



Ministry
of Defence

JSP 912
Human Factors Integration for Defence Systems

Part 1: Directive

Foreword

Capability is not just a function of equipment performance, but depends on a combination of interacting elements. Some of the most difficult issues to address lie in the Human Component of Capability. The equipment and systems have to be operated in a demanding and diverse military context in circumstances of fatigue, hunger, stress and even fear. Ultimately their usability in these demanding environments will determine our operational success. The types of equipment and systems we are now specifying and procuring will also shape the roles, responsibilities and career paths of future servicemen and women, whom we recruit and our ability to retain them.

Approaching our defence needs from a capability direction, rather than a platform or replacement one, heightens the need for Human Factors Integration (HFI) of defence systems. We must set out to deliver solutions that enhance our capability aspirations with a more sophisticated understanding of the role of people in the operation of our future systems. The challenge is to integrate the people provided by the Armed Forces (including Reservists), with the equipment developed by industry and delivered by the Ministry of Defence (MOD), in a way that maximises capability within the real operational environment.

Joint Service Publication 912 promulgates the policy requirements and comprehensive practical guidance for undertaking HFI. This Part 1 of JSP 912 provides the direction that is mandated by Defence, and is sponsored by the Defence Authority for Technical and Quality Assurance. It provides policy-compliant business practices that should be adopted in the absence of any contradicting instruction.

I commend it to you and your staff.

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Defence Authority for Technical & Quality Assurance
(Director Technical DE&S)**

Preface

How to use this JSP

1. JSP 912 directs MOD staff to include HFI in all defence acquisition projects, and is designed to inform them about what this involves. This JSP contains the policy and direction for the application of HFI as a systematic process for identifying, tracking and resolving human-related considerations, to ensure a balanced development of both the technological and human aspects of capability.
2. JSP 912 shall be used by MOD staff involved in HFI activities in acquisition projects, to ensure that the HFI activities are carried out effectively, efficiently and at appropriate times in a project. It is also intended to guide those MOD Staff who provide advice to projects in support roles. JSP 912 informs and guides other parties, such as the Solution Provider, as to how the MOD approaches this aspect of defence acquisition. This JSP will be reviewed at least annually.
3. The JSP is structured in two parts:
 - a. Part 1 - Directive, which communicates the overarching policy for HFI within defence acquisition, set by the Defence Authority for Technical & Quality Assurance.
 - b. Part 2 - Guidance, which provides the guidance and best practice that will assist the User to comply with the Directive detailed in Part 1. In particular, the guidance includes details of the Human Factors Integration Management System (HuFIMS).

Coherence with other Defence Authority Policy and Guidance

4. Where applicable, this document contains links to other relevant JSPs, some of which may be published by different Defence Authorities. Where particular dependencies exist, these other Defence Authorities have been consulted in the formulation of the policy and guidance detailed in this publication. This JSP will be reviewed at least annually.

Related JSPs	Title
JSP 815	Defence Health, Safety and Environmental Protection
JSP 822	The Governance and Management of Defence Training & Education

Training

5. For relevant training applicable to the subject consult the following:
 - a. HFI Online Training (HFIOLT) <http://www.da.mod.uk/prospectus/cmt/hfiolt>
 - b. Introduction to HFI (iHFI) <http://www.da.mod.uk/prospectus/cmt/ihfi>

Further Advice and Feedback – Contacts

6. The owner of this JSP is the Defence Authority for Technical and Quality Assurance, and it is managed by the DE&S Engineering Group (EG), HFI Team. For further

information on any aspect of this guide, or questions not answered within the subsequent sections, or to provide feedback on the content, please contact:

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Disclaimer

7. The MOD, like its contractors, is subject to both United Kingdom (UK) and European statutory duties regarding Health and Safety at work, and common law duties that have been established by judgements made in courts. Nothing contained within JSP 912 removes the responsibility of any Duty Holder to comply with the applicable legislation, regulations and policy (JSP 815).

8. There is, however, some domestic and international legislation where the MOD has exemptions or derogations. In those circumstances, it is MOD policy to introduce standards and management arrangements that are, as far as reasonably practicable, at least as good as those required by legislation.

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1 Introduction

1.1 Policy

1. Human Factors (HF) is a scientific and engineering discipline that is concerned with the study of human capabilities and limitations, human interactions with technologies and environments and the application of this knowledge to products, processes and environments. The human issues identified through the HFI process shall be analysed and addressed through systematic application of Human Factors knowledge and techniques. It is MOD Policy that HFI shall be applied to all defence acquisition activities, across the range of programme and project types: technology demonstrators, upgrades, software intensive, collaborative, Non-Development Item solutions¹, and projects dependent upon Off-The-Shelf (OTS) items.
2. In all systems that provide Defence Capability, the Equipment Component and the Human Component shall be satisfactorily integrated such that:
 - a. The roles assigned to people in the Solution enables required system performance to be achieved under all predicted conditions of use.
 - b. The design and realisation of the Solution:
 - i. Makes best use of Human capabilities (physical, cognitive, psychological and social characteristics).
 - ii. Recognises and provides for Human needs.
 - iii. Provides mitigations for Human limitations.
 - iv. Applies to all people ('End Users') involved in operation of the system including, but not limited to, operators and maintainers.
 - v. Utilises people in ways that maximise system safety.
 - vi. Utilises people cost-effectively.
 - vii. Controls through-life costs.
3. This JSP prescribes a set of high-level HFI activities that are applicable to all types of Defence Capability Acquisition projects. However, given the range and diversity of such projects, this JSP does not prescribe a single set of detailed HFI activities.
4. HFI activities undertaken by Solution Providers shall be contracted against Defence Standard 00-251 *Human Factors Integration for Defence Systems* [Ref. 1].

¹ A Non Development Item is one that has already been developed and is available and capable of meeting operational requirements.

1.2 Scope

5. The scope, extent, depth, complexity and thoroughness of all HFI activities to be undertaken, shall be determined against considerations of risk to the project and programme outcomes presented by People-Related considerations. These will be typically measured in terms of capability goals, objectives, cost, time, system performance, system safety and system usability.

1.3 Applicability

6. This HFI policy shall be implemented from the outset of all Defence Capability development, where early decisions on MOD requirements, concepts of use, system design, system constraints and assumptions will determine the ultimate effectiveness of the system. The Policy shall be applied throughout the life of the capability.

7. This JSP shall apply to all MOD staff in all phases of the system life cycle, from early concept through to equipment disposal / service termination, but especially the following capability stakeholders:

- a. Customers (capability planners, capability sponsors and requirements managers).
- b. Delivery Agents (Project / Delivery Teams).
- c. Defence Line of Development (DLOD) owners.
- d. Trials Units/Organisations.
- e. Specialist Engineering Functions.
- f. End Users.

1.4 Associated Standards and Guidance

8. The primary standard for HF and HFI is Defence Standard 00-251 *Human Factors Integration for Defence Systems* [Ref. 1]. Other Defence Standards do provide some guidance on HF/HFI, but Defence Standard 00-251 is the primary document for contracting purposes.

9. Other relevant standards and guidance:

- a. *Defence Standard 23-09, Generic Vehicle Architecture (GVA)* [Ref. 3].
- b. *System Readiness Levels* [Ref. 4].
- c. *Guide to Engineering Activities and Reviews* [Ref. 5].

10. The terms used in this JSP are defined in the Glossary in Part 2.

2 MOD HFI Process

2.1 HFI Process Activities

1. This JSP prescribes a set of HFI technical and management activities that are applicable to all types of Capability Acquisition project. The six, top-level activities span all stages of a project – pre concept, Concept, Assessment, Design, Manufacture, In-service, Disposal (CADMID) – as shown in Figure 1.
2. MOD Staff or contracted representatives shall organise and conduct tailored HFI activities systematically, and these activities shall be aligned with regard to the actual project size and complexity. A detailed description of the HFI process and individual activities can be found in JSP 912 Part 2 [Ref. 2].
3. This JSP assumes HFI processes are aligned with a generic, systems engineering life cycle, e.g. International Organization for Standardization / International Electrotechnical Commission (ISO/IEC) 15288 [Ref. 6], as widely used by MOD and Industry.

2.2 HFI Process Goals

4. In all MOD Capability Acquisition projects, the following HFI goals shall be fully pursued to achieve satisfactory outcomes. All HFI activities that are undertaken shall relate to and support one or more of the itemised goals:
 - a. People-Related Risks, Assumptions, Issues, Dependencies and Opportunities (RAIDO) shall be identified and managed from the very outset of a project, and throughout the rest of life cycle.
 - b. Human Factors Process Requirements (HFPRs), ensuring that the HFI processes are properly and adequately undertaken shall be specified.
 - c. Human Factors System Requirements (HFSRs), ensuring that the HF technical aspects of the Solution are properly and sufficiently addressed (based on the identified RAIDO) shall be specified.
 - d. A human-centred design approach that involves the end Users in system and equipment design and evaluation shall be adopted.
 - e. Established HF principles, accepted best practice, and suitable methods, tools and techniques and data shall be used.
 - f. The HFI programme shall be designed to align and integrate effectively with the project life cycle; in some cases this may drive the selection of the life cycle.
 - g. People-Related considerations of the Solution shall undergo formal scrutiny, assessment and acceptance.

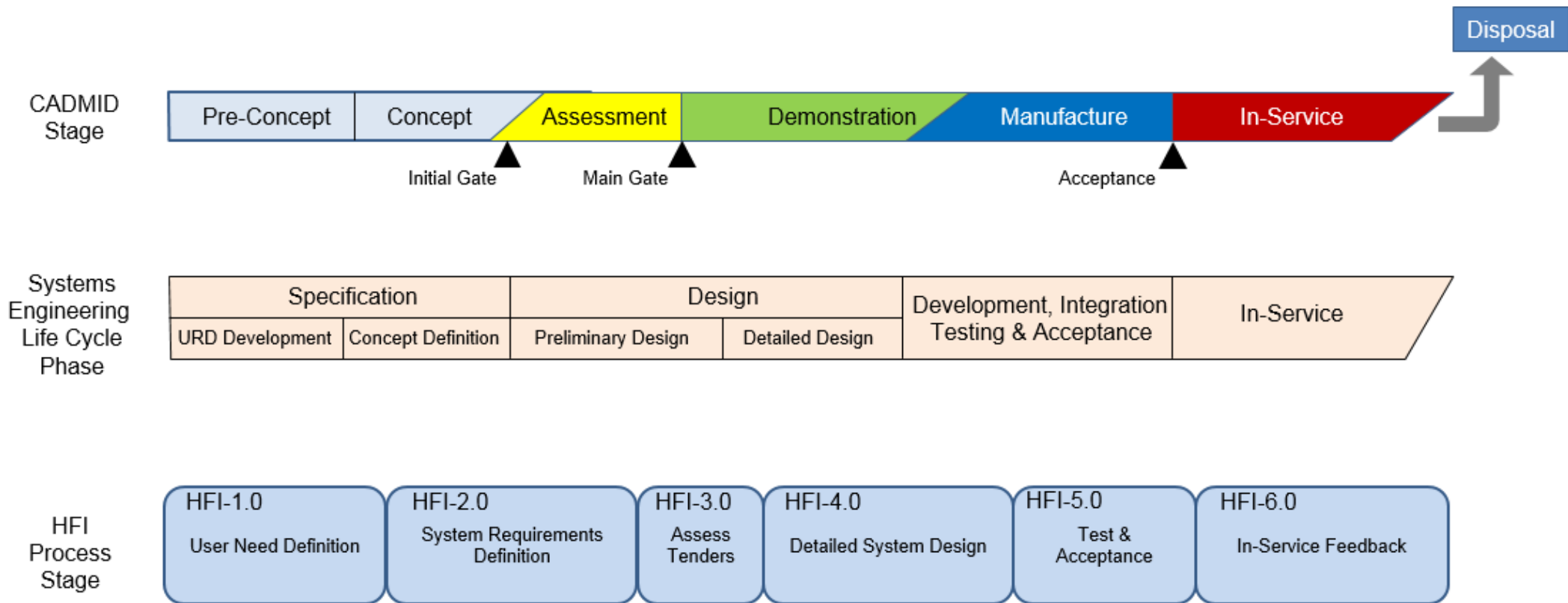


Figure 1: HFI Process Activities

2.3 Tailoring

5. Tailoring is fundamental to the cost effective application of HFI on a project. It is the process of identifying and specifying the range and depth of HFI activities that should be carried out and depends on the scope, size, complexity, life cycle phase and contractual arrangements of any given project.

6. Tailoring shall be conducted jointly by the Project Team (PT) and the Solution Provider, with agreement from all stakeholders, but the final decision must be made by the MOD Authority.

7. Before the Authority addresses tailoring with the Solution Provider, the Authority shall consider internally the range and depth of HFI activities that it expects to be carried out, and tailor them accordingly. This should include a pan-DLOD consideration of the areas of greatest perceived HF risk as identified by an Early Human Factors Analysis.

8. The acquisition strategy will influence the extent and scale of HFI activities that should be undertaken. Related issues will include: How will the system be developed? Is it completely new, modified or an existing system? Will the Authority buy just the equipment, a complete capability package or lease the system?

9. The PT is responsible for tailoring the HFI activities by considering the amount of design freedom and the availability and applicability of information in all the HFI domains. Efforts should then be concentrated on the areas where most benefit can be achieved and/or risk avoided (as identified in the People-Related considerations).

3 MOD Staff Responsibilities

3.1 Project Team Leader

1. The Project Team Leader (PT Leader) shall have prime responsibility for ensuring that HFI is successfully managed in a project, and that satisfactory HFI outcomes are achieved.
2. The PT Leader shall ensure that MOD Staff who undertake HFI management activities are provided with sufficient and suitable information and training to enable them to undertake their responsibilities.
3. The PT Leader shall ensure that the System Requirements Document (SRD) used by the Solution Provider includes sufficient HFSRs.

3.2 Human Factors Integration Focus

4. The HFI Focus is responsible for coordinating HFI activities throughout the life cycle of the project. However, in practice the 'HFI Focus' covers two separate roles:
 - a. HFI Focus within Front Line Command / Capability (FLC/Cap) community, hereafter referred to as HFI Focus(Cap); and
 - b. HFI Focus within the PT, hereafter referred to as HFI Focus(PT).
5. The HFI Focus(Cap) is responsible for managing the HFI activities during the Pre-Concept and Concept stages of development, with particular emphasis on the FLC activities associated with defining the People-Related User requirements for the capability. Consideration should be given to each of the DLODs to identify potential HFI issues and risks associated with the required Capability and the activities that will be required to address them. At this stage of procurement, the HFI Focus(Cap) is unlikely to be an exclusive or full time role.
6. The HFI Focus(PT) is a member of the PT (nominated by the PT Leader) who has responsibility for the day-to-day management of HFI activities relating to the project carried out by the MOD or by others on MOD's behalf.
7. The HFI Focus(PT) is responsible for tailoring the MOD HFI activities. Production of plans and reports are a costly and time-consuming exercise for all concerned. Over-specifying the requirement will lead to the production of valueless reports rather than the completion of useful analysis². The HFI Focus(PT) must strike a balance between having evidence of sufficient quality of the Solution Provider's (SP) work and giving the Solution Provider the freedom to get on with the job.

² The number of requirements clearly depends on the size and complexity of the project. MOD guidance on the quantity of requirements is 'to derive no more than 5 to 10 system requirements from each User requirement' – see Requirements and Acceptance on Acquisition System Guidance (ASG). Therefore, if the URD contains 50 requirements, the SRD should have no more 250-500 requirements. The HFSRs will be a small subset of these requirements.

8. Where there is insufficient expertise within the project team the HFI Focus(PT) should consider including an customer friend' in the team, for example from the Defence Science and Technology Laboratory (Dstl)³.

3.3 Requirements Management

9. It is the responsibility of the PT to manage the system requirements and ensure that they are managed across the DLODs. The HFSRs shall be derived from the User Requirements Document (URD) and incorporated within the SRD.

3.4 Capability Sponsor

10. The Capability Sponsor is responsible for capability at the programme level, leading the overall capability change planning process, and identifying the equipment and support requirements⁴. The Capability Sponsor operates as the decider in providing new equipment and equipment support on behalf of MOD. In the case of major programmes, the Senior Responsible Owner shall ensure that the programme addresses all the relevant Defence Lines of Development on a through-life basis and takes account of issues concerning process and culture or behavioural change.

3.5 Capability Integration Working Group

11. The Capability Integration Working Group (CIWG) shall ensure integration across the DLODs so as to deliver the overall military capability. The CIWG chairperson shall ensure that the Human Components of Capability (i.e. over and above issues emerging under Training, Equipment and Organisation) are adequately captured, defined, and tested. It is recommended that the HFI Focus is a member of the CIWG.

3.6 HFI Support Function

12. DE&S DTech EG HFI team shall provide information, guidance and support to MOD HFI Staff within PTs. DE&S is only responsible for Equipment and Logistics (at the project level), but HFI needs to be applied across all the DLODs.

13. The PT (and Cap Branch) shall agree a method to generate a requirements set that addresses the Human Component of Capability, seeking advice and support from the EG HFI Team where appropriate. It is essential that this set is generated so as to ensure the successful realisation of the project capability.

³ Specialists from within the Dstl Human Systems Group.

⁴ See https://www.aof.mod.uk/aofcontent/operational/org/cap/cap_purpose.htm

4 HFI Resource Competencies

4.1 MOD Staff HFI Competencies

1. The target competence for the HFI Focus shall be Practitioner level. The HFI Focus shall have, as a minimum, the competence of Awareness, gained through basic training and study of available materials (see Training). A full description of the functional competencies for HFI can be found in *Single Skills Human Factors Integration Functional Competencies* [Ref.7].
2. Every member of MOD staff undertaking HFI activities shall be a Suitably Qualified and Experienced Person (SQEP).
3. The HFI Focus should be eligible, as a minimum, for Technical Membership of the UK Chartered Institute of Ergonomics and Human Factors (CIEHF)⁵. In addition, as the HFI Focus is a HFI 'management' role, systems engineering expertise is also required.

4.2 Solution Provider HFI Competencies

4. All HFI activities carried out by a Solution Provider should be carried out by SQEP, namely a professional Ergonomist / HF Engineer, and/or a person with considerable experience of undertaking HFI in a Defence context. Therefore, all Solution Provider HFI personnel should be registered with a professional body, which in the UK is the CIEHF⁶.
5. For many HFI activities, this competency requirement will not be onerous. Some activities, such as identification and analysis of Concept of Use/Employment information, do not have to be carried out by a HFI professional, and should be supported by a military advisor or military Subject Matter Expert.

4.3 Research Ethics

6. The HFI processes conducted across the CADMID or systems engineering life cycle (see Figure 1) might involve research trials, experiments, tests, surveys or other forms of assessment with human participants. In such cases, the research activities shall comply with JSP 536 [Ref. 8].

4.4 Conduct and Behaviour

7. HFI research activities may need to conform to the Code of Human Research Ethics of the British Psychological Society [Ref. 9] and the Code of Professional Conduct of the UK Chartered IEHF [Ref. 10]. In such cases, the involvement of SQEP is essential.

⁵ <http://www.ergonomics.org.uk/technical-member/>

⁶ It is recognised that the Solution Provider itself, as a company, might not be registered with the CIEHF (i.e. as a 'registered consultancy'). However, the MOD expects that the Solution Provider's employees will include staff individually registered with the CIEHF.

5 References

- [Ref. 1] MOD (2015) 00-251 *Human Factors Integration for Defence Systems*. Issue 1.
- [Ref. 2] *JSP 912 Human Factors Integration for Defence Systems Part 2: Guidance*. Version 1.0, October 2014.
- [Ref. 3] MOD (2013) *Defence Standard 23-09 Part 2: Generic Vehicle Architecture (GVA) Human Machine Interface*. Issue 3, 17 May.
- [Ref. 4] *System Readiness Levels*. MOD ASG, Technology Management
https://www.aof.mod.uk/aofcontent/tactical/techman/content/srl_whatarethey.htm
accessed on 29 July 2014.
- [Ref. 5] *Guide to Engineering Activities and Reviews*.
- [Ref. 6] ISO/IEC (2002) *Systems Engineering – System life cycle processes*. International Organization for Standardization.
- [Ref. 7] *Single Skills Human Factors Integration Functional Competencies*.
http://defenceintranet.diif.r.mil.uk/libraries/corporate/PSCLearning/CompetenceFrameworks/UsefulInfo/FC_A-L/HumanFactorsIntegration_v1_%20Jul07-U.pdf
- [Ref. 8] MOD (2011) *JSP 536: Ethical Conduct and Scrutiny in MOD Research Involving Human Participants*. Version 1.2.
- [Ref. 9] BPS (2010) *British Psychological Society Code of Human Research Ethics*.
http://www.bps.org.uk/sites/default/files/documents/code_of_human_research_ethics.pdf accessed 22 October 2014.
- [Ref. 10] Institute of Ergonomics and Human Factors Code of Professional Conduct,
<http://www.ergonomics.org.uk/code-of-conduct/> accessed 22 October 2014.

6 Acronyms and Abbreviations

ASG	Acquisition System Guidance
CADMID	Concept, Assessment, Demonstration, Manufacture, In-service and Disposal
Cap	Capability
CIEHF	Chartered Institute of Ergonomics and Human Factors
CIWG	Capability Integration Working Group
DA4T&QA	Defence Authority for Technical & Quality Assurance
DE&S	Defence Equipment and Support
DLOD	Defence Line of Development
Dstl	Defence Science and Technology Laboratory
DTECH	Director Technical
EG	Engineering Group
FLC	Front Line Command
GEAR	Guide to Engineering Activities and Review
GVA	Generic Vehicle Architecture
HF	Human Factors
HFI	Human Factors Integration
HFIOLT	HFI Online Training
HFPR	Human Factors Process Requirement
HFSR	Human Factors System Requirement
HuFIMS	Human Factors Integration Management System
iHFI	Introduction to HFI
IEC	International Electrotechnical Commission
ISO	International Standards Organisation
JSP	Joint Service Publication
MOD	Ministry of Defence
OTS	Off-The-Shelf
PT	Project Team
RAIDO	Risks, Assumptions, Issues, Dependencies and Opportunities
SP	Solution Provider
SQEP	Suitably Qualified and Experienced Person
SRD	System Requirements Document
URD	User Requirements Document
UK	United Kingdom