CHAPTER 1

AIRFIELDS

Introduction

1. One of the exciting activities available to Air Cadets is flying. You will not only be given the opportunity to fly in powered aircraft and gliders, but you will also be allowed to handle the controls. This publication details some important facts that you must know, in preparation for this kind of flying. The following paragraphs will familiarise you with the place, the aircraft and the procedures, to ensure a safe, and pleasant experience.

Layout of an Airfield

2. First of all, we will describe airfields and their associated installations (Note: in the RAF, “aerodrome” and “airfield” mean the same thing, but “aerodrome” is more formal and is usually used in official books).

3. Some terms that you need to understand are:
   
a. Airfield - an area (including any buildings and support installations) used for the accommodation, take-off and landing of aircraft.

b. Airport - an airfield with additional facilities for freight and passengers (for example customs, money-changing, immigration, baggage areas and restaurants).

c. Aircraft manoeuvring areas - parts an airfield which have been specially prepared for the movement of aircraft on the ground (for example runways, taxiways, aircraft servicing platforms, operational readiness platforms and dispersal hardstandings).

4. Note that aircraft manoeuvring areas can be anything from quite small level areas of grass to vast areas of asphalt and concrete, with complex patterns of runways and taxiways. Grass airfields are adequate for light aircraft engaged mostly in flying instruction and civil flying club activity, but paved runways and taxiways are needed for heavier, faster aircraft. A triangular pattern of three runways is useful because it allows aircraft to take-off and land as near as possible into wind, but for
today's high performance aircraft the length of the runway has become as important as the wind direction. The present trend is for operations to be confined to one long runway, or at the most two, the longer one being designated the “main instrument runway”. This will usually be in line with the prevailing wind and will be equipped with full lighting, radio installations and safety equipment.

5. In summary, airfields fall broadly into three types:

a) The basic grass airfield.

b) The triangular-patterned runway.

c) The modern main instrument runway.

6. The following diagram at Fig 1-1 shows the layout of a typical airfield used by modern high-speed jet aircraft.

Runways

7. Construction. Runways are constructed of concrete or layers of asphalt. Concrete stands up better than asphalt to jet engine blast and fuel spillage.

8. Dimensions. Runways vary in width and length according to the role of the particular airfield.

Fig 1-1 Typical layout of a main instrument runway
At a typical RAF airfield, the main instrument runway will normally be 45m wide and 1,800m or more long, with subsidiary runways of the same width, but not necessarily as long. At airfields where transport aircraft operate, the main runway is normally 60m wide and 2,700m or more long.

9. **Markings.** The markings on runways are illustrated in Fig 1-2 and are described below:

   ![Fig 1-2 Runway Markings](image)

   a. **Colour.** Runway markings are white (do not confuse with taxi way markings which are yellow).

   b. **Runway Numbers.** Each runway is marked by two white painted numerals indicating the magnetic headings of the runway direction, taken to the nearest 10° (see Fig 1-2). For example:

   - (1) Magnetic heading 238°(M)-runway number 24.
   - (2) Magnetic heading 058°(M)-runway number 06.

   The magnetic heading is taken from the direction of approach. Thus the magnetic heading for one end of the runway is 180° different from the other (as in the above example 238° - 180° = 58°)

   c. **Threshold Markings.** The runway threshold is denoted by longitudinal white stripes painted symmetrically about the runway centre-line (see Fig 1-2).
Where the landing threshold has to be moved up the runway because of some form of obstruction in the final stages of the approach (e.g. the railway line in Fig 1-1), four chevrons and a bar are added. By making the pilot land further up the runway, the aircraft will be at a safe height when it crosses the obstruction. The area between a displaced threshold marking and the beginning of the runway is known as the sterile area; note, however, that this area is not necessarily sterile for taxying aircraft or for aircraft stopping after landing in the opposite direction.

d. Centre-Line and Side-Stripe markings. As shown in Fig 1-2, the runway centre is indicated by a broken white line (arrowheads in the sterile area). Where there is little contrast between the runway and the surrounding area, and also on runways more than 45m wide, each side of the runway will be marked with a solid white line.

**Arrester Gear**

10. Some runways are equipped with “arrester gear”, which can bring an aircraft to a stop in a very short distance. To use this system aircraft must be equipped with a strong hook which is lowered for landing, to engage a cable suspended across the runway. When the hook engages the cable, the cable is played out, cable-braking occurs to bring the aircraft swiftly to rest. The cable can be braked in a variety of ways: the system in use in the Royal Air Force is the Rotary Hydraulic Arrester Gear (RHAG), which relies on large paddles rotating in liquid for its braking effect.

**Over-Run Areas and Arrester Barriers**

11. Where space permits, areas beyond the ends of the runways are provided for accidental or emergency use by aircraft over-running or under-shooting the runway (see Fig 1-1). These “over-run areas” are cleared of obstacles, have a reasonably even surface, and are capable of supporting an over-running aircraft without seriously damaging the undercarriage. Over-run areas can also have barriers consisting of large strong nets made of nylon rope. They can be raised and lowered by the airfield controller by remote control. If a fast jet aircraft experiences a brake...
failure on landing and overruns, the net will literally “catch” the aircraft, stopping it with minimum risk of damage to the aircraft or injury to the crew.

Operational Readiness Platforms (ORPs)

12. ORPs are specially-prepared areas (associated with fighter or strike airfields) built alongside the end of a runway. They are used for parking aircraft, either for rapid take-off with minimal warning (“scramble”) or for final flight preparation. To provide the maximum safe use of the space available, the platforms are usually marked with taxying lines for individual aircraft, with areas set aside for essential ground equipment.

Dispersal Hardstandings

13. Many RAF airfields still use widely-dispersed areas, known as “dispersal hardstandings” or “dispersals”, for parking aircraft. The aim is to spread the aircraft around the airfield, to make it more difficult for enemy aircraft to damage or destroy all the parked aircraft during an attack. Some airfields may have hardened aircraft shelters (HAS), which protect the aircrews and groundcrews as well as aircraft. The walls of a HAS are made of very thick reinforced concrete, and it is capable of “stand alone” operations, with its own air supply and other essential services.

Aircraft Servicing Platforms (ASPs)

14. ASPs are large paved areas for the servicing and turn-round of aircraft. They also facilitate the speedy handling of passengers and freight. They are usually rectangular, with wide access tracks, and are normally close to hangars or airport terminal buildings.

Taxiways

15. Construction. Taxiways connect all the various parts of the aircraft manoeuvring area (e.g. Dispersal to runway, ORP to runway etc) and enable aircraft to move about easily. Taxiways are usually constructed in the same way as runways, and are normally a minimum of 15m wide.
16. **Markings.** Taxiway markings are in yellow, as shown in Fig 1-3 and are described below:

- **Centre Line.** The centre of a taxiway is indicated by broken yellow lines.

- **Edge Marking.** Where there is little contrast between the taxiway and the surrounding area, the edges of the taxiway are marked with dashed yellow lines.

- **Holding Position.** At a junction of a taxiway with a runway, taxying aircraft are required to “hold” (i.e. stop) until it is safe to move onto the runway. The “holding position” is indicated by two yellow lines, one solid and one broken, painted across the taxiway at right angles to its centre line and 70m from the nearest edge of the runway. A holding position sign, displaying the runway number in black on a yellow background (old models), or in white on a red background (new models), is also placed at this 70m point on the edge the taxiway (airfield boundary side).

### Windsocks

17. Normally, there are two or more windsocks on an airfield to provide a quick and easy way of indicating wind direction. They are positioned away from trees and buildings which may cause local wind turbulence. The main windsock (the one least subject to local effects) has a white ring round its base.
Obstructions

18. Any object that might be hit by a taxying aircraft, or by one landing or taking-off, is an obstruction. Obstructions may be permanent (e.g. building housing ILS equipment) or temporary (e.g. a mechanical digger or a group of workmen on the airfield). It is essential that the whereabouts of all obstructions are made known to pilots. Thus, obstructions must be clearly marked both by day and by night. For example, some specialised vehicles e.g. runway control caravans and sweepers used on the airfield are painted with red and white squares and have yellow roofs. Other vehicles regularly using the manoeuvring area are painted yellow all over. On some airfields however, for operational reasons, “tone down” measures may have been taken and vehicles may not be so distinctively marked. Some vehicles, e.g. Air Traffic Control vehicles and refuellers are equipped with a flashing amber light, while others like ambulances and fire engines, have flashing blue lights.

Airfield Identification

19. Each airfield is identified by means of two letters - e.g. SY for Shawbury. These letters are normally displayed in a “signals square” close to the ATC tower. At airfields with identification beacons, the same letters are used by the beacon - flashing them in Morse code.

Airfield Lighting

20. Royal Air Force airfields used for night flying have a mass of lights designed to assist pilots to taxi aircraft safely, and to take-off and land on the runway in use. Many of these lights will be hooded so that they can only be seen from a certain angle. If you visit an airfield while night flying is in progress you will see a fascinating display of lights in many colours. Mains electricity is generally used to supply power to an airfield but there will generally be an alternative method of supply to cope with power failures.

Location and Types of Lighting

21. The main types of lighting are as follows:

a. **Airfield Identification Beacon.** The airfield identification beacon is in an open space on the airfield and it flashes the airfield identification letters in
Morse code using a high-intensity red light.

b. **Obstruction Lights.** All high buildings, towers, hangars and other high obstructions, both on and in the vicinity of the airfield, are marked by red obstruction lights.

c. **Floodlighting.** Aircraft servicing platforms are often lit by powerful floodlights set on pylons. Sodium lights on the ground or on short poles may also be seen.

d. **Taxiway Lights.** Taxiways which are less than 18m wide are marked by blue edge lights along each side. Taxiways which are 18m or more wide are marked only along the centre line, and the lights are green. The airfield controller can switch the lights of different taxiways on or off, according to which are required for use.

e. **Holding Position.** Holding position signs are illuminated at night by either their own internal lighting (new models) or by a triangle of 3 blue lights fixed externally to the board (old models).

f. **Approach lighting.** Approach lighting is installed, usually outside the airfield boundary and often set on poles, to form a special pattern shown at Fig 1-4.
This pattern helps the pilot to judge the aircraft’s height and to line up with the runway on the approach to land. In addition, these high-intensity white lights are invaluable in conditions of poor visibility by day, as well as at night, in helping the pilot to find the approach path visually, towards the end of a radio or radar-controlled approach.

g. **Threshold Lights.** The threshold of the runway is marked by a row of green lights across the runway at the touchdown end, plus “wings” of three green lights on each side of the runway (Fig 1-4). However, where the threshold is displaced up the runway (see para 9c), the “wings” are omitted.

h. **Runway Lights.** Main runways have high-intensity unidirectional edge lights (seen only from the direction of landing), plus some omnidirectional edge lights. As omnidirectional lights shine in all directions they can be seen from aircraft flying near the airfield, and pilots in the circuit can use them to see the outline of the runway and judge their position relative to it.

**Conclusion**

22. There are many fascinating things to be seen on airfields and you will learn much more when you visit airfields on annual camp or on visits to Royal Air Force stations. On your next visit, try to identify some of the features described in this chapter, or on page 34.1.1b NOTES.
Sample Questions

1. The Royal Air Force uses which type of arrester gear?
   a) RHOG
   b) RHAG
   c) RHUG
   d) RAG

2. What does HAS stand for?
   a) House And Shelter
   b) Hardened Aircraft Shelter
   c) Home Aircraft Shelter
   d) Hardened Aircraft Shed

3. What colour are the obstruction lights on high buildings within aircraft operations?
   a) Blue
   b) White
   c) Green
   d) Red

4. How far is the holding position normally situated from the edge of the runway?
   a) 60m
   b) 64m
   c) 70m
   d) 62m