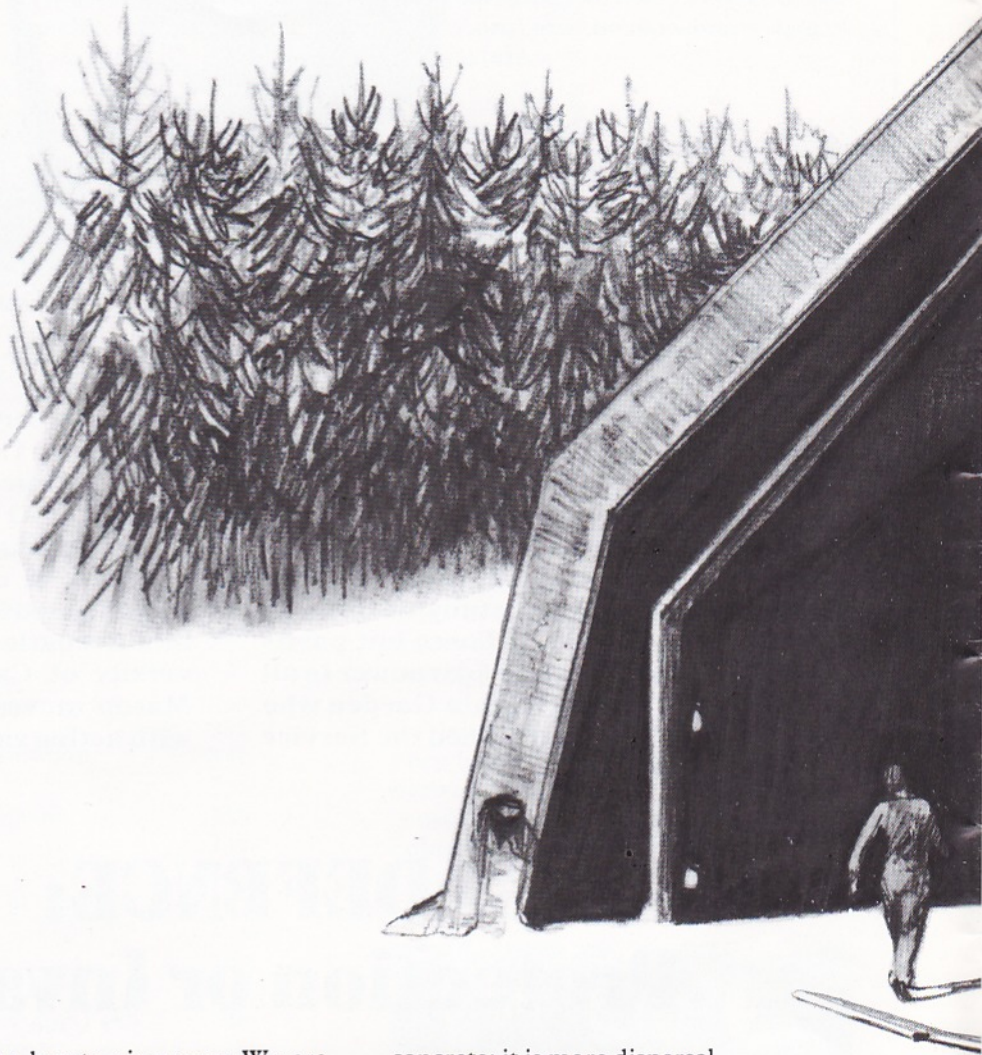


# HARDENED AIRCRAFT

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**F**lexibility is the key to air power. We are all brought up on this simple doctrine. When the phrase was coined the RAF operated from grass strips, and was able to move its aircraft assets at a moment's notice. Since that time the logistic tail has grown, and our aircraft are now tied to concrete runways. While British air power can be brought to bear from the North Cape to the Mediterranean its base is now very small. This concentration of assets onto a few airfields makes us vulnerable to sabotage, CW, air, and missile attack. It has simplified targeting for our opposite numbers, and has reduced their pilots' acquisition problems. Our response is the UK hardening programme. This article is intended to suggest that the answer to our problem is not more

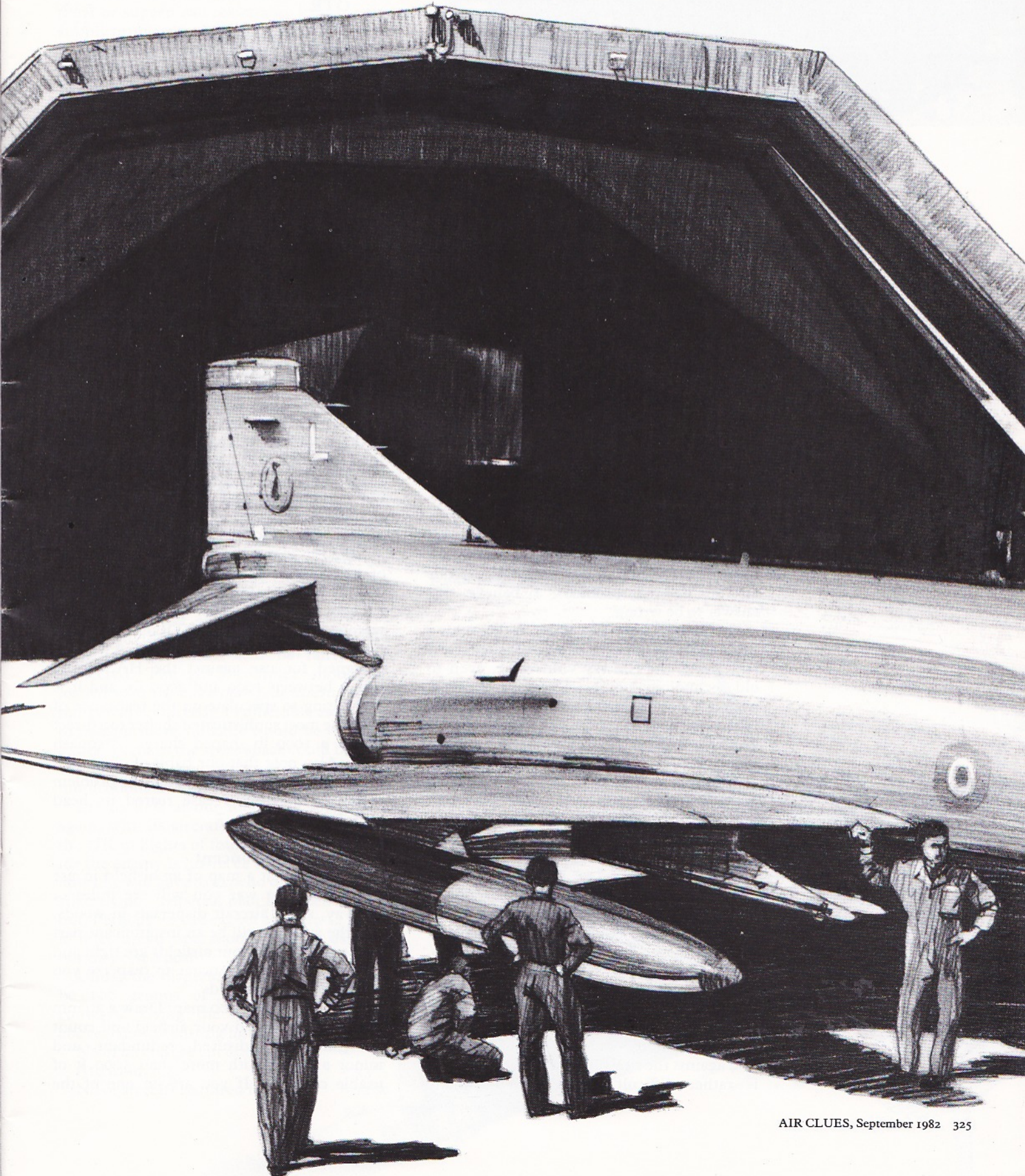
concrete: it is more dispersal.

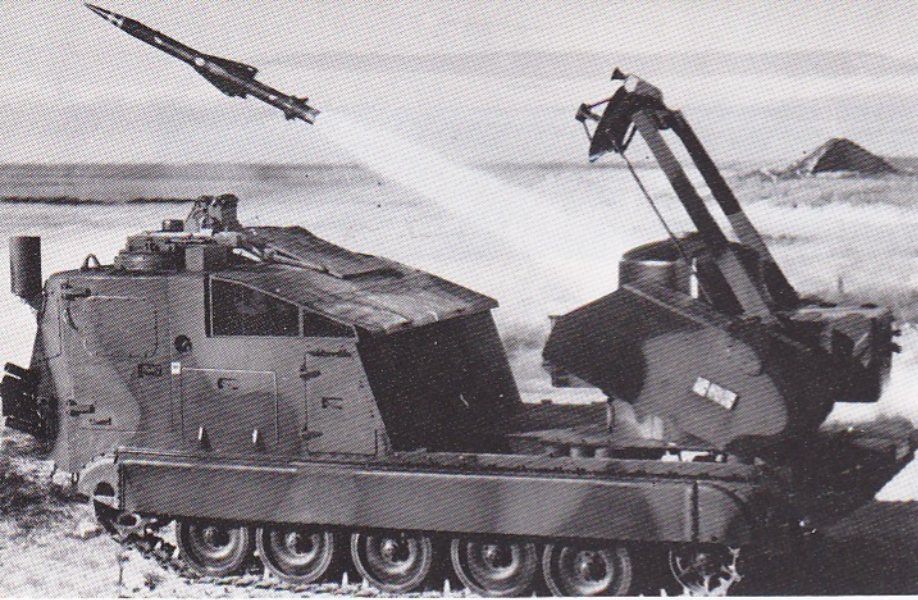
## **Air Defence**

An enemy aircraft has to fight its way back through several layers of defence in order to attack the UK. First it encounters the long range fighters, then the Bloodhound MEZ. If it negotiates these hazards it is engaged by point defence fighters, and finally the Rapier Shoradez. This air defence system will certainly take out a large proportion of the attacking force. However, as the size of the raid increases beyond saturation level the percentage losses of the enemy would decrease. A raid of 200 might well produce an acceptable loss rate. As an arbitrary figure I have assumed a 33 per cent loss rate on a major raid of 200 + aircraft.

# RAFT SHELTERS

*- another view*





### The Shelter Concept

The shelter concept has several immediately obvious advantages over the dispersal option, chief among which is cost. It concentrates administrative and supply resources, which simplifies guarding and servicing, and allows concentration of air defence units. When enemy attack aircraft penetrate our defences the resistance of the shelters to WWII standard weapons, together with the ability to provide CW protection, means that aircraft and aircrew may be kept safely tucked away. Furthermore, an effective attack can never be carried out with complete confidence against any individual HAS as that shelter may be empty. Finally an organisation based on the HAS is easy to control with limited communications and a minimum of delegation.

It is easy to appreciate how these advantages, and especially the ease of control and relative cost, have tilted the balance of choice towards the shelter as the best answer to our aircraft defence problem. I believe this answer to be wrong.

No matter how efficient our hardening programme is in terms of aircraft shelters, it still leaves the runway vulnerable, even to old technology bombs, let alone the new weapons now being developed. A daylight raid concentrated against the runway of a hardened airfield could close that runway for the vital first two days of the war. Target acquisition might well be aided by the normally significant and radar discrete shelters.

The hardening programme is obviously going to be limited. A cursory glance at a UK topo indicates 22 prime candidates for the scheme if it were carried out thoroughly. This should concentrate the enemy's attention wonderfully, and lends itself to sabotage. Easily surveyed by 'lost' aircraft and lorries, regularly checked by satellite, the airfield is a simple target for the sabotage team, which can even train on full-scale mock-ups, sure that the objective will not change.

Applying numbers to the idea of a massive raid against the runway of a hardened airfield is rather difficult. There are too many

variables in the real work for accuracy, but if we use a model air force of 400 OS aircraft based on 20 airfields we can get some feel for the numbers involved.

First let us calculate the Over Target Requirement (OTR) for old technology bombs.

If the number of aircraft required for 1 cut	= 8
Number of runways to be cut	= 20
OTR	= 160
If attrition	= 33%
Then the total number of aircraft required per raid	= $160 \times \frac{3}{2}$ = 240

These figures assume a 50 per cent probability figure, which means that at the end of a raid of 240 aircraft half the runways would be cut. If the attacking aircraft were to use more modern weapons then the raid size might well reduce to 180, with an OTR of six aircraft per runway.

The scenario could be as follows. At dawn the enemy mounts a raid of 240 aircraft against our 20 runways, saturating the defences. Of those aircraft 150 or so return to their bases, while reconnaissance is carried out. After a rapid turn-round, a further massive raid later in the day would leave our hypothetical air force grounded, with perhaps only two or three airfields still usable.

### Anti-HAS Weapons

If any target becomes sufficiently valuable then designers will try to produce a weapon to match that target. Let us look once more at our hypothetical air force. If we harden all the airfields, and provide a HAS for each aircraft then 400 HASs would have to be attacked to eliminate the fighting capability of our model.

The original OTR for the mass anti-runway raid was 160 using developed weapons. To maintain his OTR the enemy will have to kill  $\frac{400}{160}$  HAS per pass or 2.5. A weapon designed for use against the HAS could weigh between 1000 and 2000 lb, and it is interesting to speculate on the resistance of even the most sophisticated shelter to a direct hit by a 1000 lb shaped charge or squash head. Also note that our habit of clustering HASs into groups will simplify the problem – has administrative ease reared its head again?

### The Dispersal Concept

If you look at a map of an airfield in use during the last war you will see miles of taxiway, small aircraft dispersals in woods, and the runway will be an insignificant part of the whole. Now our airfields are tight and concentrated, and in order to disperse you must look further afield.

Take a JOG 250,000 map. Draw a 30 mm radius wide around your airfield and count the number of disused, redundant, and minor airfields with more than 5000 ft of usable concrete. If you are on one of the

'hardened' airfields then you need to find four bases with reasonable road access. Sweep the runways. Fly in four aircraft per airfield, and spread them around. Your dispersal plan has begun. If you haven't enough airfields then check the LCN of your local motorway. It could prove even more useful than an old airfield.

Your problems now begin. Communications between dispersals and mother units must be superb and reasonably secure, your supply problem for fuel, weapons, and spares is enormous, engineering manpower is at a premium, and guarding will be difficult. Because you are away from your shelters you are vulnerable to air attack once your aircraft have been acquired. You will immediately think of spoofing, decoys, camouflage and the use of natural features and old buildings in which to hide. Can a mobile unit be made gas-proof? Try it.

To make your small flight work is going to take money. Browsers and fuel tankers are going to be needed as mobile stores. Old decaying concrete will need to be repaired (what are they going to do with all that machinery when the UK motorway programme is completed in 1985?). More armourers will have to be trained. Are there enough helicopters to use as emergency spares transport. Clearly these preparations cannot be carried out in the heat of battle. We must get ready now.

As soon as you have dispersed then the enemy's profit from an attack on your airfield is no longer commensurate with the cost of mounting that attack. If they do attack and manage to acquire and kill your unhardened support systems then the RAF has only lost a minor part of its capability. Even the saboteur has to change his tactics, and his target drops in value dramatically.

The RAF has already invested a lot of money in the hardening programme, and your mother airfield will be fairly well protected. The HAS complex should be loaded with *not more than four aircraft*. The mother site is already a vulnerable asset, and to make it more valuable would be to invite attack. Perhaps the spare space could be used to house all the extra MT and communications aircraft you are going to need.

Let us look at our model air force once again, with its aircraft scattered throughout the UK in flights of four. The first difficulty for the enemy is his recce effort. How much effort he will have to expend depends on how covertly our dispersal plan has been carried out. Perhaps we can expect an extra 12 hours uninterrupted operation while he assesses our dispersed posture.

Under the dispersal concept there would be 100 groups of four aircraft on 100 runways. Using the same calculation as above, runway cutting figures would be:

No of aircraft to cut one runway	=	8
Attrition	=	33%
No of aircraft required for raid	=	1200

With more modern weapons the figure would be 800 aircraft per raid. To ground our model air force would take days, and would probably prove impossible. A better option would be to go for engineering facilities and aircraft, ignoring the runway. This might give him an OTR of 4-500. At a price we have upped his OTR and reduced our losses. The RAF at the end of a massive raid is still a fighting force.

It will have become obvious to the discerning staff officer that this article begs some vital questions. How many of our old airfields are still usable for instance? What would be the actual cost of re-organising the entire concept of RAF life? I have tried to point out some of the difficulties to which dispersal would lead. The figures for my hypothetical air force are, of necessity, inaccurate.

These apologies aside I have tried to make you think outside the usual framework of the day-to-day routine in which we live. NATO, with its inherently defensive posture, can easily narrow the vision of those who labour in its ranks. Are we as complacent as those who sat in their bunkers on the Maginot line while behind their unbreachable wall Paris fell? When Barnes Wallis' magnificent Tallboys punched through 20 ft of concrete into the U-boat pens beneath, the limited minds responded by adding a further 10 ft of concrete to the remaining pens. The bombs wrecked these as well. Let us not make the same mistake.

Before you dismiss this concept, answer the following question. When the balloon goes up where would you rather be - on one of 20 pre-targetted and recced bullseyes, or on one of 100 small and unimportant airfields somewhere in the UK?

