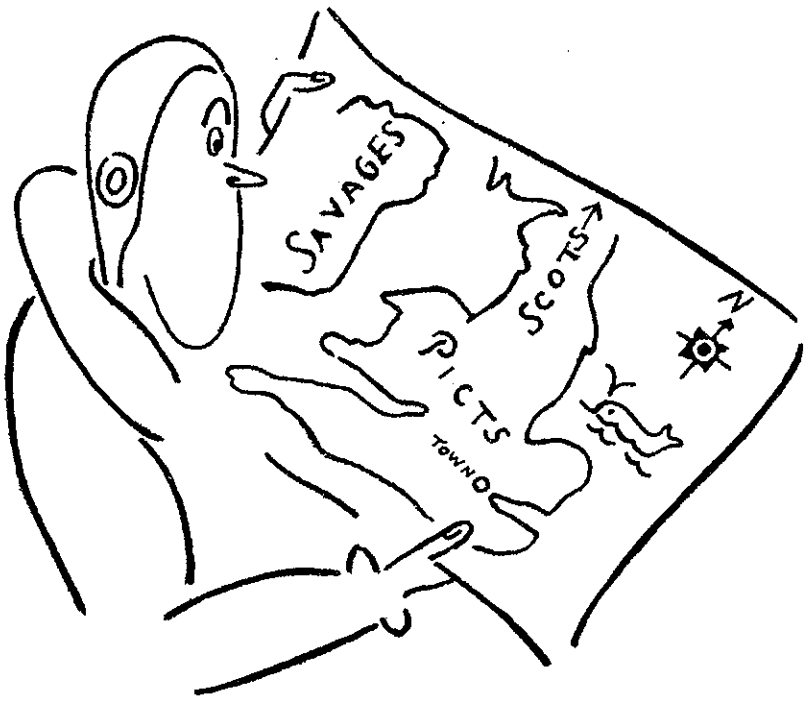
But it HAS happened in the past and WILL certainly happen again in the future.

Having got a map, he can then map-read provided, of course, it is the <u>RIGHT</u> map.



Searching for a landmark on the the wrong map-sheet is like expecting summer in England.

ALSO IT SHOULD BE
UP-TO-DATE



WITH ALL PUBLISHED AMENDMENTS.

Finally, he shouldn't just take maps for the intended route but also of any route he may have to use in an emergency

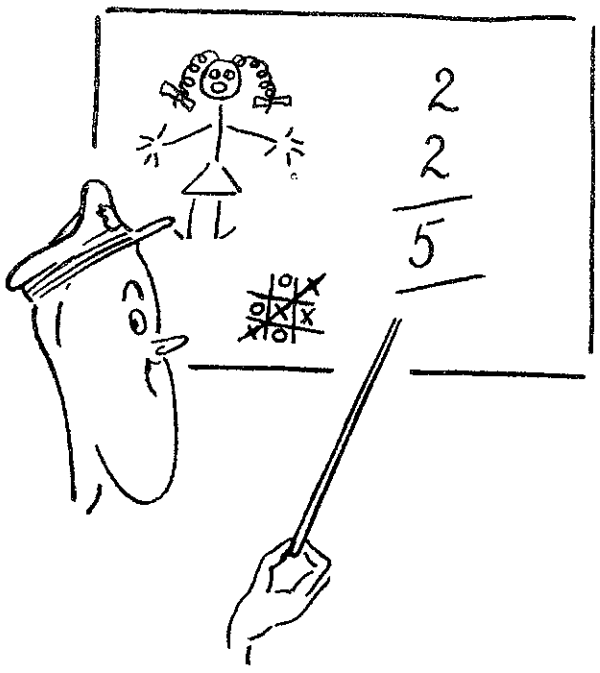
IN OTHER WORDS

TAKE ALL *the* MAPS

THAT MAY POSSIBLY BE REQUIRED

II. KNOW YOUR MAPS

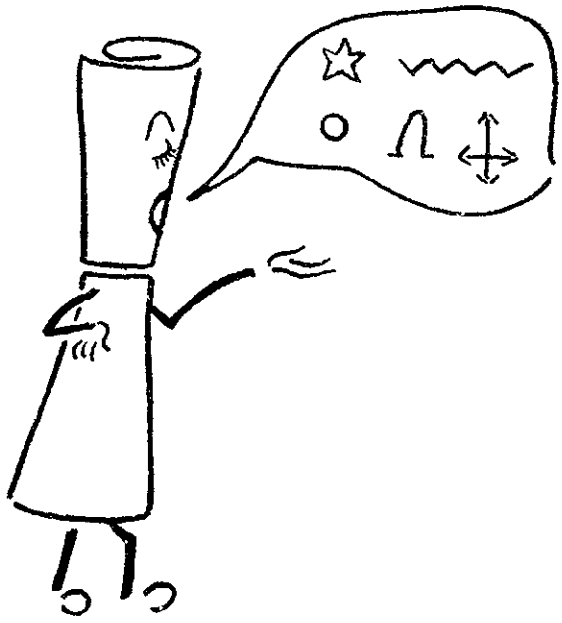
Before we go further into **MAP-READING**, how about a few words on the subject of the **MAPS** themselves?
There isn't room in this little booklet to deal with **EACH** and **EVERY** question about **MAPS** and, in any case the proficient navigator **WILL KNOW JUST ABOUT ALL THE ANSWERS.**



There **ARE**, however, one or two questions particularly appropriate to **MAP-READING** and so we make no apology for including them here.

QUESTION Nº1 IS –

How Well Do You Speak The Language Of Maps?



By this we mean those funny-looking symbols dotted around on maps and known to the Highbrows as

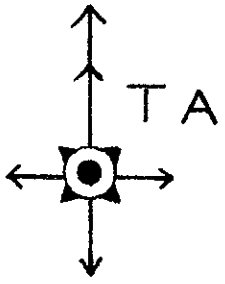
CONVENTIONAL SIGNS

Probably you're pretty fluent, but you cant get along really well with maps unless you're Word Perfect (And it isn't good enough to carry an English ~~~ Cartography Dictionary along with you!)

Of course everyone knows what this means

in honest-to-goodness English, and this

BUT WHAT ABOUT THIS?

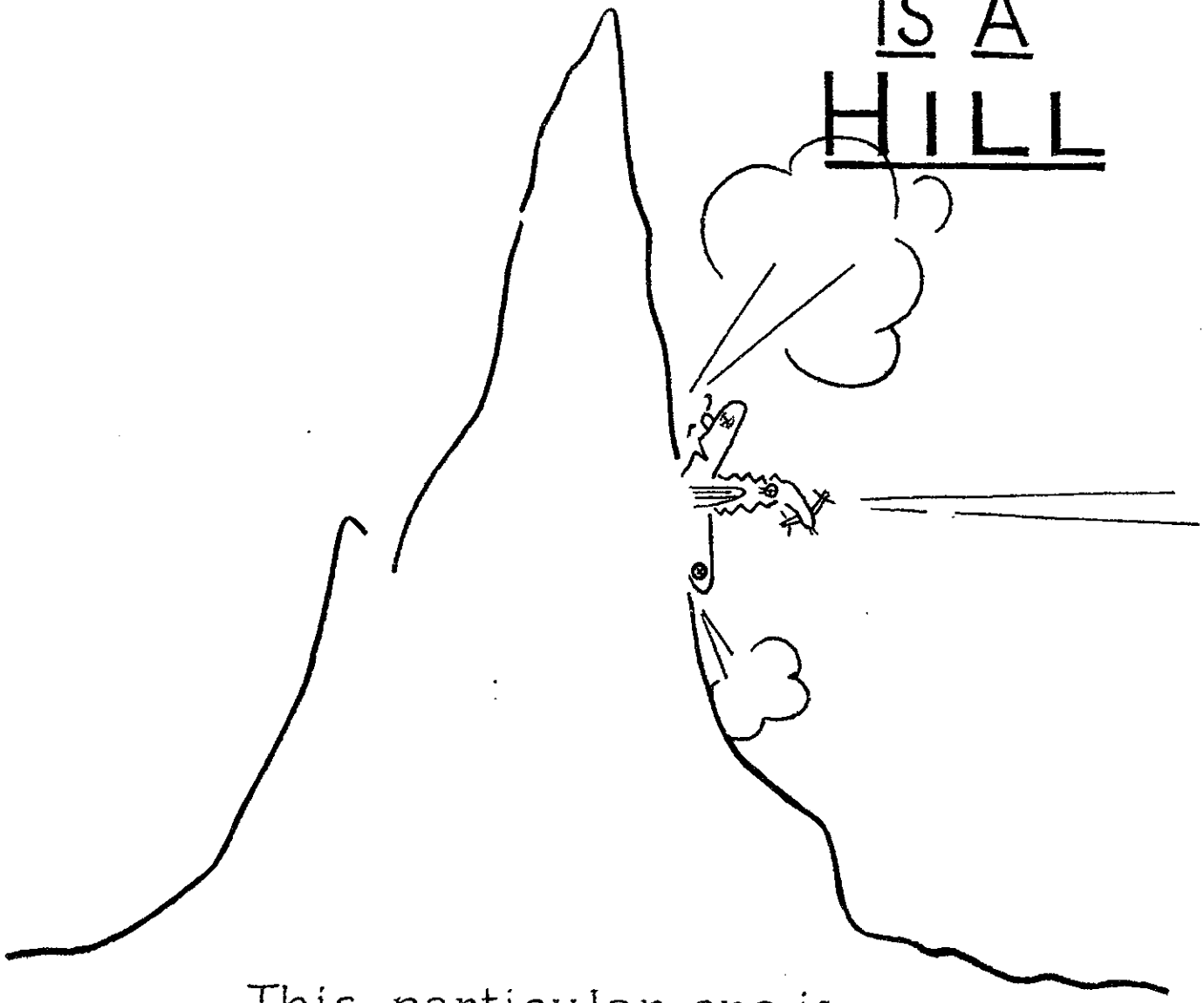


Remember, to be able to say "Voulez-vous promenade avec moi?" does not make you a French linguist.

The moral is — KNOW YOUR MAP SYMBOLS BY HEART-ALL OF 'EM.

Another Important Question is:

How High is a Hill



This particular one is

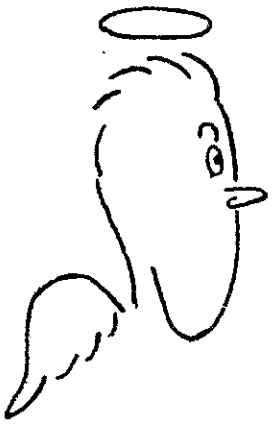
5,000

and the airplane is (or rather <u>was</u>!) flying at 7,000 feet.

The answer is →

That the height of the hill was expressed in

METRES



And the navigator forgot to convert it to feet. (in this case about 16,500)

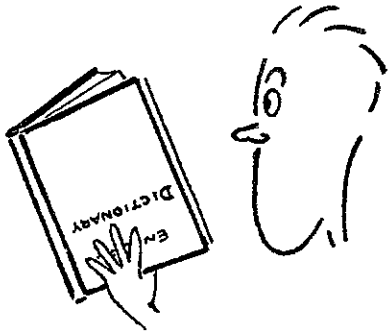
Generally speaking, maps of the British Isles use <u>FEET</u> to express height of terrain above sea level, while those of Continental Europe use <u>METRES</u>, but don't assume this to be true in all cases. Always check the map margin to make sure which unit of measurement is employed and

WHEREVER NECESSARY

CONVERT METRES TO FEET!

THIRDLY, AND LASTLY:

WHAT DOES A MILE MEAN?



Well, it doesn't mean anything very much until you reduce it to homely **EVERY-DAY** terms.

To most people a **MILE** means such things as a 15-minutes walk, a 2-minutes car ride or the distance to the railway station. They form these values by **EXPERIENCE** & get used to them by **HABIT.**

Now if a law was passed to **CHANGE** a mile to a half-mile, a half-mile to a quarter-mile, and so on, it would take us quite some time to **GET USED TO** the new set of values which would then apply.

It's not likely to happen, but something very like this **DOES** happen to the map-reader when he **CHANGES** from one **SCALE** of map to another. (And you've got to remember that he may be **FORCED** to change at any time — as for instance when his route is not **COVER-ED** by his favorite scale of map)

If for example, he is accustomed to using 1:500,000 maps & changes to 1:250,000 he must **GET USED** to the fact that **NOW**

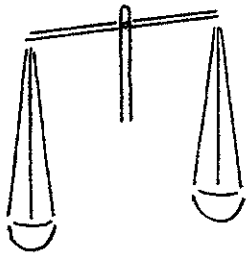
Everything on the map is **TWICE** as big,

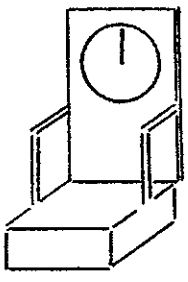
A mile, measured on the map is **TWICE** as long, and

His aircraft travels across it **TWICE** as fast.

Naturally he **KNOWS** all this but it takes time to feel **AT HOME** about it. Meanwhile he's **"UP IN THE AIR"** because his previous values have **FALLEN TO THE GROUND.** Well, the big thing is to be **PREPARED** for such an emergency by practice in using maps with **DIFFERENT SCALES** and so getting accustomed to the values **PECULIAR TO EACH.**

In other words, **PRACTICE NOW** so you'll be **PROFICIENT THEN.**



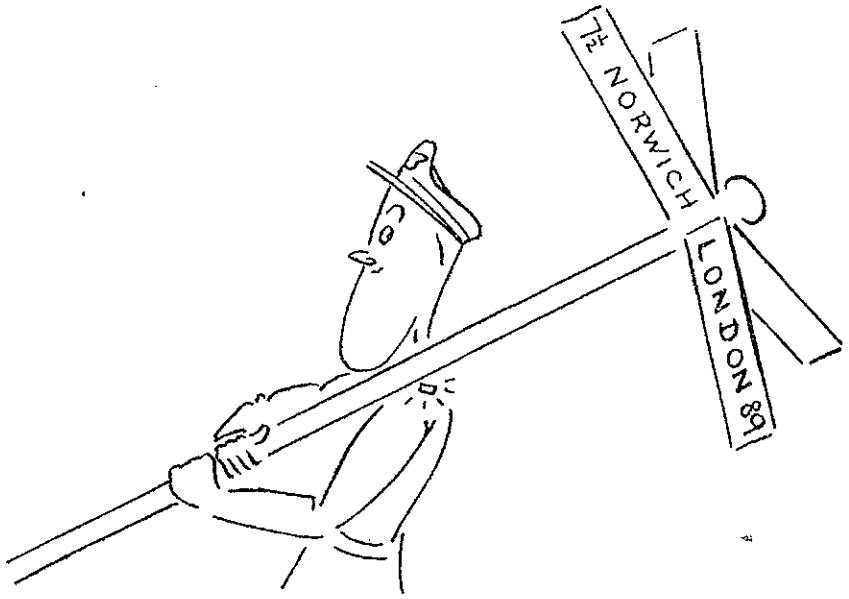


USE THE DIFFERENT SCALES

III. KNOW WHAT TO LOOK FOR

As a map-reader you must **BE SELECTIVE.**

That is you must choose from the mass of ground detail **ONLY THOSE FEATURES WHICH ARE LIKELY TO ASSIST YOU IN PIN-POINTING YOUR POSITION.**



To help you **MAKE** this choice we will, in the following few pages take a look at the more common features & try to give you some of the **GOOD** and **BAD POINTS** about each

TOWNS

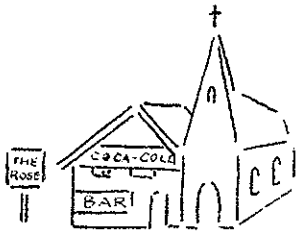
SMALL towns are **NOT** much good, IN THEMSELVES, as landmarks ***BECAUSE–***

There are

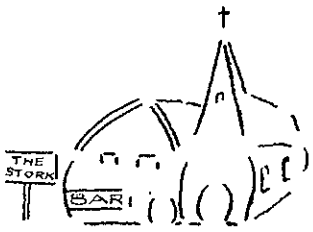
far **TOO** many

of the **ONE SORT!**

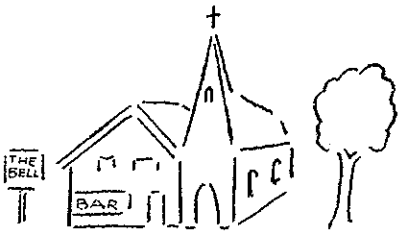
BIG towns and **CITIES** are **GOOD**, **BIG LANDMARKS** - and they are **FEWER** and more **WIDELY SPACED**.



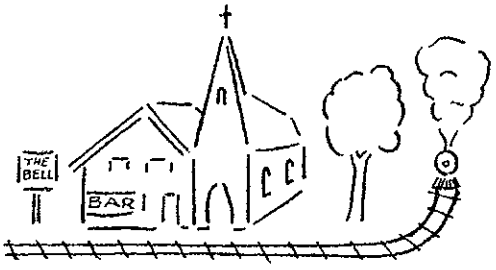
If you choose a **SMALL** town - there should be something really **DISTINCTIVE** about it.



Towns **DO** change their shapes, due to population increases, etc., but it's a very gradual change

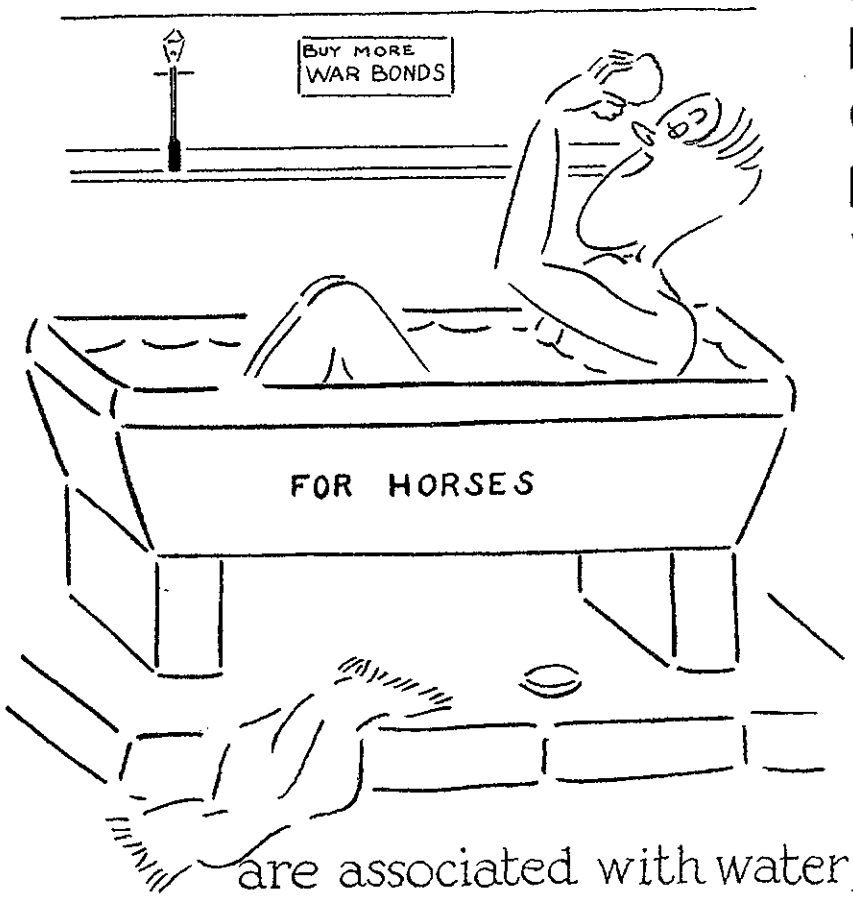


SMALL towns are **O.K.** as landmarks if they have one



or two associated features to make identification **CERTAIN**

WATER



IT IS ALMOST IMPOSSIBLE TO OVER-STRESS THE IMPORTANCE OF WATER TO MAP-READERS

Quite a lot of ground features are associated with water, in one form or another and nearly **ALL** of them are rich in potential **PIN-POINTS.**

Probably the **BEST** of the bunch are: -

LAKES These are nearly always **EASY** to identify.

ISLANDS (The **SMALLER** ones)

RESERVOIRS (The **LARGER** ones)

RIVERS The **BIG** ones are best and the **TWISTS** and **TURNS** make for good pin-points. **Be** careful during times of **FLOOD**, when a river may get a bit beyond itself, and of **DROUGHT**, when it may even become **DEHYDRATED.**

Among the **SECOND CHOICES** we might include:-

COASTLINES Where **BROKEN** - the **INDENTATIONS** will provide good pin-points. **WHERE STRAIGHT** - the **TREND** or **DIRECTION** gives a **POSITION LINE.**

ROCKS These **MAY** be covered at **HIGH TIDE**, but **EVEN SO** there is often **SURF** to give away their position.

ESTUARIES Be careful when using these as estuaries have a trick of **IMITATING** each other.

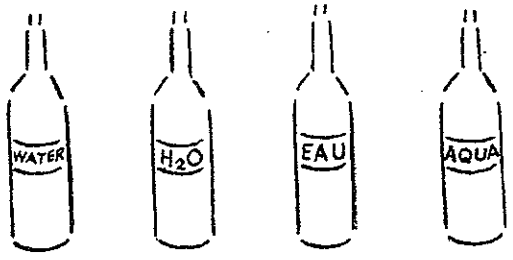
Of **LESSER IMPORTANCE**, but with definite utilitarian value, are

CLIFFS They may be **SHEER** or **SLOPING**, **STRAIGHT** or **BROKEN.** They may **RUN DIRECT** into the sea or be **SEPARATED** by a strip of beach. And they may have a distinctive **COLOUR.**

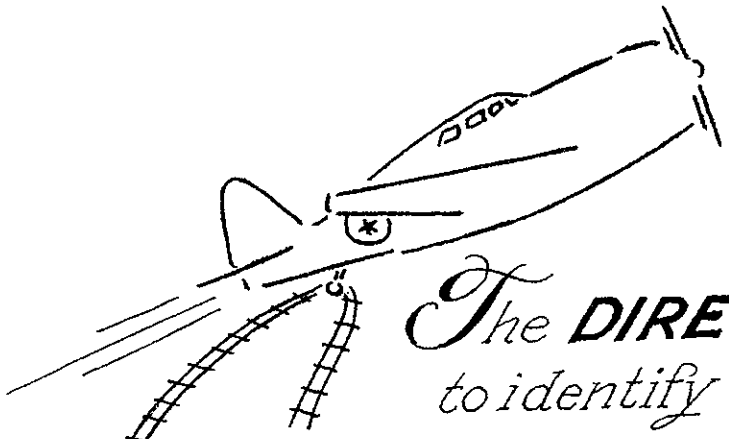
SANDBANKS When **COVERED** by the tide you can spot them by the way they upset the **GENERAL COLOUR SCHEME** of the sea.

SHOALS (Not the **PISCATORIAL** variety) They **ALSO** mess up the surrounding **COLOUR SCHEME** for your benefit.

Quite an impressive array, isn't it? Yes, there's no doubt that **WATER**, whichever way you look at it, is an extraordinarily useful commodity.



RAILWAYS



RAILWAYS CAN EASILY BE PICKED UP FROM THE AIR

The ***DIRECTION*** *of the lines helps to identify* ***WHICH*** *railway it is.*

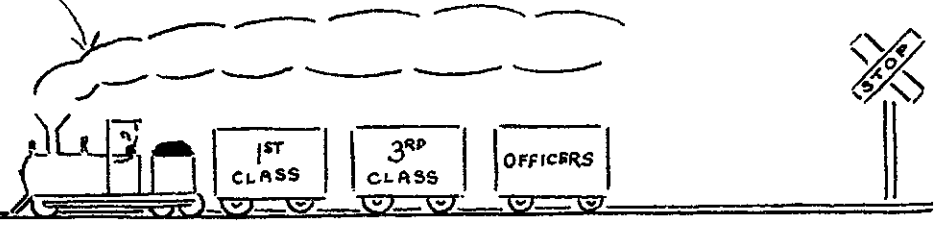
Generally speaking, a railway does **NOT** give you a **FIX**
(**RAILWAY LINE = POSITION LINE**)
but it **DOES** narrow down the **AREA OF SEARCH.**

You get the **FIX** by linking up the railway to some **OTHER** landmark, **ON** or **NEAR** it, such as a tunnel, junction or town.

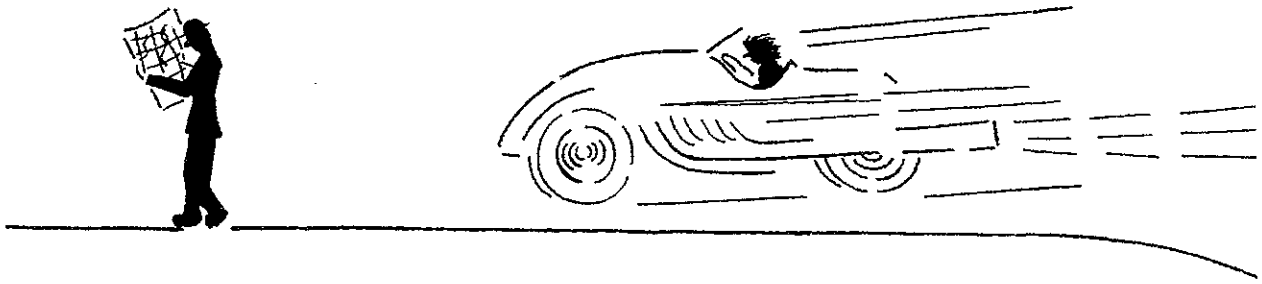
In **SOME** parts of Britain & the Continent the railway network is too **CONGESTED** to be of much assistance, but **MOSTLY** it is widely spaced enough to be a **REAL HELP.**

Even if you're flying so high you can't see THESE

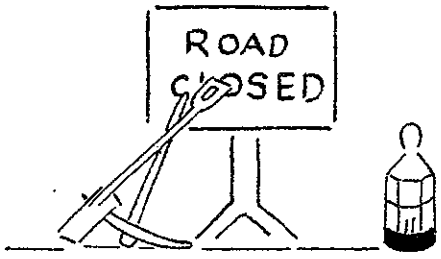
You can still see THIS



ROADS

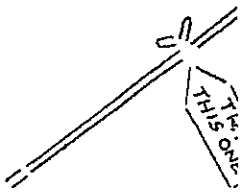


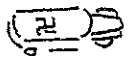
Roads are **NOT** to be recommended for map-reading



They are **NOT** conspicuous f
the air, particularly the **MA**
roads with **METALLED** surfa

In any case there are **MORE** roads than you can shake a stick at.

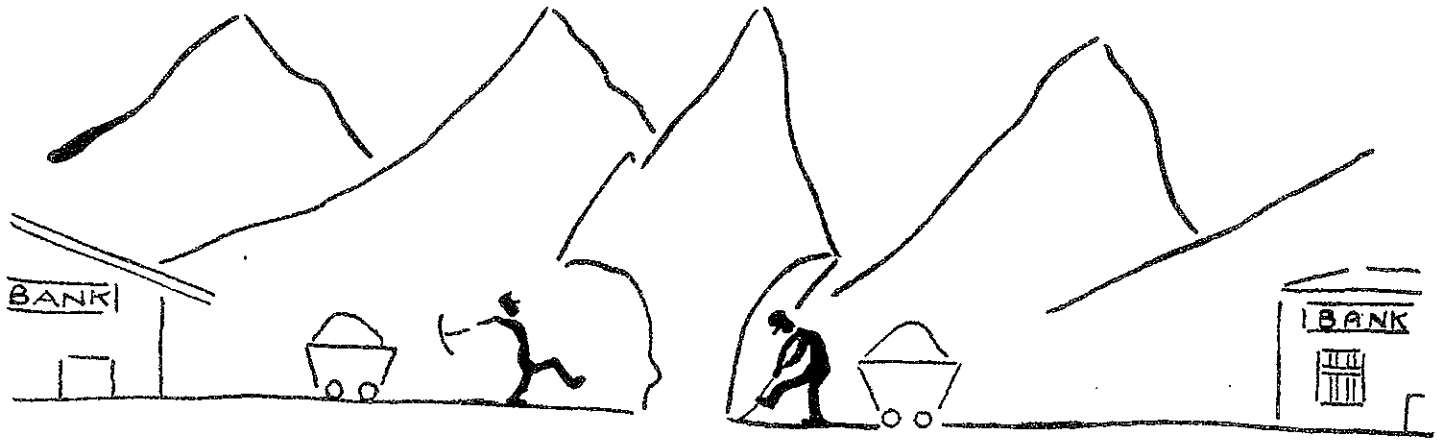




The well-defined **GERI**
AUTO-BAHN is a pos
exception but **THESE**
BE CAMOUFLAGED.

MOUNTAINS AND HILLS

THAR'S GOLD IN THEM THAR HILLS!



ITS PERFECTLY TRUE – Mountains and Hills can be like money in the **BANK** to the **MAP-READER** who knows **HOW** to use them.

It must be admitted that they are **NOT** good for a **LOT** of Pin-Points. Mountains & Hills are **GREGARIOUS** Creatures. They **HUDDLE** together like **SHEEP** and, like sheep, it isn't always easy **TO TELL T'OTHER FROM WHICH!**

You **CAN**, however, **DEDUCE QUITE A LOT** from them

F'RINSTANCE

DEDUCTION 1

The mere fact of **SEEING** high grou
below you is a pretty good indication
WHAT AREA you're flying over.

DEDUCTION 2

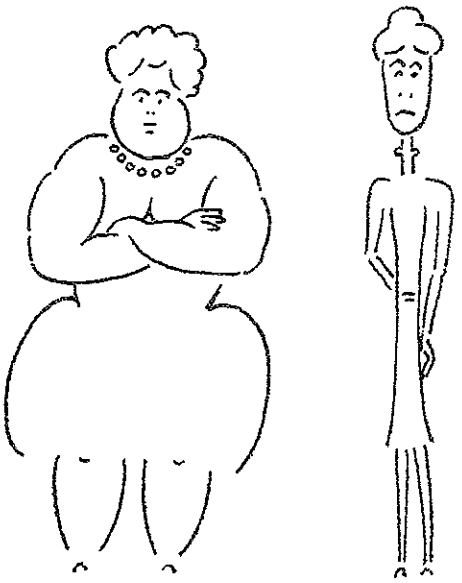
The **GENERAL SLOPE** of the grou
and the way the **RIVERS** run will tell y
WHICH side of the **WATERSHED** of tha
area you are on.

DEDUCTION 3

You **MAY** be able to estimate the heig
of any **PEAKS** by comparison with your o
height & then check against the **SPOT-HEIGHTS** on your map.
FINALLY, don't forget the odd peak or h
standing aloof from the rest of the gang
it **MAY NOT** be the **BIGGEST** or **TALLES**
but it **WILL** make the **BEST** pin-point.

WOODS AND FORESTS

WOODS are sometimes useful

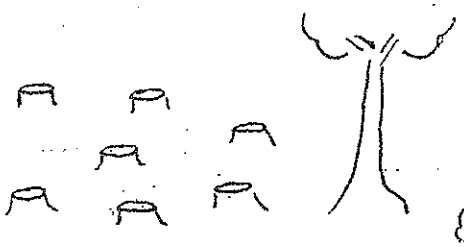


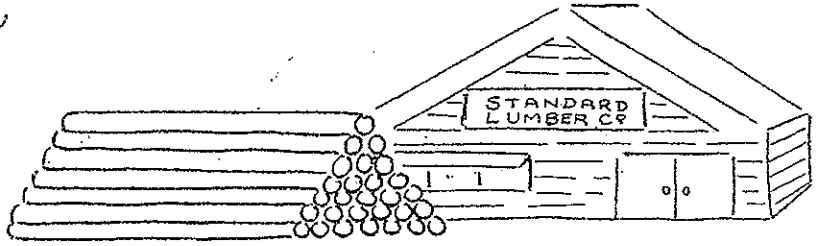
Particularly if they have **DISTINCTIVE** shapes

FORESTS

ARE TOO BIG AND SO ARE NOT MUCH GOOD

UNLESS YOU COME TO A IN THE TREES





ALSO, don't forget that **BOTH FORESTS** and **WOODS** are liable to **CHANGE** their shapes.

SMALL LANDMARKS

Under **THIS** heading we're going to include

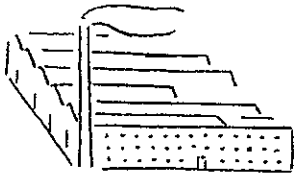
RACE COURSES RC

GOLF COURSES

LIGHTHOUSES

LIGHTSHIPS

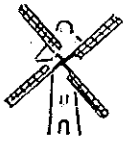
*They're **SMALL**, but they're **NEARLY AL-WAYS** marked on maps and if you can spot one it's a **FIRST CLASS** pin-point.*



LARGE HOUSES

LARGE FACTORIES

WINDMILLS



*These **SOMETIMES** stand out very well but the draw-back is that they are **RARELY** marked on maps.*

AIRDROMES

We advise you to be **VERY CAREFUL** how you use these.

There are several **GOOD REASONS** for this

Even **IF** your map were marked with **EVERY** airdrome **BUILT** and **UNDER** construction (and of course it never **IS**) it **STILL REMAINS** that, in **MANY PARTS** of **BRITAIN**, air-dromes are

1. As **THICK** as **BLACKBERRIES** in **SEPTEMBER.**
2. As **CLOSE TOGETHER** as **SARDINES** in a **TIN.**
3. As **ALIKE** as **PEAS** in a **POD.**

in fact, **ALL** the qualities a good land-mark should **NOT** have.

We **DON'T** say, mark you that you shouldn't use airdromes **AT ALL** for map-reading — **WE DO** say, if you **DO** use them, be **VERY, VERY CAREFUL**

And **LAST** but not **LEAST**

BARRAGE BALLOONS

can be used to assist the map-reader's purpose

FOR

They **MAY** serve to indicate the position of a town **EVEN** when the town **ITSELF** cannot be seen

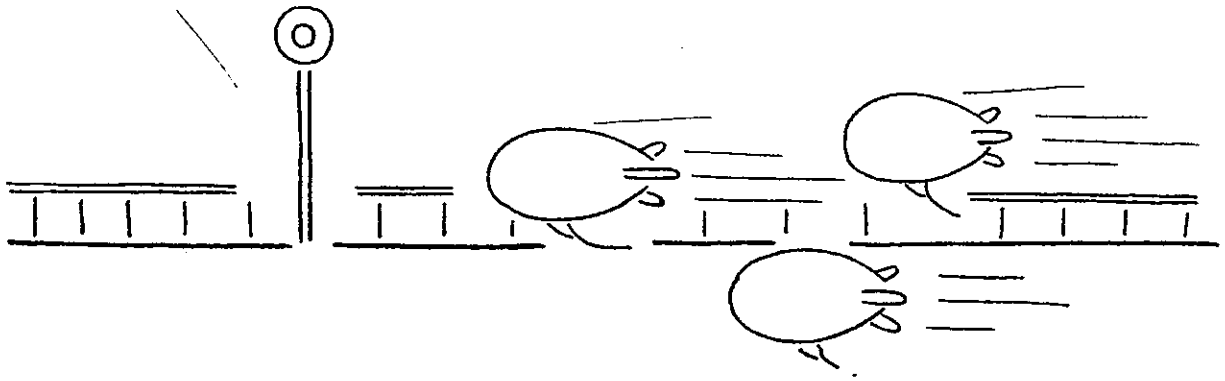
OR

They **MAY** help to **IDENTIFY** a town which can be **SEEN** but is not **RECOGNISED**

ALSO

(this has nothing to do with map-reading) they always fly with **NOSES INTO WIND.** So if you want to know where the wind is coming from

PUT YOUR MONEY ON THE NOSE!

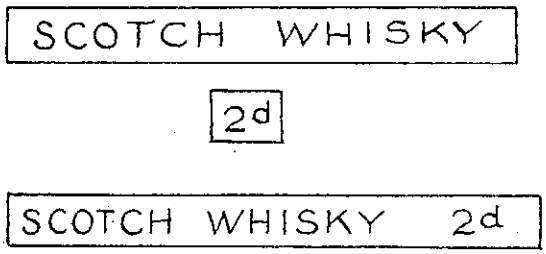


For the sake of convenience we've dealt almost exclusively, in this Part, with the **INDIVIDUAL** qualities of **INDIVIDUAL** ground features.

But **PLEASE** don't assume because of this that a **LANDMARK** necessarily consists of just **ONE** ground feature — **USUALLY** it needs **MORE** than one.

Of course, if a feature is **UNIQUE IN ITSELF** it may be used **BY ITSELF**, as a landmark.

Mostly, though, there is no **SINGLE** feature around with this desirable quality and the required result must be got by **"MARRYING-UP"** two or more features. **INDIVIDUALLY** they have nothing uncommon about them — **COMBINED TOGETHER** they form something really **DISTINCTIVE**.



Hence the saying that

THE PATTERN IS MORE IMPORTANT THAN IT'S PARTS

IV. KNOW WHAT TO DO.

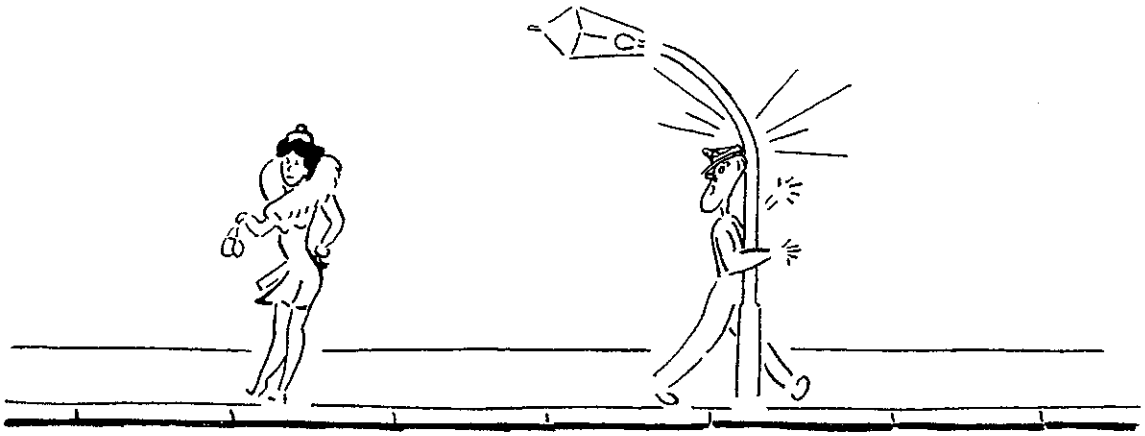
The **VERY FIRST THING** to do, before you **EVEN BEGIN** to map-read, is to **TURN** your **MAP** so that you can **VIEW IT** in the **SAME DIRECTION** as the aircraft is **FLYING**

This may not seem a very **IMPORTANT** point, but it is very much **EASIER** for you to recognize the **LIE OF THE LAND** if you've got **MAP** and **GROUND SYNCHRONIZED** as to **DIRECTION**

This process is known as

ORIENTATION

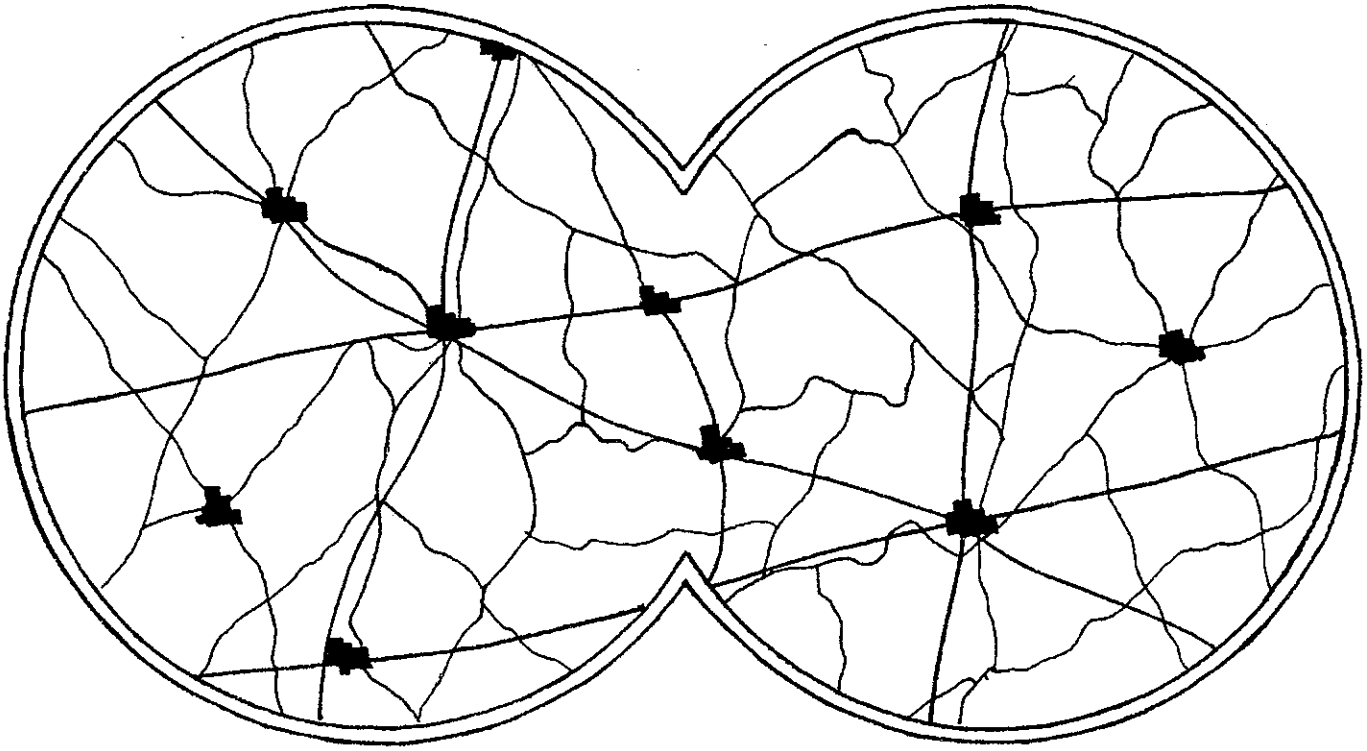
which sounds like something to do with the Mysterious East, but there's **NOTHING MYSTERIOUS** about it at all for it is only **COMMONSENSE** to



LOOK WHERE YOU'RE GOING

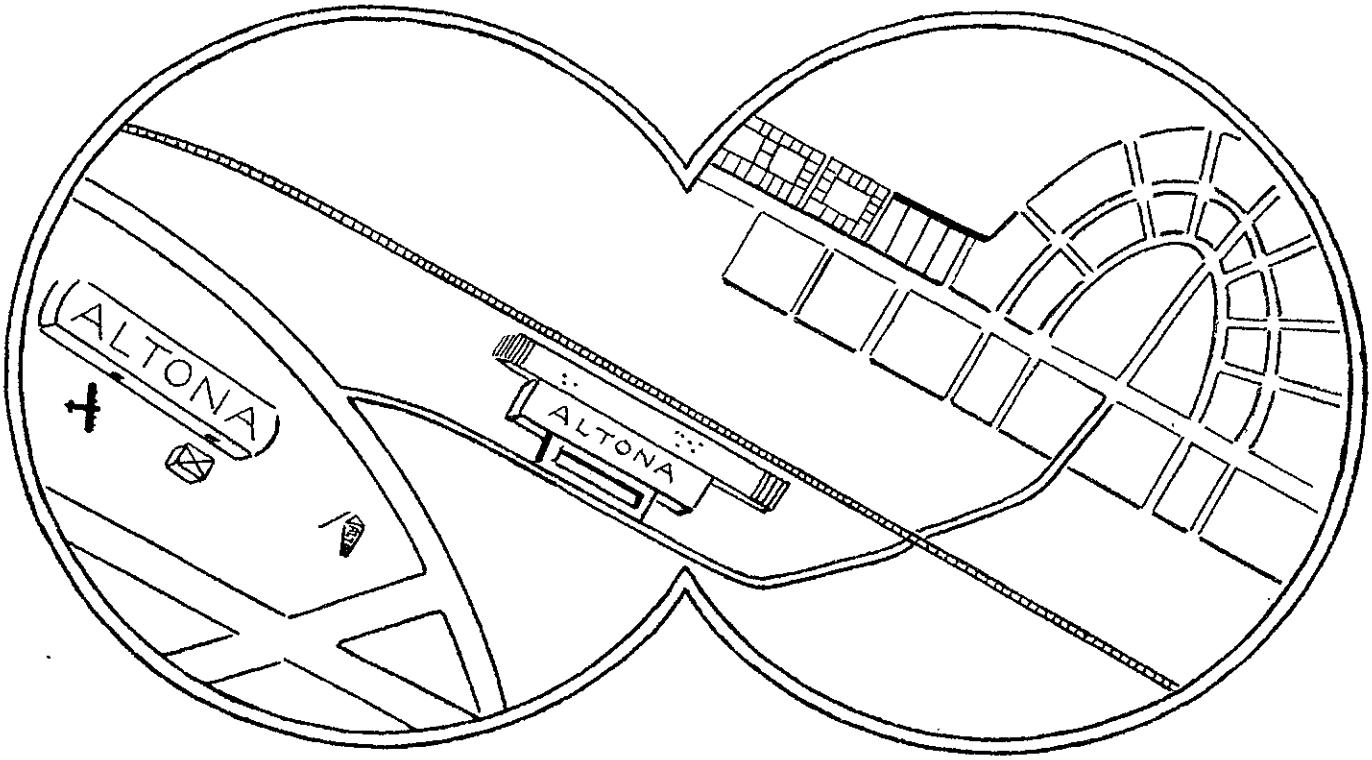
You will **NATURALLY** have observed that

MAP-READING IN ENGLAND



is somewhat **DIFFERENT** from

MAP-READING IN THE STATES



We'll go on to explain **A SUGGESTED METHOD** to you in a minute. **BEFORE** doing so, however, we'd like to say a word about **TWO OTHER METHODS**, still used in some quarters,

which we do

strongly recommend

you **NOT**

TO USE

BOTH these methods have been tried out by certain misguided (and **MISGUIDING**) navigators and both have been found wanting — and not only

WANTING

but positively

DESTITUTE!

The **FIRST** of these is

THE "BLIND FAITH" METHOD.

The use of **MAPS** does **NOT** appear to be **ESSENTIAL** to this method. *Firm reliance is placed in the HOMING INSTINCT OF THE AIRCRAFT.*

Reference to the **GROUND** is carried out in a **VAGUE** manner at **IRREGULAR** intervals- usually only **AFTER** the aircraft has become nicely **LOST.**

*From there on the **SUCCESS** of the system seems to rely on the **ASSUMPTION** that the **GROUND** will **REVEAL IT'S IDENTITY** by some form of **SUPERNATURAL MANIFESTATION.***

Disciples of the "B.F." method can be spotted by their **FREQUENT** use of the phrase "**I THINK**", with which they conclude **ALL** remarks relating to the aircraft's **POSITION.**

As a **RACE** they are rapidly becoming **EXTINCT.** The **FEW** remaining are usually fairly widely **SCATTERED** - although they do **OCCASIONALLY** find their way back to **BASE!**

It's not only **DIFFERENT** — it's more **DIFFICULT** (conblast it!)

For instance — on the weather side. There's a lot **MORE** cloud & a lot **LESS** visibility. Even if you take the **BROAD ASPECT** of the weather, the weather won't let you take a **BROAD ASPECT** of the ground.

Then again — take the ground — detail. Certainly there is **ENOUGH** of it! — Multitudes of —

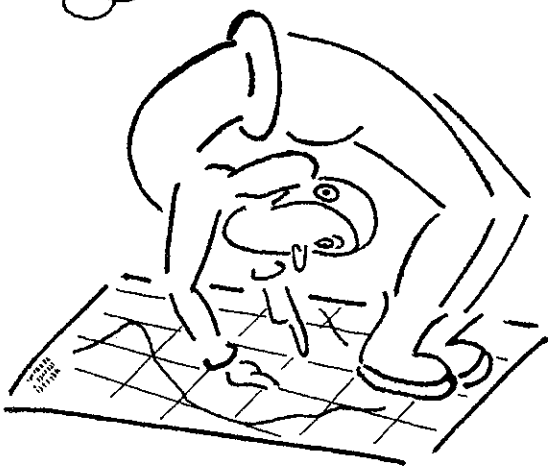
Small	Streams
Little	Lakes
Tiny	Towns
Minute	Mountains
Infinitesimal	Islands

each one looking **VERY MUCH LIKE** every other

Small	Stream
Little	Lake
Tiny	Town

(**NEED** we repeat all this!?)

Other drawbacks excepted (we feel sure there <u>are</u> others, if only we thought hard enough), this fact alone, with the **NEW CONDITIONS** it imposes, would be sufficient reason for adopting—



A NEW ATTITUDE TOWARDS MAP-READING

TO PUT IT IN A NUTSHELL

THE MORE UNPLANNED THE SCENERY
THE MORE ESSENTIAL THE PLAN FOR MAP-READING

Probably you've **ALREADY** solved the problem to your own satisfaction. If so, you are excused from reading further.

IF NOT—

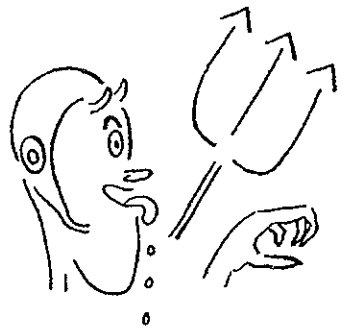
THERE'S MORE ON THE NEXT PAGE

THEN there is

THE "NO FAITH" METHOD

This entails an eagle-eyed, hawklike **WATCH** on the aircraft's progress from **TAKE-OFF** to **LANDING.**

Every foot of the ground traversed is **JEALOUSLY SCRUTINISED**-every hamlet stream & road is **ZEALOUSLY CHECKED OFF** on the map - every other form of navigation is **CALLOUSLY DISREGARDED.**



In fact **NO RELIANCE** is placed in anything, **EXCEPT** the map-reader's **TWO EYES.**

It's rather like a **RACE** in which the **"N.F."** adherent gives himself about a 100 yards **START** of the aircraft & grimly tries to hang on to his **LEAD.**

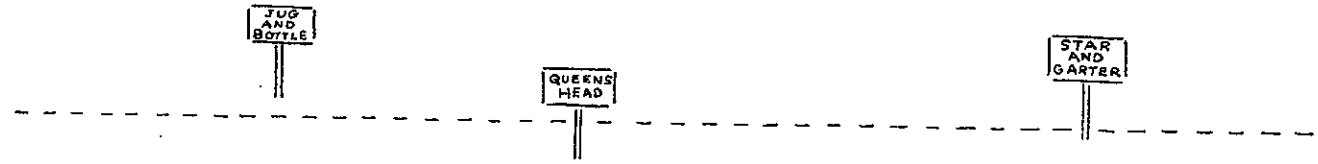
WOE BETIDE him if he's interrupted & **"LOSES HIS PLACE"**, for there's no store of navigational data to fall back on — **THERE HASN'T BEEN TIME TO RECORD ANY.**

And **NOW** to revert from the **DONT'S** to the **DO'S** —

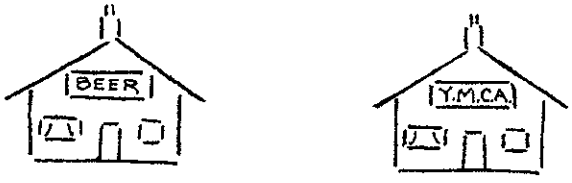
The **FIRST** part of the job can be done **BEFORE** you set off.

Assemble your **MAPS** and lay down your **INTENDED ROUTE**

NEXT study the route carefully and pick out any **GOOD** landmarks lying **ON** or within assumed **VISIBILITY DISTANCE** of it



Be sure **EACH** landmark chosen is **REALLY DISTINCTIVE** and that there is no danger of confusing it with another **SIMILAR** feature in the vicinity.



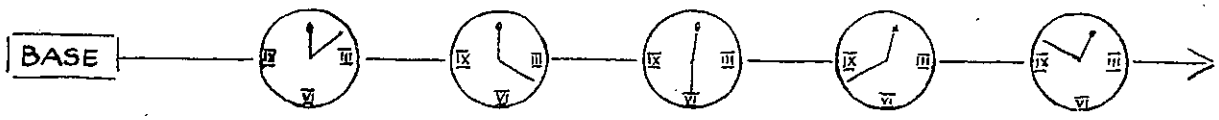
REMEMBER it is

BETTER TO CHOOSE FOUR OUTSTANDING LANDMARKS THAN FORTY DOUBTFUL ONES

ALRIGHT, so you've got your land-marks lined up -

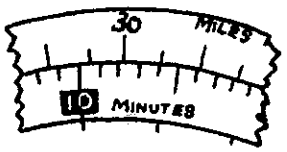
NOW put a ring round each one so you won't forget it — and also to prove you **REALLY** mean to do something about it.

ANOTHER good thing which can also be done on the **GROUND** is to mark off **10 MINUTE STAGES** along the route, based on what distance you calculate you will fly in **10 MINUTES** at your estimated **GROUND SPEED.**



It won't be quite **ACCURATE**, for it's **20-1** that the **ACTUAL** Ground Speed will vary a little – but it will tell you **QUICKLY** just about where to look on the map at any time during the flight.

Some navigators prefer to mark off **30 MILE** stages, which are converted to terms of **MINUTES** after they get up aloft and find out the **ACTUAL** Ground Speed



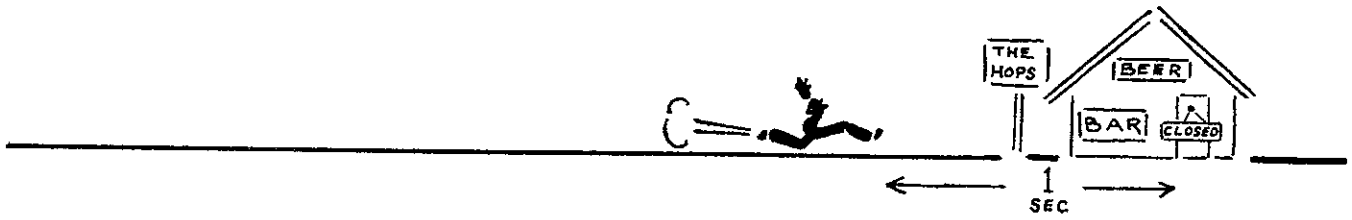
Others use some form of **TIME – SPEED** scale to get a similar result.

THE CHOICE OF WHICH TO USE IS UP TO YOU

So much for the ***GROUND*** *work-* **AS SOON** as you set course from **BASE** work out a **ROUGH E.T.A.** for **LANDMARK Nº 1.**

5 SECS

Having done that, **GET ON WITH SOMETHING ELSE.** Don't hang out the window all the time looking for it — it won't turn up any **QUICKER.**
Start searching for it about **TWO MINUTES BEFORE E.T.A.** and if it doesn't show up **BY E.T.A.** give it a couple of minutes **EXTRA TIME.** This will allow for any **GROUND SPEED ERROR.**



[**IF,** at the **END** of Extra Time it **STILL** has not put on an appearance, then it's pretty obvious that

You've gone by without seeing it

OR

It was hiding under that cloud

OR

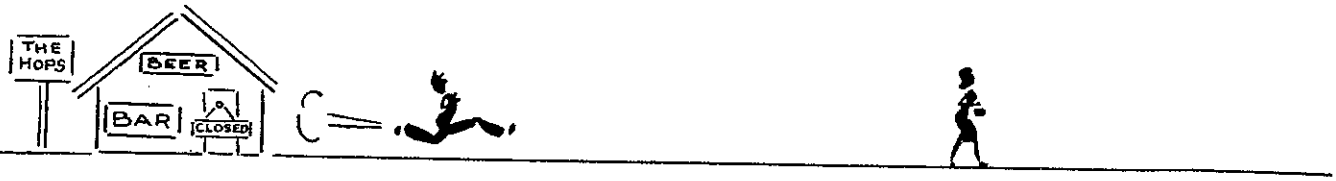
It was obscured by ground haze

OR

something

It's no earthly use continuing the search indefinitely – **YOU'VE HAD IT!**
The only thing to do is to **REPEAT** the process with **LANDMARK No 2**]

UPON ARRIVAL at **LANDMARK Nº1**, make a note of the **TIME** and plot your **POSITION** relative to it.



Also check your **GROUND SPEED** and use it to work out an **E.T.A.** for **LANDMARK Nº2.**

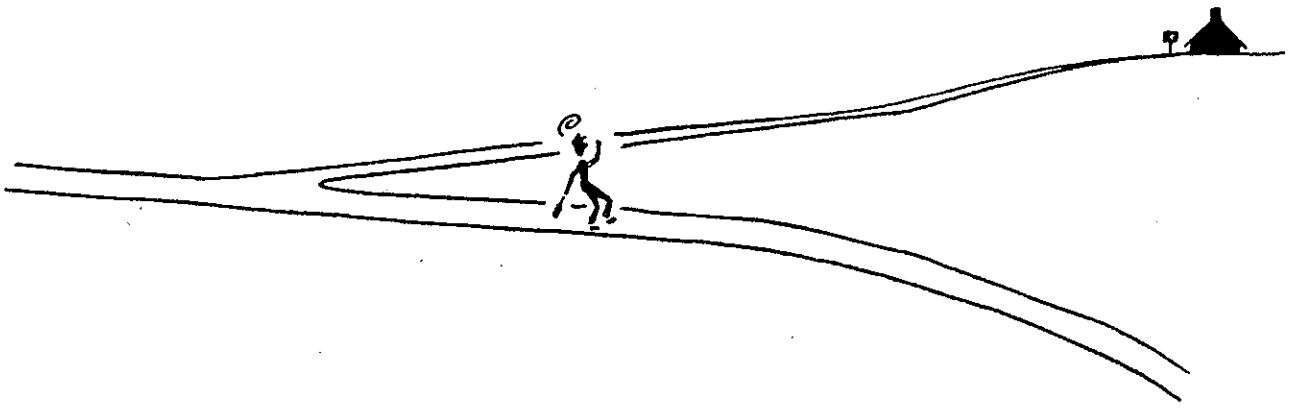
THEREAFTER follow the instructions contained in the paragraph on the **PREVIOUS PAGE** which starts off with "Having done that".

DON'T FORGET to re-check your progress (**G/S, COURSE, E.T.A., WIND**, etc.) **EACH** and **EVERY** time you arrive at a landmark. [The **SAME** applies, of course to fixes **OTHER THAN VISUAL ONES**, but we're only concerned with the **MAP-READING** aspect here.]

There is just **ONE OTHER** point to be considered here.

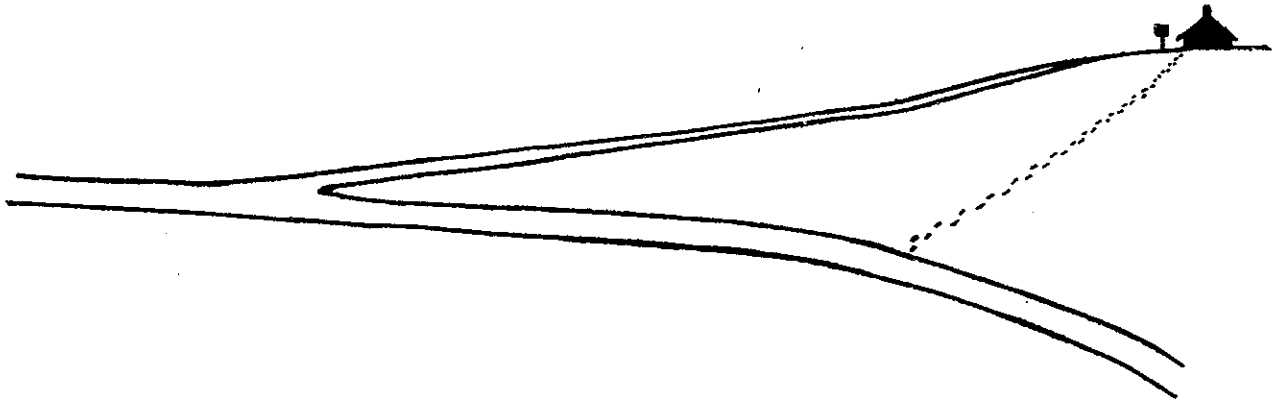
THAT is the case when, due to **WIND** or other causes your aircraft is **DRIFTING OFF** at an **ANGLE** to **INTENDED COURSE.**

You've perhaps seen **LANDMARK Nº1 O.K.** but you realize that by the time you are opposite to **LANDMARK Nº2** it will be **OUT OF SIGHT** to one side.

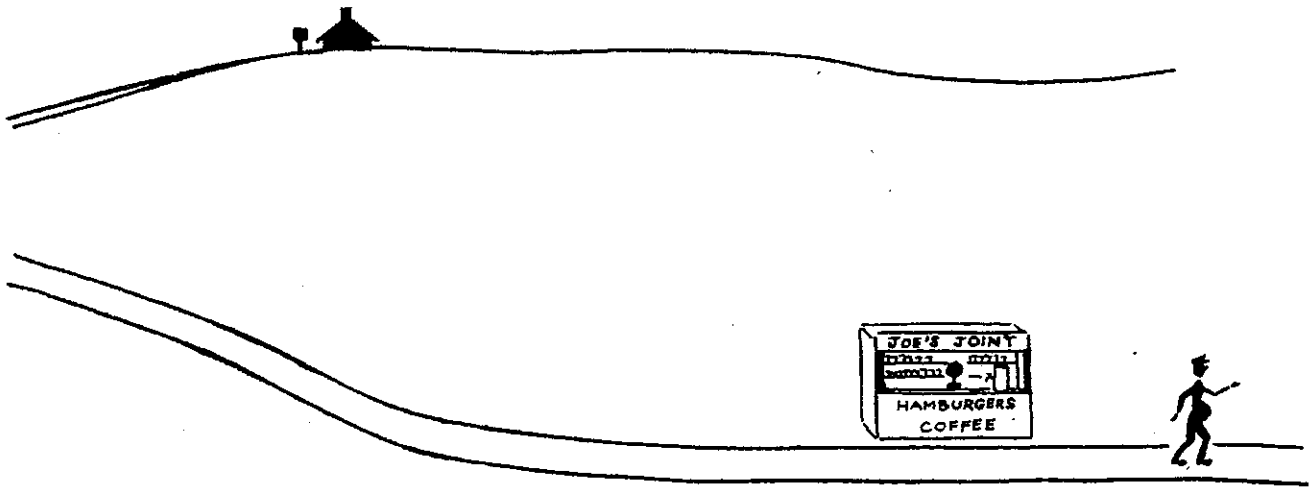


Well, the answer is **TWOFOLD —**

You can **ALTER COURSE** so as to regain intended route, **IN WHICH CASE** you will be able to use the **ORIGINAL** landmarks.



OR ELSE, if you decide to **CONTINUE** in the present direction (at any rate for the time being) the only thing is to **FORGET** the original landmarks and select the most suitable ones on or near your **NEW LINE OF FLIGHT.**



O.K. so far?

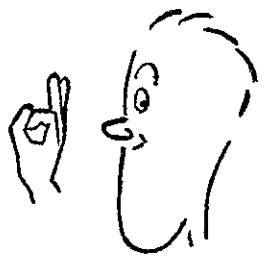
Of course, this is all fine and dandy when you **KNOW** just about where the aircraft **IS** all the time and are able to check your position **REGULARLY.** Map-reading is a **GIFT** under such circumstances.

But let's suppose you have been flying **OVER TEN-TENTHS** for the best part of an **HOUR** and **HAVEN'T** been able to get any reliable check on position. **THEN** the cloud breaks and you are able to map-read again. **BUT, HOW TO START?**

Well, certainly do **NOT** begin by studying the **GROUND,** in the hope that some heaven-sent pin-point will leap to your eyes. [We know that this is **PRECISELY** what **DOES** happen on occasions, but they are **VERY RARE** occasions - and in any case we're not going to have our carefully thought out arguments busted up on account of any over-considerate landmarks!]

No, the way to start is to calculate your **PROBABLE WHEREABOUTS.**

Take your **LAST CHECK POINT** (you must have had **SOME** check point — even if it was only **BASE** when you set out) and from it work out your **PRESENT APPROXIMATE D.R. POSITION.**



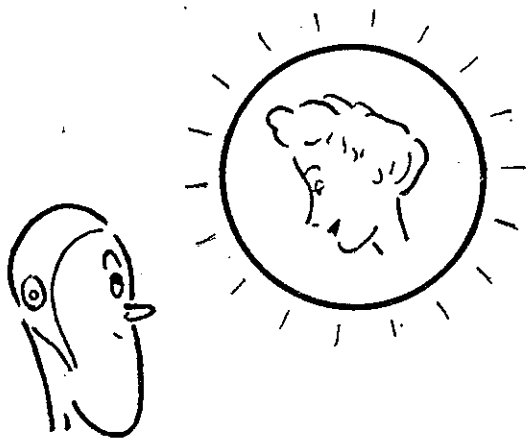
Having got thus far the Plan of Campaign is to

Study the **MAP** in the area of that D.R. position,
Pick out the most distinctive features it contains,
and then
Search the **GROUND** around you to try to find their counterpart.

The area to be searched is a **CIRCLE** of which the **D.R. POSITION** is the **CENTRE**

It's difficult to lay down hard and fast rules about **WHAT LENGTH OF RADIUS** should be adopted — but just as a suggestion we advise

10% OF THE DISTANCE FLOWN <u>WITHOUT</u> ANY RELIABLE CHECK ON POSITION



There's no need to **DRAW** the circle on your map — just **PROJECT IT MENTALLY.**

And since the aircraft won't **"STAY PUT"** while you are finding out where you are, **BE SURE** to keep up with it by **ADVANCING** the **D.R. POSITION** (and the circle) **EVERY FEW MINUTES.**

You will notice that we recommend you to

WORK FROM THE MAP TO THE GROUND

and **NOT** from the **GROUND** to the **MAP** which is the **NATURAL IMPULSE.**

This isn't just a **FAD**—there are good and solid reasons for it.

1ST There will certainly be features on the ground **NOT** shown on the map, but **EVERY** feature on the map will appear on the ground.

2ND If you have a clear picture **IN ADVANCE** of what you're looking for, you are **NOT** so likely to be tricked by **WISHFUL THINKING** (of which **MORE ANON**) into **FORCING** the **GROUND** to fit the **MAP,**

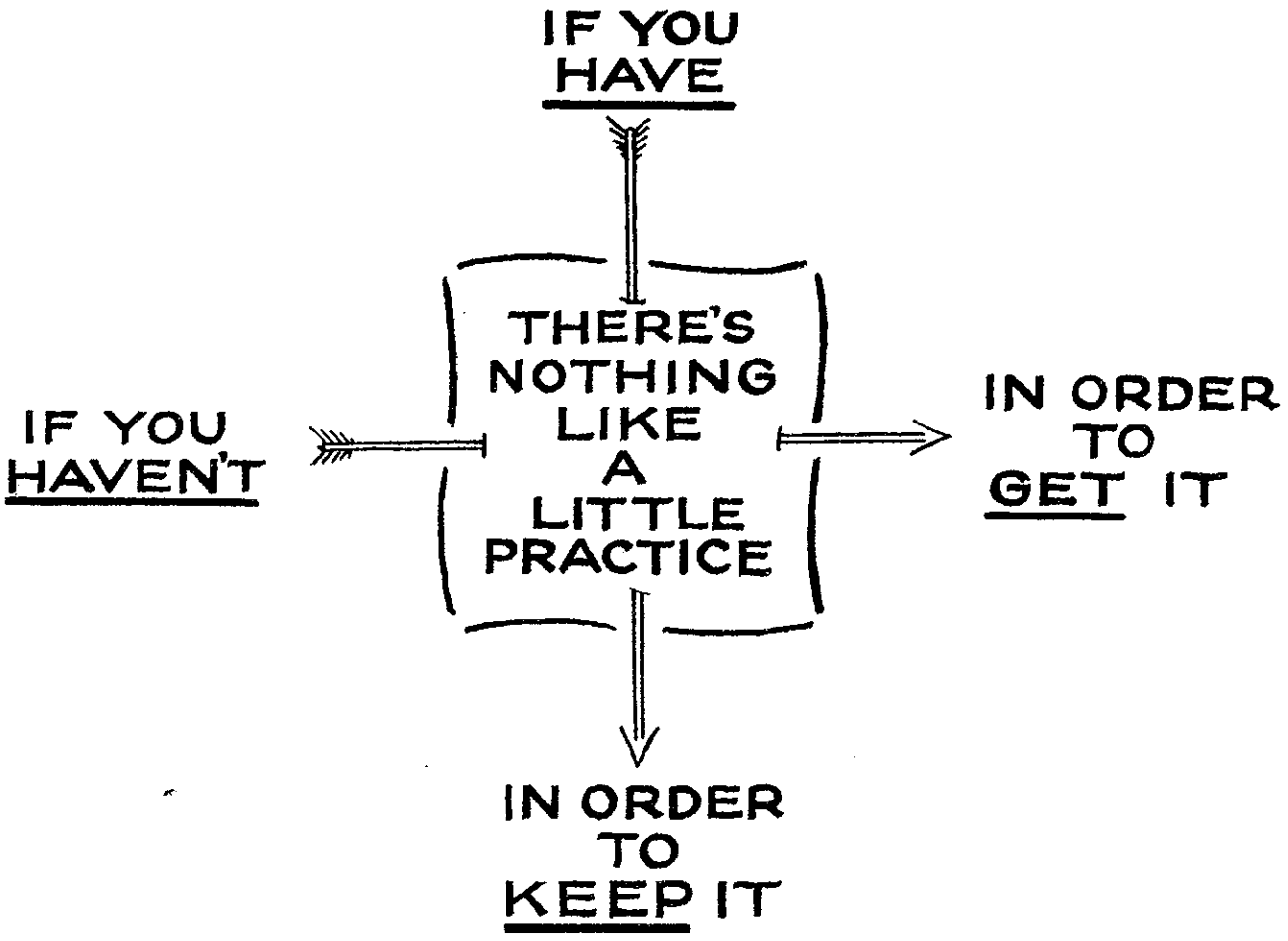
and

3RD It's only simple logic to **MAKE THE PART FIT THE WHOLE** isn't it?

WELL, that's about all about that.

As you can see, this **SECOND** class of map-reading (i.e. when your position is in doubt) calls for much greater **SKILL.**

It's your job to see that you have this **SKILL.**



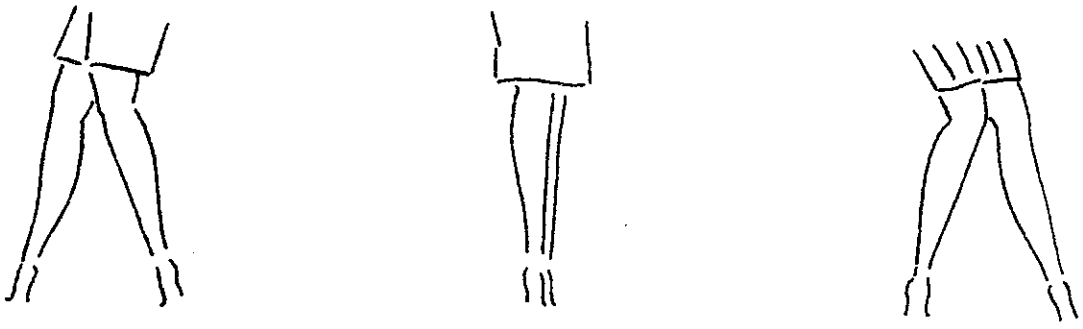
THREE HEADS ARE BETTER THAN ONE

In this Section we propose to deal with the ways in which **CREW CO-OPERATION** can be extended to benefit the **MAP-READER.**

Naturally the onus of **ALL NAVIGATION** lies on the **NAVIGATOR,** but that's no reason why he should carry it alone and unaided when there are helping hands available — and this is very true in the **MAP-READING BRANCH** of the crafty art of navigation.

After all, the **BOMBARDIER** has a couple of eyes which he isn't using all the time and so has the **PILOT** — and what navigator hasn't fervently prayed on occasions for

THREE PAIRS OF EYES



There's no sound reason why these crew members (the Pilot, the navigator and the Bombardier) should not all join

THE MAP-READERS' UNION

There is no entrance fee and the **RULES** of **MEMBERSHIP** (which follow) are not hard to keep. You must of course, **HAVE** rules so everyone knows who's to do what.

RULES FOR THE

1. Be certain the Pilot's and Bombardier's watches are synchonized with your own – otherwise all will be in vain!

2. Keep the Pilot and Bombardier (and the rest of the crew too, for that matter) regularly informed of the aircraft's progress.

3. Tell them the aircraft's position so it is readily understandable. "Lat. 48.45 N. Long 02.20 E" doesn't mean much to anyone without a map - but "3 miles south of Paris" does.

4. See to it they know the E.T.A. of each landmark in turn. And if the E.T.A. alters, let them know that too.

5. Describe each landmark so they'll know what to look for. Give them the salient points about it.

6. If you think a landmark will show up off to one side - say so. It may save a lot of futile looking in the wrong direction.

RULES FOR THE

1. Keep frequently checked-up on the aircraft's D.R. position.

2. If you don't carry maps you **CAN'T** be expected to **MAP-READ** (in the accepted sense) but you **CAN** report any landmarks you see even if you can't identify them. The identification can be left to the navigator.

3. When reporting, don't be long-winded, but do say enough for the navigator to know where & at what to direct his gaze. **THUS-NOT** "Landmark on the right", **BUT** " Small egg-shaped lake about 5 miles off the right wing."

4. If you **DO** carry maps, you can observe just about all the Bombardier's Rules.

RULES FOR THE

1. Carry a complete set of maps for the route to be flown, and of the adjoining areas.

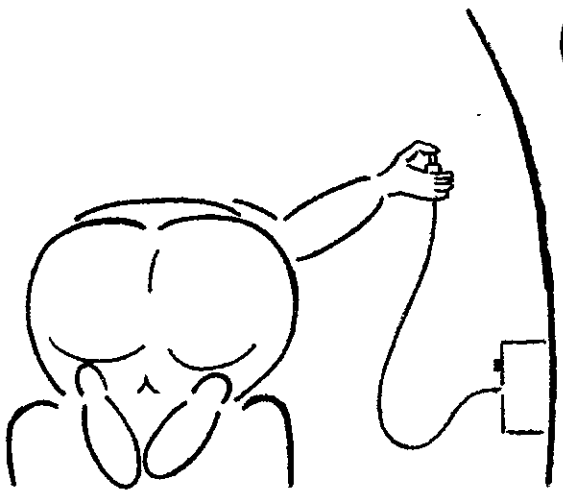
2. Help with map-reading at all times when your other duties are not claiming attention.

3. Look especially for those landmarks selected by the navigator (tho' that's no reason why you can't pick out a few extra ones of your own).

4. Report each landmark like we said in Rule 3 for the Pilot.

5. If you lose track of where you are, ask the navigator for the D.R. position. It will give a definite point on your map around which to search.

THE BOMBARDIER'S ANGLE



Quite apart from the help you give the navigator, you have some **MAP-READING** to do on your **OWN ACCOUNT** from the **INITIAL POINT** to the **TARGET.**

The principles are similar to those for normal map-reading, as already discussed, and it is on this basis you should set about it.

Nevertheless, there **ARE** a few shades of differences worth noting:

1. You should have **FAMILIARISED** yourself with the appearance of the **TARGET**, the **I.P.** and other **LANDMARKS** in the target area, and their position **RELATIVE TO EACH OTHER, BEFORE** take-off.

2. The **DISTANCE** from **I.P.** to **TARGET** is usually so **SHORT** that you should keep **CONSTANT** track of the aircraft. That is, you should map-read **THE WHOLE WAY** and not just at set **INTERVALS.**

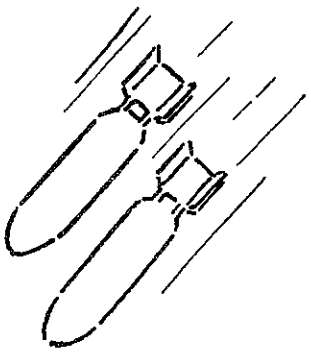
3. You can't expect one long string of **LANDMARKS** stretching from **I. P.** to **TARGET** – it isn't that easy. Often there are no good landmarks at all. When you can't have what you want, you must make do with what there is. There will **ALWAYS** be **SOME** ground **FEATURES** — a river, a wood, a railway, and so on. The thing to do is

A. Note the **RELATIONSHIP** of several **FEATURES** to each other,
B. Form a **MENTAL PICTURE** of the **PATTERN** they make, and
C. Look for the **COUNTERPART** of that **PATTERN** on the ground.

4. In the early part of the run-up from the **I.P.**, landmarks and ground features **SEVERAL MILES** to one side or the other will be a good enough **GUIDE** to give your **GENERAL POSITION** and **DIRECTION.** But as the run proceeds you must identify **NEARER** and **EVER NEARER** features to narrow down the **MARGIN OF ERROR.** This is called **"BOXING-IN"** the Target. In other words **THE CLOSER THE TARGET, THE CLOSER THE MAP-READING.**

5. From **I.P.** onwards constant check should be kept (preferably by **STOP WATCH**) of the **NUMBER of MINUTES** to **E.T.A.** Target. During this Last Lap you will be a very busy man, so the **NAVIGATOR** could keep this time check and call it out over the inter-phones at minute intervals. Thus "8 minutes to go..... 7 minutes to go..... 6 minutes to go....."

Between **I.P.** and Target the map-reading roles of Navigator and Bombardier are, in effect, **REVERSED.** That is, the Bombardier conducts the movements of the aircraft and the navigator is his **ASSISTANT.** Both help each other in the map-reading, but the final responsibility and decision rests with the **BOMBARDIER.**

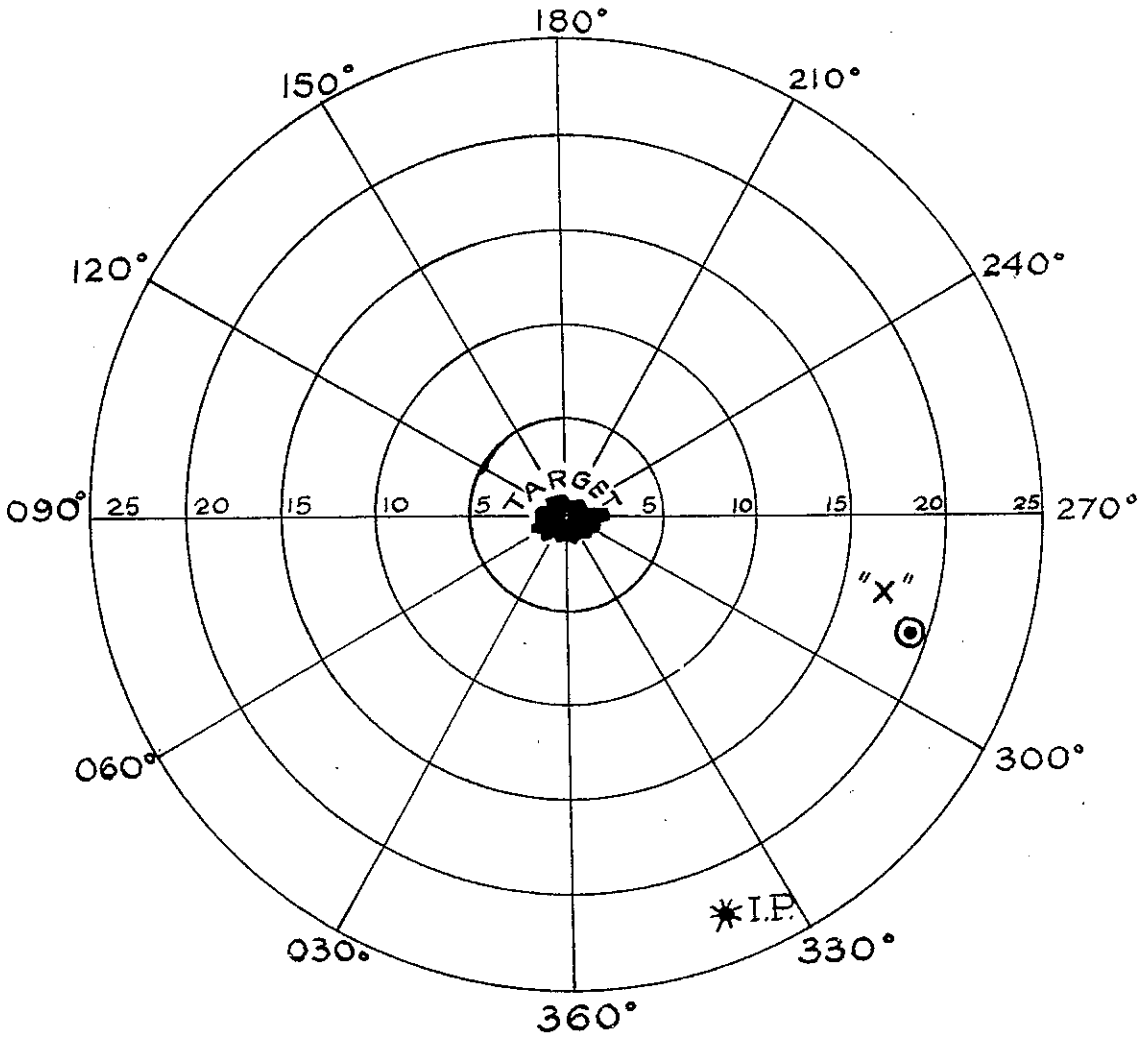


There is an ever-growing number of gadgets and contrivances to help the Bombardier with map-reading, course-setting and E.T.A. checks in the **TARGET AREA.**

We haven't space to talk about 'em all, and in any case they are not wholly appropriate to our chosen subject, **BUT**

We **WILL**, however, just refer to **ONE** simple contrivance which has much to commend itself & which is fairly **REPRESENTATIVE** of the whole.

We won't describe it, but here is a picture of it:



All you have to do is **DRAW** it on your **MAP** as shown. Note that the **CIRCLES** are **5 MILES APART** and that the **SKELETON COMPASS ROSE** is **UP-SIDE-DOWN.**

The beauty of it is that, **EVEN** if you **DON'T** see either the Target or the **I.P.**, provided you can pick up **SOME** pin-point in the **TARGET AREA,** you can **WHIP OUT** a snap course to the Target and at the same time say **HOW LONG** it will take to **REACH** it.

For instance (from the Picture), if you find yourself at "X", it requires little mental effort to see that, by steering 290° for 19 miles, theres a very real danger of getting to the Target.

NOTE: To be really technical **ADD** local Variation to the 290° and also **SWAP** the 19 miles into **MINUTES** of flying time (but you'd do this normally, wouldn't you?)

WISHFUL THINKING

We saved this up 'til nearly last because it's **VERY IMPORTANT** and we want it to be among your **LAST IMPRESSIONS** as you lay this book down.

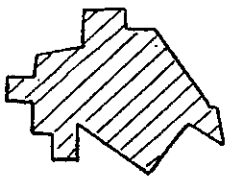
First of all, **HOW** does this **WISHFUL THINKING** operate?

Well, it goes something like **THIS—**

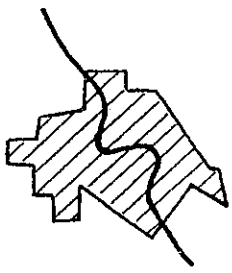
The victim isn't sure where he is (This is an **ESSENTIAL** qualification before Wishful Thinking can get it's claws into him).

He looks down from up aloft and he sees

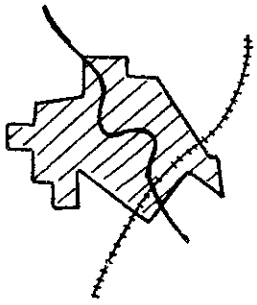
a TOWN



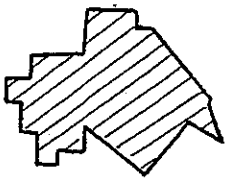
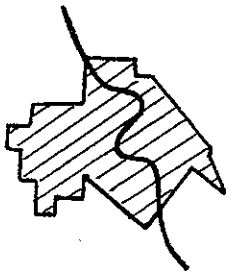
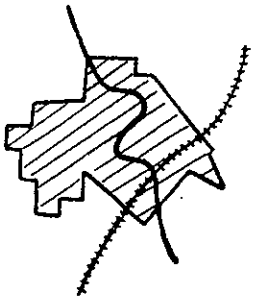
with a RIVER running through it



and also a RAILWAY



THEN he looks at his map round about where he thinks he **MIGHT** be and he sees

a TOWN  with a RIVER running through it  and also a RAILWAY 

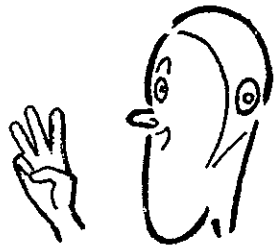
And immediately (such is human nature) he feels the impulse to say "Ah, **THAT'S** where I am!"
Quite often he **DOES** say this - **AND** believes it — and quite often [**AS IN <u>THIS</u> CASE — DID YOU NOTICE?**] he's **WRONG.**
Yes, it's the old, old business of **JUMPING TO CONCLUSIONS.**

If he'd really **<u>LOOKED</u>** he would have **<u>SEEN</u>** that the two are not identical.

Make no mistake about it, **WISHFUL THINKING** is a very **REAL** danger to the map-reader. [As one-time victims we can speak with some authority on it's **EVIL MACHINATIONS!**]

Be **PARTICULARLY** on your guard at those times when you are doubtful of your position **OR** when an expected landmark fails to show up on time but something rather similar **DOES** show up. These are occasions when your **SELF-RESTRAINT** will be **SORELY TESTED.**

In general the **THREE BEST TIPS** we can give you are



MAKE SURE

MAKE DOUBLY SURE

and

LOOK YET AGAIN

We have just two final pronouncements to make & then we won't keep you any longer

PRONOUNCEMENT "A"

The **SECRET OF SUCCESS** in map-reading lies in **ANTICIPATING** everything **BEFORE** it shows up. In other words, it's no good **EXPECTING** to map-read if you're not **EXPECTING** the landmarks.

So, plan well ahead and

DON'T BE CAUGHT UNAWARES!

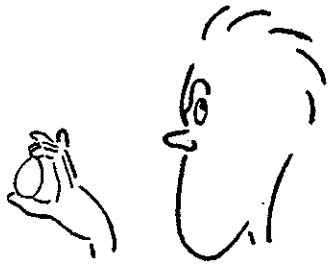
PRONOUNCEMENT "B"

Map-reading is an **AID TO** navigation and **NOT** a **SYSTEM OF** navigation.

There are other things in your aircraft to help you besides **MAPS.**

The method we've outlined will give you plenty of **SPARE TIME** to use the **OTHER** navigational aids (even if you're **NOT** flying above cloud). so

DON'T PUT ALL YOUR EGGS IN ONE BASKET



That's all there is folks

It only remains for us to say that we hope you'll find this of some assistance to you in finding your way around.

GLOSSARY
of
BRITISH–AMERICAN TERMS.

AMERICAN	BRITISH
Poop	Gen
Course	Track
Heading	Course
Bombardier	Bomb-Aimer
Right	Starboard
Left	Port
Initial Point (I.P.)	The last turning point before the run-up to the Target – usually a well-defined landmark