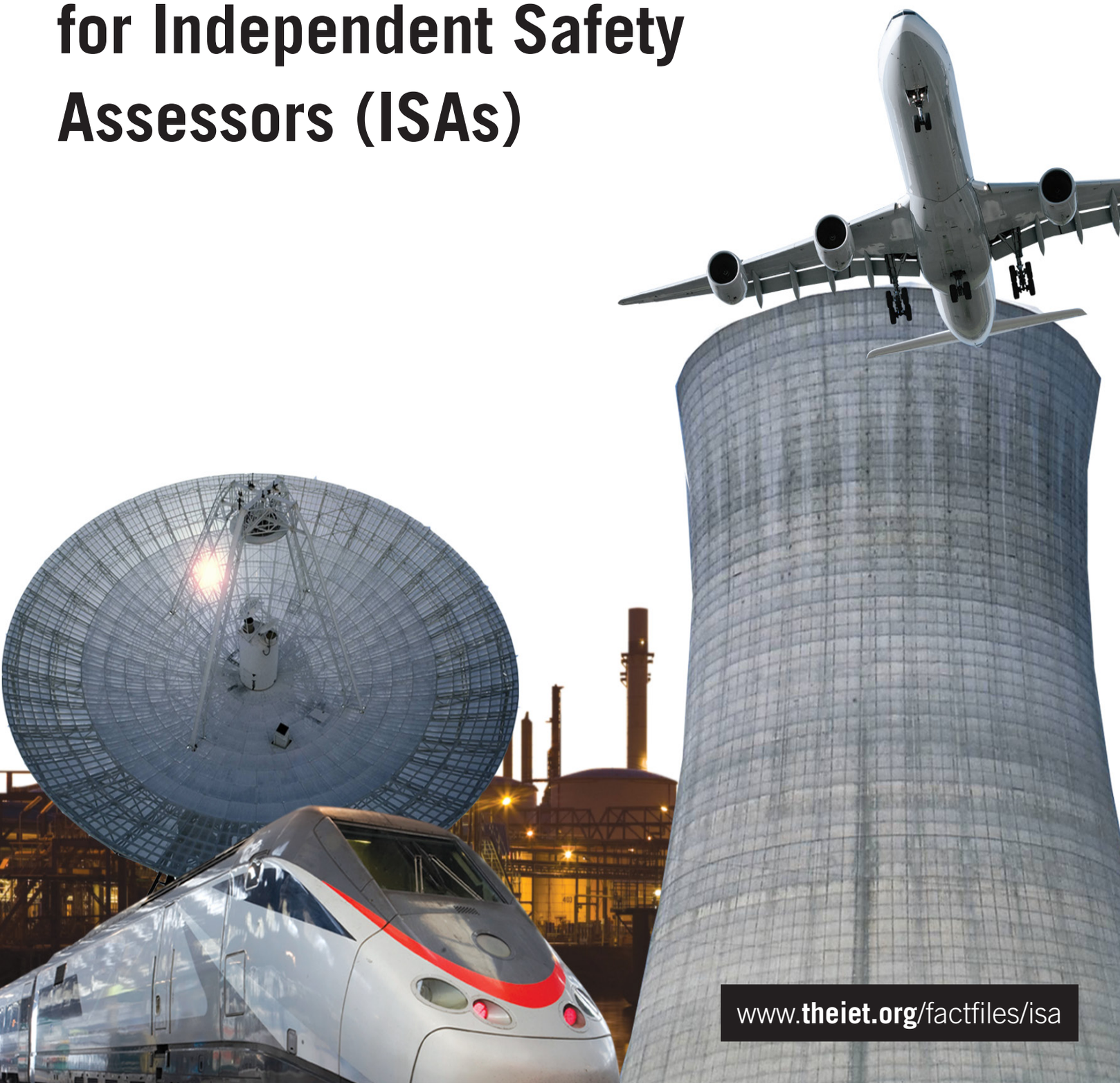
Factfiles

The Institution of Engineering and Technology

SaRS SAFETY AND RELIABILITY SOCIETY

bcs The Chartered Institute for IT

Competency Framework for Independent Safety Assessors (ISAs)



www.theiet.org/factfiles/isa

Change History

Version	Date	Status
Draft 0.6	29 June 2009	Published for consultation
Draft 0.7	7th October 2009	Incorporates comments from consultation
Issue 1	22nd October 2009	First formal issue

Please send suggestions for improvements, for example of other open access sources of data, for consideration by the Working Group to:

- isawg@theiet.org

Disclaimer

This document is owned and maintained by the IET/BCS ISA Working group and is not the property of the IET.

The information contained in this document should not be interpreted as representing the views of the IET or BCS. Nor should it be assumed that it reflects any current or future IET/BCS policy. The information cannot supersede any statutory or contractual requirements or liabilities and is offered without prejudice.

While the author, publisher and contributors believe that the information and guidance given in this work are correct, all parties must rely upon their own skill and judgement when making use of them. Neither the author nor the publishers assume any liability to anyone for any loss or damage caused by an error or omission in the work, whether such error or omission is the result of negligence or any other cause.

Where reference is made to legislation it is not considered as legal advice. Any and all such liability is disclaimed.

Cover Image © The IET 2009

The Institution of Engineering and Technology is registered as a Charity in England & Wales (no. 211014) and Scotland (no. SC038698).

The BCS is a registered charity: No 292786

1. Purpose

Independent safety assessment is the formation of a judgement, separate and independent from any system design, development or operational personnel, that the safety requirements for the system are appropriate and adequate for the planned application and that the system satisfies those safety requirements. A person who carries out independent safety assessment is known as an independent safety assessor or ISA.

This document is a framework for assessing the competency of ISAs and provides broad guidance on the competency criteria for ISAs. This is aimed at:

- individuals who wish to become an ISA
- individuals who wish to develop their skills as an ISA
- individuals who need to document their skills as an ISA
- organisations who wish to procure the services of an ISA
- organisations who need to know that an ISA is competent
- regulators who are assessing ISAs

This framework is intended to support the requirement for competency and its associated guidance contained in the Code of Practice for ISAs [7], namely "The ISA shall be demonstrably competent to undertake the assessment activities, to make judgements regarding safety and to communicate effectively the results of their work".

The scope does not cover the development of a competency management scheme which incorporates ISAs. Interested readers are referred to the "Red Book" [1].

Note: In some industry sectors the term 'Functional Safety Assessor' is used for 'Safety Assessor'.

2. Overall framework for ISA competency

The document defines three types of competence required to assess the suitability of an ISA:

1. Technical competence:
   a. Safety and technical skills cover the techniques and methods used to determine and analyse safety issues of importance and to make a judgement on the safety of a system, e.g. performing HAZOPs, risk assessment
   b. Understanding of the principles and concepts of safety and safety management, e.g. criteria for accepting risk such as ALARP
   c. Assessment and auditing skills necessary, e.g. document review, process audits and independent analyses
   d. General skills, e.g. presenting and documenting findings and recommendations
2. Behavioural competence covers the qualities and attributes of behaviour and character needed to perform the role of an ISA effectively including maintaining independence
3. Knowledge:
   a. Safety or engineering knowledge of the domain, system, application area or technology
   b. Legal and safety regulatory framework, standards, guidelines or codes of practice
   c. Experience of other systems engineering disciplines, e.g. software, human factors

The above categories are expanded in Table 1 with examples of competency requirements in column 4. Where additional guidance exists this is shown in column 5. Implementation of the framework will then require evidence to substantiate the requirements. It should be noted that for some of the requirements, it is not necessarily expected that the ISA is able to carry out the task, e.g. performing a HAZOP, but an understanding of the task is beneficial.

It is normal to define levels of competency as an individual progresses in their career. Typically these stages of increasing levels of competency are characterised by:

- Awareness of the principles and knowledge of technologies and practices
- Transfer of the knowledge to new applications and new domains
- Being able to carry out the tasks effectively in many different real world situations

© ISA Working Group 2011

A scheme such as the "Blue Book" [2] builds on the above and defines three levels of competency (see [2] for detailed definitions):

- Supervised practitioner – has sufficient knowledge and understanding of best practice of the organisation or relevant industry sector to be able to work on the tasks under the supervision of a practitioner or expert.
- Practitioner – has sufficient knowledge and understanding of best practice and demonstrated experience to be able to work on the tasks without supervision, will maintain their knowledge and be aware of current developments in the context of their work.
- Expert – has sufficient understanding of why things are done, is familiar with the ways systems have failed in the past, keeps abreast of technologies, architectures, standards etc, and is able to work in novel situations.

More guidance can be found in the reference list [1-6].

3. Procurement

When procuring the services of an ISA, the procurer should describe the main characteristics of the system and its use and what has to be assessed for the ISA organisation to respond, e.g.

- System characteristics – novelty, complexity, criticality, software-intensive, method of operation, and technology
- Development characteristics – safety management and engineering processes, documentation, acceptance process
- Domain characteristics – physical, operational and regulatory environments

From these, the procurer should be able, using the competency categories in Table 1, to select the more detailed competency requirements using the examples from column 4. For procurement, it is not usual to specify competencies covering behaviour. If necessary, the procurer should seek competent advice on how to define required competency categories. The procurer should also check if the domain has already specified schemes for ISA accreditation which should then be used as the basis for defining the required competencies.

The ISA should then respond using Table 1 as guidance and provide evidence to demonstrate the competencies are met based on training, qualifications and experience. Pointers to further guidance are provided in column 5 of Table 1. A key point is that ISAs should know their own limitations and should not overstate their competency.

The procurer should then analyse the response and, if required, check any competency claims against information held in CVs, training records or qualifications. Note that in some cases, a procurer may audit this evidence, e.g. through interviews of ISAs. It is important that the procurer should themselves have the competence to be able to assess the levels of competency provided and again, if necessary, should use a safety advisor to help the process.

In addition, the ISA should also demonstrate an appropriate level of independence (see the Code of Practice [7] for guidance).

4. Organisational Competency

When an organisation is documenting the competencies of its ISAs, it needs to ensure that their competency matches the main characteristics of the systems which they intend to assess. The organisation should be able, using the competency categories in Table 1, to select the more detailed competency requirements using the examples from column 4, adding additional categories where necessary. To these should be added competencies covering behaviour. It is usual also to define the level of competency; for the majority of categories, the "Blue Book" guidance can be used. Where levels do not exist, then the organisation will have to define its own.

Each ISA in the organisation should then respond to the competency requirements providing evidence to demonstrate the competencies are met based on training, qualifications and experience. The organisation should then review these to ensure that the documented achievements in such sources as an individual's CV, training records and qualifications can substantiate the competency claims.

5. Individual Competency

Once an organisation has established competency requirements together with defined levels of competency, it is possible for an individual ISA to ascertain how to progress from one competency level to the next, or to add new competency categories, by identifying the required experience, training or qualifications as necessary.

Similarly, an organisation may use the competency scheme and levels for identifying training needs etc for continuous development or for maintaining competency and currency.

© ISA Working Group 2011

A similar process could be used for an individual wishing to become an ISA. However, if an organisation does not already have an ISA competency scheme, then a good starting point would be for the individual to assess themselves against the "Blue Book" ISA requirements (ISA1-ISA14). Once the basic ISA skills have been determined, then additional safety and technical skills, knowledge categories (such as software or human factors) or standards can be added.

6. Further Considerations

- For specific roles such as a Lead ISA (the ISA who is overall responsible for the conduct of the assessment), higher levels of competency are usually required together with a defined number of years experience in the domain area as an ISA or a particular qualification such as a Chartered Engineer or equivalent.
- Where the Safety Assessment is carried out by a team, the team as a whole should provide the necessary level of competence for the context.
- If the ISA organisation sub-contracts any of its ISA services, then the organisation should ensure that the sub-contractors also meet the competency requirements (see procurement guidance above).
- For procurement, the specification and assessment of competence should be more rigorous where the consequences of failure of the safety-related systems are greater, or the safety integrity/ assurance levels are higher, or the design, design procedures or application are novel or untried.

7. Justifying competency

The training, experience and qualifications of all persons involved in the ISA activities should be documented. It should be possible to back up any competency claims against information such as:

- Assignments/ projects described in CVs
- Training records, e.g. completion of a formally assessed/ examined audit course
- Qualifications, e.g. completion of an assessed training course related to safety, such as a unit from a safety related MSc or degree
- Contributions to peer reviewed safety related papers or reports
- Contribution to reviewed company, domain, national or international safety related standards
- Contribution to safety related committees/ communities, at company, domain, national or international levels

Note that in some cases, a procuring agency may require the backing evidence or may audit this.

When conducting an independent assessment, the competency of the ISA (individual or team) should be justified in writing, for instance in an ISA Plan. It should be demonstrated that the overall competency is sufficient to match the ISA competency requirements for the system being assessed.

8. Training

Evidence of suitable training is a useful indicator of competence but is not sufficient on its own. The purpose of training is development of the individual to gain:

- Awareness
- Technical skills
- Process skills
- Domain knowledge

Training can encompass a wide range of activities such as:

- Formal courses
- Internal courses
- On the job-training
- Conferences / seminars

© ISA Working Group 2011

9. References

1 Managing Competence for Safety-related Systems (Part 1: Key Guidance and Part 2; Supplementary Material), HSE/IET/BCS, 2007 [Red Book]

2 IET/BCS 'Competence Criteria for Safety Related Practitioners' and its predecessor 'Safety, Competence and Commitment: Competency Guidelines for Safety-Related System Practitioners' [Blue Book]

3 Network Rail Competency Requirements [Railway]

4 Guidance for Integrated Project Teams for Use in Contracting for Independent Safety Auditor (ISA) Services, STG/181/1/9/1, Version 1.0 dated 1 June, 2004 [MoD]

5 Functional safety of electrical/electronic/programmable electronic safety-related systems, IEC 61508

6 The CASS scheme [http://www.cass.uk.net/Home.htm]

7 Code of Practice for Independent Safety Assessors, Guidance from the IET and the BCS Independent Safety Assurance Working Group [available from IET website]

8 Reducing Risks, Protecting People HSE 2001 [http://www.hse.gov.uk/risk/theory/r2p2.pdf]

© ISA Working Group 2011

Table 1: Competency Categories

Main competency areas	Sub-areas	Competencies	Examples	Further Guidance
Technical skills	Safety and technical skills	Knowledge and experience of the techniques and methods used to determine and analyse safety issues of importance and to make a judgement on the safety of a system	Examples include: ■ Safety Planning ■ Safety Requirements Capture/ Analysis ■ Performing HAZOPs ■ Derivation and apportioning of SIL ■ Risk Assessment ■ Validation/Acceptance Planning ■ Safety Requirements Validation ■ Compiling a Safety Case	See IET/BCS 'Competence Criteria for Safety Related Practitioners' competencies: ■ HRA (Safety Hazard and Risk Analysis) ■ SRS (Safety Requirements Specification) ■ SV (Safety Validation) ■ PSM1-5 (Project Safety Assurance Management)
Technical skills	Understanding	Understanding the principles and concepts of safety and safety management appropriate to the domain	Examples include: ■ Risk management, criteria for accepting risk (e.g. ALARP) ■ Developing safety management systems possibly including writing safety procedures/work instructions	See IET/BCS 'Competence Criteria for Safety Related Practitioners' competencies: ■ ISA13 Functional safety practices ■ ISA14 Principles of functional safety assurance ■ See also Red Book Part 1 paragraph 25 [1] regarding transferability of competence between different work situations and how it depends very much on the context in which apparently similar competency is required.

© ISA Working Group 2011

Main competency areas	Sub-areas	Competencies	Examples	Further Guidance
Technical skills	Assessment or auditing skills	Knowledge and experience of the specific activities performed as part of a Safety Assessment and Audit (e.g. document review, process audits and independent analyses)	Examples include: ■ ISA Planning (scope and objectives, creating and maintaining an ISA Plan) Assessing safety evidence include: ■ Collecting and analysing objective evidence to support a judgement about the safety of the system (interviewing, examining and reviewing documents, observing activities) ■ Verifying the accuracy of information gathered in interviews by observation, measurements and records analyses ■ Identifying, recording and investigating clues suggesting possible problems Performing Safety Audits include: ■ Formal process audits against relevant standards, plans, etc ■ Verifying that any actions necessary to address the results of the Safety Audit ctivities are appropriately completed Specific safety assessment competencies including: ■ Assessment of Safety Cases	See IET/BCS 'Competence Criteria for Safety Related Practitioners' competencies: ■ ISA1 Scope and context appreciation ■ ISA2 Assessment strategy selection ■ ISA3 [ISA] Planning ■ ISA4 Safety Auditing ■ ISA5 Reviewing safety documentation ■ ISA6 Assessing safety analysis
Technical skills	General skills	General competencies that are not particular to carrying out assessments or audits but which may be expected in carrying out a successful assessment	Examples of relevant skills: ■ Document findings including producing formal ISA Reports ■ Project Start-up and Planning ■ Project Control	See IET/BCS 'Competence Criteria for Safety Related Practitioners' competencies: ■ ISA8 Producing assessment reports

© ISA Working Group 2011

Main competency areas	Sub-areas	Competencies	Examples	Further Guidance
Behavioural skills		Attributes of conduct and character needed to perform the role of ISA effectively	Examples include: ■ Making a judgement ■ Ability to make Lead ISA decisions ■ Not being inappropriately influenced ■ Recognising when independence is being compromised and taking appropriate actions ■ Running Meetings ■ Interpersonal skills ■ Competence in communicating at all levels of the organisation ■ Interviewing skills ■ Reporting and presentation skills ■ Integrity and trustworthiness	See IET/BCS 'Competence Criteria for Safety Related Practitioners' competencies: ■ ISA7 Forming a judgement ■ ISA9 Managing Outcomes ■ ISA10 Methodical Approach ■ ISA11 Eliciting information ■ ISA12 Effective communication ■ ISA15 Professional standing and personal integrity ■ PSM6-13 (Project Safety Assurance Management)
Knowledge	Domain, system, application or technology	Engineering or safety engineering knowledge and experience appropriate to the application area or technology	Typically competencies that may be relevant include: ■ Technology areas such as formal methods, embedded real-time systems ■ Domain specific knowledge such as Signalling Systems, Rolling Stock, lecommunications ■ Domain specific lifecycles and procedures (such as nuclear waste disposal, airworthiness)	
Knowledge	Standards	Knowledge and experience of the legal and safety regulatory framework Knowledge and experience of specific standards, guidelines or codes of practice	An example of legislation includes: ■ Health and Safety at Work etc Act 1974 Regulatory frameworks include: ■ Nuclear Installations Inspectorate – Safety Assessment Principles for Nuclear Facilities 2006 ■ Railways and Other Guided Transport Systems (ROGS) Safety Regulations 2006 Examples of standards and guidance include: ■ IEC 61508 (General) ■ Def Stan 00-56 (Defence) ■ ARP 4761 (Aviation) ■ BS EN 50126 (Rail) ■ Engineering Safety Management (The Yellow Book) (Rail)	See "Documents useful to Independent Safety Assurance" at http://www.theiet.org/factfiles/isa/index.cfm (ISA Standards List)

© ISA Working Group 2011

Main competency areas	Sub-areas	Competencies	Examples	Further Guidance
Knowledge	Engineering and other functions	Experience of other systems engineering disciplines appropriate to the system	Examples of systems engineering disciplines include: ■ Systems ■ Human Factors ■ Software ■ Hardware Examples of other general disciplines include: ■ Assessing competency	See IET/BCS 'Competence Criteria for Safety Related Practitioners' competencies: ■ SAD (Safety-related System Architecture Design) ■ HF (Human Factors Safety Engineering) ■ SHR (Safety-related System Hardware Realisation) ■ SSR (Safety-related System Software Realisation) ■ CFM9 (Corporate Functional Safety Management – assuring competency)

© ISA Working Group 2011