Ministry of Defence

Element 7: Equipment Design, Manufacture and Maintenance

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Contents

Amendment record

1. This chapter has been reviewed by the Directorate of Levelling Up, Climate Change and Sustainability together with relevant subject matter experts and key environmental stakeholders. Any suggestions for amendments should be sent to: SPO-LUCCS@mod.gov.uk

Version No	Date	Text Affected	Authority

Use of must and should

2. Where this chapter says must, this means that the action is a compulsory requirement.

3. Where this chapter says should, this means that the action is not a compulsory requirement but is considered best practice to comply with the policy.

Scope

4. This policy applies to all those employed by Defence (military or civilian) as well as those working on behalf of Defence (for example, contractors). It applies to all Defence activities carried out in any location (UK or overseas).

Introduction

5. This element provides the guidance and best practice that should be followed and will assist Defence Organisations to comply with the expectations for equipment design, manufacture and maintenance that are set out in Element 7 of the Volume 1 to JSP 816 (this JSP). The term 'equipment' used in this element refers to all types of equipment, vehicles, platforms, systems or services that are acquired to meet a capability requirement.

Purpose and expectations

6. This element ensures that the Defence Organisation has put in place frameworks and working practices to incorporate environmental considerations into the conceptualisation[1], design, acquisition, manufacture, operation, modification, and maintenance of equipment, including Defence digital systems. The focus for this guidance is establishments or units and TLB headquarters for oversight and coordination. References to 'equipment' throughout this Element are considered to include its design, manufacture, import, supply, in-service use and disposal within Defence.

E7.1 The Defence Organisation has mechanisms in place to identify and assess environmental risks, impacts and requirements associated with equipment throughout its entire lifecycle; from Concept, Assessment, Demonstration, Manufacture, In-service and Disposal/Termination (CADMID/T).

E7.2 The Defence Organisation has mechanisms in place to ensure risks and impacts associated with equipment are adequately controlled and mitigated through its entire lifecycle and where necessary elevated to the appropriate SRO and competent person.

E7.3 The Defence Organisation has mechanisms in place to ensure equipment is compliant with statute and Defence regulation throughout its lifecycle. Where necessary, a derogation, exemption or disapplication (DED) / waiver / concession is in place where compliance is not achievable.

E7.4 The Defence Organisation has processes in place to ensure equipment is always maintained and operated within defined design and operating limits to avoid environmental damage. Mechanisms are in place to communicate these operating limits to those who operate and maintain equipment.

E7.5 The Defence Organisation has mechanisms in place to ensure physical changes to equipment, (including major software changes), materials and associated specifications are evaluated, the environmental risk and impacts assessed, approved and documented.

E7.6 The Defence Organisation has mechanisms to accurately identify and manage the environmental risks, impacts and dependencies in their equipment supply chain.

E7.7 Lessons learned from previous equipment design, acquisition, manufacture, operation, modification, maintenance and end of life activities are shared effectively across the Defence Organisation.

[1] This could include pre-requirements setting for candidate Key User Requirements (KUR) meetings, FLC engagement, initial Investment Approvals Committee (IAC) and Outline Business Case (OBC).

E7.8 The Defence Organisation has mechanisms in place to assess the risk from integration of equipment and systems and its effects on the environment.

The CADMID/T lifecycle

7. After Defence has identified and expressed a capability requirement it uses the six-phase CADMID/T lifecycle approach for the acquisition of equipment to meet that capability requirement.

8. Factors and requirements relating to environmental management are prevalent throughout and they help to inform every phase of the CADMID/T cycle. They are proactive rather than reactive in nature. As it is likely that different environmental impacts will arise for each of these stages, it is important to consider environmental impacts throughout the whole lifecycle of any particular piece of equipment. Specifically, it is important to attempt to maximise the environmental performance of equipment during the concept phase (requirements setting and sustainable procurement, circular principles). This requirement and process for military equipment is supported by the use of ASEMS (Acquisition Safety and Environmental Management System).

9. The CADMID/T lifecycle approach adheres to the HMT Green Book (which provides guidance to Government Departments on how to appraise policies, programmes and projects). In particular the MOD's lead organisation for acquisition (DE&S) has an EMS in place supported by an Environmental Management Plan (EMP)[2]. Requirements should be set against key stage-gates to evaluate and consider the suitability and purpose of equipment against approved performance envelopes. Approval points across the CADMID/T lifecycle correspond to the overall ownership of the equipment, and key information deliverables such as environmental case reports align to those approval points. Environmental management should be considered at critical stages of the CADMID/T lifecycle and especially during the handover phase.

Concept, Assessment and Demonstration (CAD)

10. During the Concept phase, the outcomes of the initial environmental assessment can identify opportunities to promote positive environmental outcomes and exploit positive environmental impacts. An assessment should then be undertaken for each suggested design option considering environmental impacts and risks throughout the equipment lifetime. This may include its potential operating envelope, possible emissions and material usage and end of life.

11. The final design will have been agreed and commissioned through the agreed governance process (which should include consideration of environmental impacts and risks). Any identified environmental impacts and risks identified at this stage should be reviewed on a periodic basis for the remainder of the CADMID/T cycle.

Manufacture (M)

12. Manufacturing military equipment is resource and energy intensive, and utilises specialist production facilities, complex international supply-chains, and typically rare materials which are also energy intensive to extract and refine. The manufacturing process

[2] An Environmental Management Plan (EMP) defines the strategy for assessing environmental matters and the Environmental Management System.

should strive to maximise environmental performance and should follow any agreed design choices and meet the performance criteria agreed in the EMP.

13. During this, key decisions related to the design amendments, or changes to materials or systems design which may affect environmental impacts and risks in future operation and maintenance should be reviewed. A change management process owned by the Senior Responsible Owner (SRO) or accountable person should be followed to re-assess risks and evaluate the impact of the proposed changes, this should include any identified environmental risks.

In-Service (I)

14. The use of military equipment commonly leads to considerable greenhouse gas emissions as well as numerous, significant environmental impacts including pollution of land, water and air. In times of conflict or exception operation, environmental risks associated with equipment will increase.

15. Planned preventative maintenance systems should be implemented to facilitate optimum equipment operating conditions and minimise unnecessary environmental impacts as a result of inefficiency or in-service failure. A range of computerised maintenance management systems (CMMS) are commercially available which can be used to facilitate the planning and implementation of planned and corrective maintenance. Operating limits defined as part of the environmental case should only be exceeded following a risk review which should be addressed as part of management of change.

16. Incidents or near-miss reports should be monitored to ensure that the environmental implications are recorded and actions are put in place to avoid any repeat occurrences, including activities such as revision of operational control procedures, changes to maintenance programmes or further training requirements. Consideration to environmental impacts and risks should also be given to through-life disposal (e.g. mid-life upgrades, maintenance, parts replacement).

Disposal and service termination (D/T)

17. The Defence organisation should assess how equipment will be appropriately disposed of and taken out of service, specifically considering any environmental factors. The Disposal phase in particular should be considered throughout the equipment lifecycle from pre-concept phase onwards and updated and refined throughout each subsequent phase in accordance with POEMS procedures/processes.

Compliance with legislation and regulations

18. The Defence organisation is bound by domestic and international regulations and legislations which aim to conserve and protect natural resources, whilst acting in an environmentally responsible manner. When deployed overseas, Defence must follow legislation that applies at the appropriate location. If laws that apply overseas fall short of UK requirements, Defence will apply UK standards, so far as is reasonably practicable. Legislation is covered in more detail in Element 3 of this JSP.

19. Defence must comply with all environmental legislation, unless covered by a disapplication, exemption or derogation (DED) where such an exception is required to maintain operational capability. Applications for DEDs should only be made where absolutely necessary, and where the DED is not already written into legislation. They may

be applicable for certain equipment or circumstances, but must be clearly approved and set for a defined period as well as reviewed prior to their expiry date and throughout the equipment lifecycle. DEDs are covered in more detail in Element 3 of this JSP.

20. The increasing demands and scope of environmental legislation provide the ability to protect the environment and create opportunity for improved environmental outcomes, and ever stricter limits on negative impacts such as air emissions, effluent discharges, noise, and waste. Legislation is designed to require those who manufacture, market or use equipment to be responsible for understanding and managing their risks and impacts.

Equipment design and environmental cases

21. A formal environmental case should be generated for equipment to capture all the associated environmental impacts, the case should evidence how these impacts will be managed to the best and most Environmentally Practicable Environmental Option (BPEO) standard possible. This will require collaboration across Defence given the multiple stakeholders often involved.

22. The environmental case is a structured argument, supported by a body of evidence. It should provide a compelling, comprehensible, and valid case that a system has avoided environmental impacts, and identified that they are sufficiently mitigated. It usually includes evidence of test results (including technical annexes), detailed environmental analysis, modelling and expert judgement, together with the context to explain how this information supports the claim that use of the equipment is of sound environmental performance.

23. The environmental case should be maintained so that any claims made within it draw on current evidence and enable an environmental case report to be published at major review points, decision milestones and scrutiny points.

24. It is expected that an environmental case will develop throughout the equipment lifecycle and is typically summarised in environmental case reports at the end of each phase or prior to a major decision point.

25. Environmental cases should be updated when a ‘material change’ to the understanding, risk profile, design or operation of the equipment occurs. Environmental performance monitoring of the equipment should be maintained throughout the in-service phase for sustaining the environmental performance of that equipment, any environmental related issues identified must be acted upon.

Management of change

26. The Defence organisation should introduce mechanisms to become aware of new equipment requirements and changes when they arise, for example adjustments to statute, technology or policy decisions. Horizon-scanning at a local or TLB-level could be a useful activity to ensure coherence and understanding of incoming regulation. The impacts of any changes in environmental legislative or regulatory requirements should be considered within the existing environmental case and expected equipment operation. Otherwise, a change to the environmental case should be undertaken to reflect the updated means of operation.

27. Defence organisations should formally re-assess the risks they face on a continual basis through equipment lifecycle, including environmental risks, to remain up to date with their use.

28. Where an operational requirement exists to use equipment outside of the parameters of their environmental case, the Head of Establishment/Unit commander should be able to demonstrate evidence of possession of a formal written dispensation from their Chain of Command or the Operating Duty Holder (if one is in place).

29. The system for the evaluation, risk assessment, approval, implementation and documentation of all physical changes should consider the essential elements listed below (the emphasis on these various elements will alter depending on where the organisation is within the CADMID/T cycle in relation to a specific piece of equipment). It should also integrate an assessment of any environmental impacts that may arise (or current environmental impacts that may change in severity and duration) with the change.

a. Agree and evaluate the technical justification for the change at the appropriate management level.

b. Risk assess the proposed change using a multi-disciplinary team of competent people, including specialists, contractors, vendors and suppliers when their particular experience and knowledge is needed.

c. Put in place a rigorous design approval system to ensure that the appropriate engineering standards are applied to the design, and any deviations from design are approved by a suitably qualified and competent person with sufficient knowledge and experience. If the Defence organisation does not have control of the design, it should request confirmations from the design holder on its rigour.

d. Write formal procedures to implement the change, train all personnel who are directly affected by the physical change and obtain confirmation that training has been effective.

e. confirm the change has been communicated to all relevant stakeholders, maintain records of the change and share feedback and lessons learned for the benefit of continuous improvement.

30. Once the physical changes to equipment have been completed, these changes should be monitored closely and potential environmental impacts and risks considered. Feedback and lessons learned should be recorded for the benefit of continuous improvement and future projects.

Equipment and supply chain

31. Where equipment is procured information regarding the supplier’s approach to environmental performance can be requested (pre-selection checks can be included in tendering). Setting standards and promoting positive environmental performance will encourage the supply chain to become more environmentally aware as well as building better environmental performance and solutions into the CADMID/T cycle for equipment.

32. A material may be considered a risk to capability when it is essential and there is no alternative to it or where supply problems are encountered. Acquisition projects should ensure that capability solutions are future-proof against material security or supply chain availability risks.

33. Robust and rigorous quality assurance on equipment acceptance should be established with appropriate feedback to supply chain and suppliers. This is not only on initial purchase but throughout the life of the contract.

34. As the end user, the Defence organisation has a responsibility to ensure that selected suppliers are able to demonstrate compliance with environmental legislation and regulation through the commercial process.

Lessons learned

35. Defence organisations should undertake regular, lessons learned reviews relating to any environmental-related incident or occurrence. These should focus on informing and updating their EMS and capturing new understanding in a Learning from Experience (LfE) log. Lessons learned should also provide updated feedback into relevant environmental cases and equipment users. They should be documented and communicated as widely as possible across the organisation. Where available Defence organisations are to consider lessons learned from previous equipment design, acquisition, manufacture, operation, modification, and maintenance activity (see ASEMS EMP 09 for further information).

36. When a concern relating to environmental protection is raised, an assessment or re-assessment of related environmental controls should be undertaken and formally documented. Assessments (including any necessary investigations) should seek to:

a. understand what contributed to the specific environmental concern.

b. understand the potential consequences, what prevented the outcome from being worse, and the reliability of those controls.

c. identify related environmental concerns.

d. address any systemic weaknesses identified in the overall EMS.

e. update the environmental case and communicate these changes as necessary.

f. present recommendations to the appropriate stakeholders to address the above.

g. use the outcome of the assessment to review the effectiveness of the occurrence management process.

37. All concerns and required actions should be communicated to the relevant stakeholders in a timely manner as identified in the Defence organisation's communications plan.

38. Processes and controls to manage environmental impacts and risks should be regularly updated, following identification of new risks and reassessment of existing risks. Any changes to risk management or practical use of equipment should be revised in the Defence organisation's EMS and communicated to key stakeholders.

Element summary

39. Defence organisation leaders at all levels are to make sure that their organisation has:

a. mechanisms in place to identify and assess environmental impact associated with equipment throughout its CADMID/T lifecycle.

b. mechanisms in place to adequately reduce, control and mitigate environmental impacts associated with equipment through its entire lifecycle and where necessary elevated to the appropriate level within the chain of command.

c. processes in place so that equipment in a way to avoid environmental damage wherever possible.

d. mechanisms in place to ensure physical changes to equipment, (including major software changes), materials and associated specifications are evaluated, the environmental risk and impacts assessed, approved and documented.

e. mechanisms to accurately identify and manage the environmental risks, impacts and dependencies in their equipment supply chain.

f. processes in place to share lessons learned from previous equipment design, acquisition, manufacture, operation, modification, maintenance and end of life activities are shared effectively across the Defence organisation.

g. mechanisms in place to assess the environmental risks (actual or projected) and operational impacts from integration of equipment and systems.

Plan- Do- Check- Act (PDCA) Cycle

40. This diagram is designed to illustrate where this, and all the elements of JSP 816, fit into the PDCA cycle.