PART 2

Chapter 1

SURFACE TO AIR RANGES

INTRODUCTION

0101. General. Surface to air ranges are those where the weapon system to be fired is primarily designed to deal with airborne targets (either real or simulated). Some surface to air weapon systems can be used in a ground role, in which case such use is covered in Chapter 6 of this Part of Volume III.

0102. Purpose. The purpose of surface to air weapon systems is to prevent the enemy interfering from the air with the conduct of surface operations. Enemy interference from the air could be in the form of fixed wing aircraft, whether armed or for reconnaissance, armed or attack helicopters, cruise missiles or Unmanned Aircraft Systems (UAS). Surface to Air practices allow weapon system operators to carry out live firing training against the potential threats and may be fired on a variety of ranges. Small arms practices will usually take place on Field Firing Areas (FFA), larger calibre weapons and missiles will normally require specialised facilities.

0103. Aim. The aim of JSP 403 Volume III Part 2 is to detail the policy and principles for the conduct of firing practices by surface to air weapon systems against air or surface targets or simulated air targets on or over land or sea.

TYPES OF RANGE

0104. **General.** Ranges used for surface to air firings vary in the facilities that they are able to offer depending on whether they are single or multi-function ranges. For example, Trial, Evaluation, Research and Proof (TERP) ranges can be configured to contain the effects of a greater spread of events than a range established for training with an in-service weapon system. Nevertheless, TERP ranges may well be in a position to provide facilities to fire an in-service weapon system. The sophistication of equipment that can be deployed to support such firings is far superior to that on the training range but this does not mean that the risks involved in such firings will be any less. There are essentially four types of range used for surface to air firings:

a. **TERP Ranges**. These ranges are likely to have sea and air surveillance radars, tracking radars, optical trackers, thermal-imaging and high-speed cameras. These facilities are deployed to monitor the major elements in the firing of a live or inert round. They can therefore monitor independently the launcher system(s), the missile(s), the target(s) and the major parts of any debris after warhead event. TERP activities are prepared and conducted within a safety management system (SMS) which mandates a full risk assessment leading to the risk of harm being reduced to ALARP. Where Service firings for training purposes are carried out on TERP ranges, local conduct and control is exercised by the user unit, but in accordance with the ranges SMS, which will include attention to Range SO and will require a practice or trials specification. In the context of TERP ranges the term 'practice' includes trials unless otherwise stated.

b. **UK Surface to Air Ranges**. These ranges are operated within the Defence Training Estate (DTE) and Defence Equipment & Support (DE&S) in accordance with the provisions of JSP 403 and the safe system of training. They provide a sanitised area for the weapon system and target operators to use, and may be supported by sea and air surveillance radars. The operators are monitored, but not necessarily the missile or the target. The use of an approved WDA allows the introduction of generic risk assessment and better use of valuable range time.

c. **Greenfield Sites Used as Surface to Air Ranges**. These can be sites for Temporary Exercise Ranges (TER) used, for example, during transition to war or they can be established training areas activated from time to time for surface to air firing. In either case a SMS must be established using the principles and best practice given in Part 2 of this Volume.

d**. Field Firing Areas (FFA).** FFAs do not, as a rule, have the necessary range equipment or permanent infrastructure to reconfigure automatically as a surface to air range. Alterations, enhancements and probably some restrictions are likely to be required. A full risk assessment is therefore needed to determine the SMS that must be applied. Provided a risk assessment has been carried out and the risks reduced to ALARP there is no reason why a FFA cannot be used for surface to air practices.

0105. **Range Requirements.** The basic requirements for any surface to air range are:

a. A cleared three dimensional space that will contain the approved Weapon Danger Area (WDA), including any rear danger area, and provide sufficient space for the target to operate within its design parameters.

b. Sufficient safety staff to carry out the safety functions generated by both the weapon system and the target.

c. A Safety Management System (SMS) that provides the confidence to the Range Authorising Officer (RAO) that the range is being operated and used safely.

d. Surveillance and policing of the danger zone when range orders specify.

BOUNDARIES

0106. Boundary Marking. The boundaries of any permanent range used for surface to air practices must be demarcated as described in Chapter 5 of Reference C1.

0107. NOTAM. Areas which are covered by a permanent NOTAM are detailed in the UK Air Information Pilot. It is the responsibility of the range authorities to notify the civil aviation authorities of required changes to the NOTAM.

0108. Water Space Management. This system requires authorities programming firings which pose a potential danger to submerged submarines to signal CTF 311 requesting the issue of an Ops Hazardous message. The signal must state who, what, where (Lat and Long of the Range Boundaries) and when (Z time) with a point of contact in the programming authority. This signal must be sent as far in advance of the firing as possible to allow de-confliction and notification to take place. Whilst it is not normally a problem, it should be noted that clearance is not guaranteed as there may be a higher priority tasking for the waterspace in question. Further guidance is available from CinCFleet Staff.

RANGE SURVEILLANCE

0109. General. In order to demonstrate that the range operator, whether MOD or a contractor, is carrying out the duty of care a comprehensive system of surveillance of the range is required. Some ranges are sufficiently remote that the surveillance system can be reduced to a minimum but in all cases there is still a requirement to observe the warhead event within the danger area and a responsibility not to endanger the local population. To this end, the active weapon danger area boundaries must be observed or, alternatively, the range area boundaries that enclose the WDA must be controlled. This essentially means that there will be observation of the land, sea and air approaches to the range as well as observation of the likely target area and any impact area.

0110. Surveillance. At present, radar provides the most efficient system of monitoring an area. However, it is not the only solution and, depending on local circumstances, there may be other means applied or used to support the radars:

a. **Visual Overflight**. Where there is a surrounding low population density, a visual overflight with trained observers may be sufficient to provide assurance that the range area is clear prior to firing.

b. **CCTV.** These systems can be used for specific blind spots as well as part of the general security system.

c. Manned Vedettes. Manned Vedettes should be established at all critical points of access to the range with a suitable communication link to the Range Controller. Vedettes can also be used to observe into radar shadow areas.

0111. Radars. There are a variety of radars that can be linked into the range surveillance system. However, radars are optimised to specific roles and therefore do not necessarily cover all surveillance requirements:

a. Air Surveillance Radar. All permanent surface to air ranges in the UK are equipped with an air surveillance radar. The performance of the radar should be sufficient that it can detect an airborne intruder at such a range that firing can be stopped before a potential intruder reaches the boundary of the Weapon Danger Zone.

b. Surface Surveillance Radar. All permanent surface to air ranges with a Sea Danger Area (SDA) should be equipped with a sea surveillance radar. The performance of the radar should be sufficient that it can detect a waterborne intruder at such a range that firing can be stopped before the intruder reaches the boundary of the Weapon Danger Zone.

c. Tracking Radar. This is normally only available on TERP ranges.

0112. Mobile Surveillance Systems. The more sophisticated Surface to Air Missile (SAM) systems have integral air surveillance. It may be possible to use such a system (eg: Rapier FSC) as part of the SMS for a range. However, if this is adopted then the system is to be dedicated to the safety role and come under the direct control of the Range Control Staff.

0113. Air Traffic Control Radars. In certain circumstances local air traffic control radar may provide an extended area of surveillance. However, the SMS must allow for areas of radar shadow since the ATC radar will be optimised for its own specialised function and area of interest and may not be operating for 24 hours a day.

RANGE CO-ORDINATION

0114. Documentation.

a. **DTE Ranges.** The Practising Unit is responsible for writing and distributing the Exercise Instruction, which must reflect the firing practices agreed at the range planning conference. The Range Staff are responsible for producing and publishing the Range Detail and the Range Event Summary.

b. **TERP Ranges**. The Range Staff will co-ordinate the trials documentation. The IPT/Customer is responsible for producing the trials specification and supporting data. The Trials Safety Manager has the final responsibility for signing off the trials documentation. The Trials Conducting Officer is the responsible person at the trial site.

0115. Co-ordination between Range Staff and the User. It is vital that the requirements of the range user are co-ordinated with the services that the Range is able to provide. If co-ordination has not been achieved beforehand on any aspect of the firing the practice must not take place.

0116. Communications. The key factor in the range communication system is the length of time it takes to pass a safety message and for the safety staff and users to react to that message. Assumptions are made in the construction of a weapon danger area trace that cut down commands are passed immediately and acted upon immediately. Therefore the safety communication system must be fully tested and shown to be effective. If the communication system fails then the firing is to stop until the link is re-established.

SUBJECT MATTER EXPERTS

0117. General. There are three groups of Subject Matter Experts (SME):

a. Competent Authority . The HQ responsible for the corporate knowledge base of a particular weapon system, e.g. HQ DRA for the Ground Based Air Defence (GBAD) assets of the Royal Artillery.

b. Acquisition and Logistic Staff. The specialist MOD staff that may be found in DE&S IPTs and who are responsible for formulating the weapon system Safety Case.

c. Training Staff. Trainers appointed by the Competent Authority to maintain levels of excellence and produce the procedural training pamphlets.

0118. Technical SME. They are responsible for the maintenance, repair and disposal of the weapon systems. For example, an Ammunition Technician is required on the range during GBAD weapon system firing.