Australian Government

Australian Radiation Protection and Nuclear Safety Agency

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THOF Methods Library



Introduction **3**

Template 3

Tools **4**

Task analysis techniques *4*

Cognitive work analysis *5*

Psychosocial Hazard Work Re-Design Tool *6*

Copenhagen Psychosocial Questionnaire III *7*

Resilience Assessment Grid *8*

Safety culture self-assessment *9*

Situation Awareness Global Assessment Technique *10*

The National Aeronautics and Space Administration Task Load Index *11*

Rapid Entire Body Assessment *12*

Fatigue Factors Checklist *13*

Accident Mapping *14*

System-Theoretic Process Analysis *15*

References **16**

Introduction

This document is intended to supplement ARPANSA's Regulatory Guide – Holistic Safety (Holistic Safety Guide; HSG) and should be read in conjunction with it. This information is not intended to replace specialist expertise. It is intended as an introductory and general reference only. Licence holders seeking to understand, assess, or address technical, human, and organisation factors (THOF) in the management of safety are encouraged to use this document as a starting point. Licence holders should engage in further research and seek assistance from suitably qualified subject matter experts (SMEs) to ensure the effective application of the methods introduced below. Tools, techniques, and methods described in this document have not been developed by ARPANSA.

This document is intended to raise awareness of the range of approaches available to support in the management of holistic safety. This is not an exhaustive list and, in many cases, multiple methods will be required to fully appreciate the risks and hazards of a given situation. The methods vary in complexity and in their demand on resources. Selecting the right tool will depend on:

- the purpose they are to serve (e.g. designing, monitoring, accident analysis);
- the context in which they are to be applied; and
- the interactions between technical, human, and organisational factors to be considered.

Licence holders should consider their specific operating context, objectives, needs, and available resources to determine which method(s) are most appropriate.

The use of any particular tool in this document is not mandatory unless otherwise specified by ARPANSA. However, use of these tools may assist licence holders in meeting the expectations set out in the HSG and regulatory requirements under the *Australian Radiation Protection and Nuclear Safety Regulations 2018* (s53(ea), s54(ea), s57A, and s60).

Template

All tools, techniques, and methods will be presented in the following format:

 ***Tool name***
Purpose: *the intended use of the tool* ***Benefits:*** *potential positive outcomes of using the tool* *Details regarding the tool and how to apply it.*

 **Related THOF**	*A list of the factors from the HSG that relate to the tool.*

 **Resource demand**	*A resource demand rating:* • *Low – e.g. requires an individual to carry out or can be completed within a day.* • *Medium – e.g. requires a team to carry out or tool adaptation or multiple days.* • *High – e.g. requires a team of SMEs to carry out or be conducted as a major project.*

 **Useful resources**	*Links to the tool, research, or related information.*

Tools



Task analysis techniques

Task analysis (TA) refers to a broad category of techniques.

Purpose: To better understand how individuals work to achieve the goals of a given task. A task is any observable activity with a clear start and end point. In a task analysis, this is deconstructed into component task steps or physical operations.

Benefits: TA output can be leveraged for system design, including human-machine interfaces, job design and training, error prediction and risk assessments, as well as situation awareness requirements.

Many task analysis techniques have been developed to serve different purposes. The technique employed will depend on the desired output and the context within which it is being applied. Common techniques include:

- **Hierarchical Task Analysis** (HTA) is a structured method for analysing how a system achieves its goals by deconstructing the system into a hierarchy of goals, subordinate goals, operations, and plans. HTA can be useful at both an individual task level as well as the system level, where understanding the unique operations performed by multiple stakeholders to achieve system goals is key.
- **Cognitive Task Analysis** (CTA) extends traditional TA by exploring underlying thought processes, decision-making, and other mental structures that underpin observable behaviour through structured interviews with SMEs. The combined understanding of overt behaviour and covert cognition deepens the understanding of the integrated whole; the task.
- **Goal Directed Task Analysis** (GDTA) is a situation-awareness-based variation of CTA. GDTA systematically defines the goals of a task, the decision-making which underpins it, and the precise situation-awareness requirements that must be met to achieve it. Results from GDTA may be leveraged for designing new systems to support decision-makers or to appraise existing systems.

 **Related THOF**	• Human-machine interfaces • Automation and AI • Situation awareness • Cognitive demands • Sensory perception • Decision-making • Procedure management

 **Resource demand**	MEDIUM

 **Useful resources**	**The Tool (HTA):** Handbook of Systems Thinking Methods – Chapter 5 HTA **The Tool (CTA & GDTA):** IHMC – Protocols for Cognitive Task Analysis • Working Minds: A Practitioner's Guide to Cognitive Task Analysis • U.S. Nuclear Regulatory Commission – Cognitive Task Analysis

Cognitive work analysis

Purpose: Cognitive Work Analysis (CWA) is a systems-based framework used to analyse and design complex work systems.

Benefits: Developing an understanding of the constraints within which people must operate to perform their work safely, effectively, and efficiently including in abnormal, emergency, or first-of-a-kind conditions.

CWA consists of five complementary phases:

- **Work Domain Analysis** – examines the purpose, functions, priorities, and constraints of the system.
- **Control Task Analysis** – identifies the key activities, decisions, and tasks required to achieve system objectives.
- **Strategies Analysis** – explores the different ways in which tasks and objectives can be achieved.
- **Social Organisation and Cooperation Analysis** – examines the roles, responsibilities, interactions, and coordination requirements of those involved in the work, including human and non-human agents.
- **Worker Competencies Analysis** – identifies the knowledge, skills, and abilities required to perform effectively.

By understanding the constraints that shape work, CWA provides insights into both the limitations and possibilities within a system. This enables practitioners to identify opportunities for improving work design, procedures, technologies, training, and organisational arrangements.

Related THOF	• Human-machine interface • Automation & Artificial Intelligence (AI) • Cognitive demands • Sensory perception • Decision-making • Competency and training • Procedure management

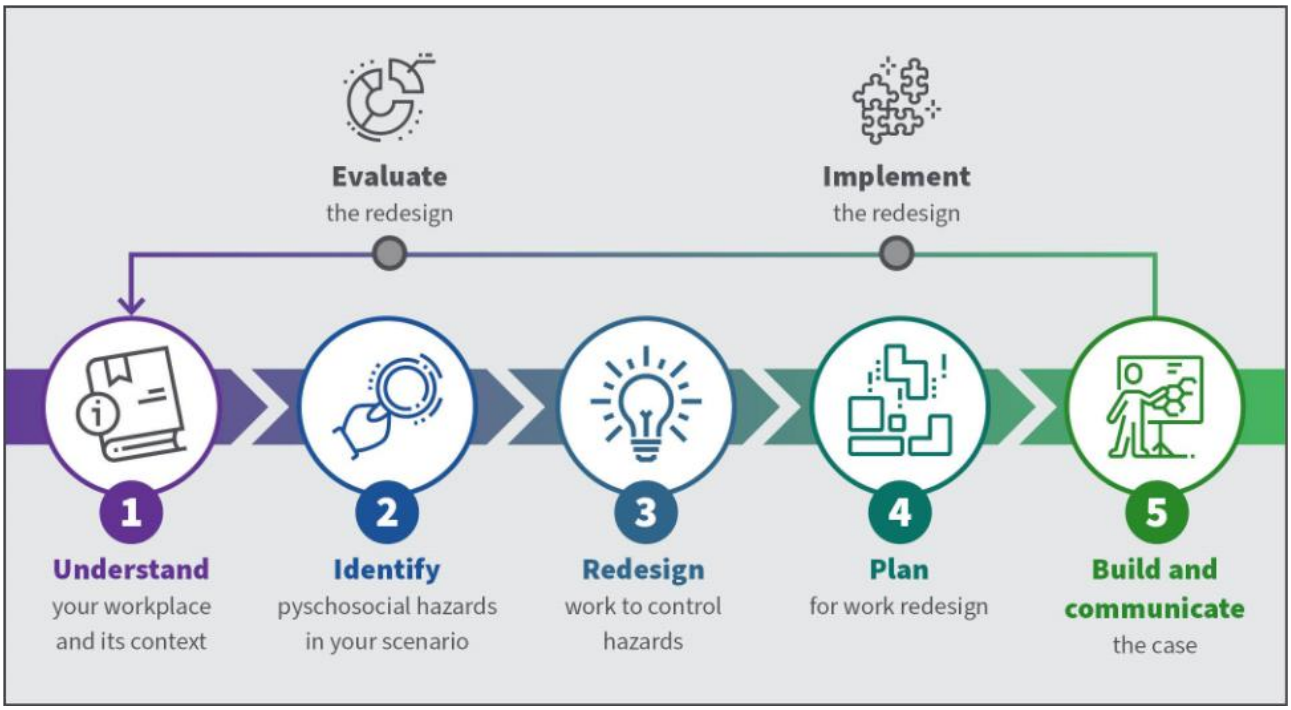
Resource demand	HIGH

Useful resources	**The Tool:** The Cognitive Work Analysis Design Toolkit - Chapter 11 CWA • Idaho National Laboratory – Use of Cognitive Work Analysis in Developing a Nuclear Power Plant New State Vision • Department of Defence – Cognitive Work Analysis: Foundations, Extensions, and Challenges

Psychosocial Hazard Work Re-Design Tool

Purpose: The Psychosocial Hazard Work Re-Design Tool (PHReD-T) is an interactive tool which can be used to help identify, assess, and address psychosocial hazards in the workplace. Using a structured, multi-step process, the tool guides users to understand the work context and apply this understanding to work redesign.

Benefits: The interactive tool identifies existing and emerging psychosocial risks to then guide the redesign of work. Once appropriate re-design strategies have been determined, PHReD-T can be used to facilitate their implementation, evaluate their effectiveness, and elicit feedback to guide continuous improvement.



Related THOF	• Cognitive demands • User-centred design • Psychosocial hazards • Fatigue • Stress and burnout • Competence and training

Resource demand	MEDIUM

Useful resources	**The Tool:** Work Design for Mental Health – PHReD-T • Work Design for Mental Health – Case Studies

Copenhagen Psychosocial Questionnaire III

Purpose: The Copenhagen Psychosocial Questionnaire (COPSOQ III) is a validated tool designed to identify psychosocial hazards. The questionnaire provides a comprehensive assessment of psychosocial risk factors that can influence both wellbeing and safety performance.

Benefits: Enabling organisations to identify risk areas which can serve as an evidence base for developing targeted interventions to improve working conditions and strengthen the capacity of staff to work safely. Repeated administration of the questionnaire can also be used to evaluate the effectiveness of improvement initiatives and track changes over time.

The risk factors covered by the tool include:

- Role Clarity
- Job Control
- Job Demands
- Support
- Organisational Justice
- Recognition and Reward
- Change Management
- Environmental conditions
- Aggression or Violence
- Sexual Harassment
- Gendered Violence
- Bullying
- Workplace Relationships

Related THOF	• Stress and Burnout • Psychosocial Hazards • Safety Culture
Resource demand	LOW
Useful resources	**The Tool:** COPSOQ III Licence, Guidelines & Questionnaire • COPSOQ Australia • COPSOQ Validation - Australia • COPSOQ International Network

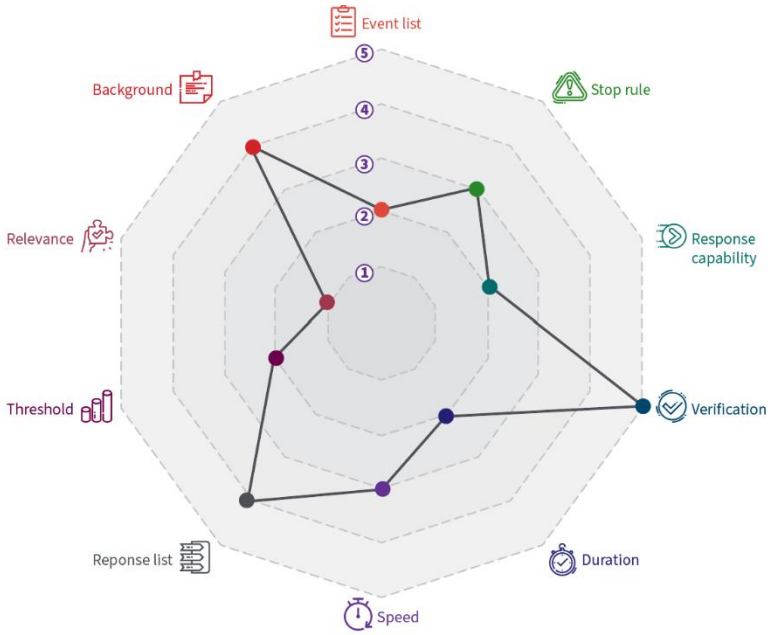
Resilience Assessment Grid

Purpose: The Resilience Assessment Grid (RAG), sometimes referred to as the Resilience Analysis Grid, is a structured tool which can be used to assess the extent to which an organisation supports the four core abilities of resilience:

1. The ability to respond
2. The ability to monitor
3. The ability to learn
4. The ability to anticipate

Benefits: By evaluating these abilities, the RAG helps organisations understand how effectively they can sustain safe and effective operations.

The RAG consists of four sets of questions, one for each resilience ability. Responses are captured on a Likert scale and presented in a radar chart to provide a visual representation of the organisation's resilience profile. This profile can help identify relative strengths, areas for improvement, and imbalances across the four abilities.



The example questions provided in the generic version of the tool are intended as a starting point only. For the assessment to generate meaningful insights, the questions should be tailored to the organisation's operational context. This tailoring should be undertaken by a suitably qualified SME to ensure that the assessment reflects the realities of the work being performed. ARPANSA has developed a customised set of questions (provided below) that may be applicable to some nuclear organisations. However, these questions should also be reviewed before use.

Related THOF	• Resilience
Resource demand	MEDIUM
Useful resources	**The Adapted Tool:** ARPANSA – Adapted Resilience Assessment Grid Question Set **The Tool:** Resilience Engineering in Practice: A Guidebook (pp. 275-296)

Safety culture self-assessment

Purpose: The IAEA Safety Culture Self-Assessment methodology allows an organisation to comprehensively evaluate safety culture using multiple lines of evidence, delivering a nuanced understanding of how safety is prioritised, communicated, and enacted.

Benefits: Findings of this assessment can be used to inform targeted culture interventions, monitor cultural change over time, and support ongoing efforts to strengthen safety performance.

The methodology draws on multiple sources of evidence to develop a holistic picture of safety culture, including:

- A perception questionnaire
- Document reviews
- Workplace observations
- Interviews
- Focus groups

ARPANSA has adopted the above methodology to perform safety culture self-assessments, with findings published on the ARPANSA website.

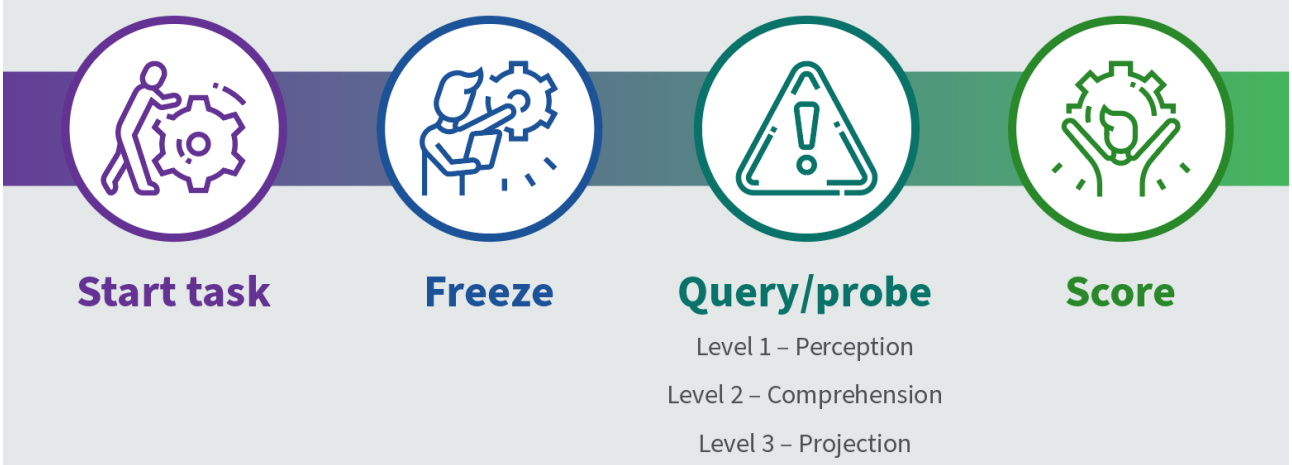
Related THOF	• Leadership for safety • Individual responsibility • Values and behaviour • Questioning attitude • Just culture and fairness
Resource demand	HIGH
Useful resources	**The Tool (instructions):** IAEA SRS No. 83: Performing Safety Culture Self-assessment **The Tool (questionnaire):** IAEA Safety Culture Perception Questionnaire

Situation Awareness Global Assessment Technique

Purpose: The Situation Awareness Global Assessment Technique (SAGAT) can be used to assess an individual's situation awareness during a task.

Benefits: Results can provide valuable insights into the situation awareness demands of specific roles and tasks and how these change over time. This may be useful in identifying factors which support or hinder safe performance and enable the early identification of performance degradation. Where declining performance is detected, appropriate interventions may be developed.

SAGAT requires participants to undertake a representative task, which is periodically paused at predefined points. During these pauses, participants are asked a set of structured questions to assess their perception of key information, comprehension of its significance, and ability to anticipate future events or system states.



The effectiveness of SAGAT depends on the quality and relevance of the questions asked during the probing phase. To ensure meaningful results, questions should be developed using the output of a rigorous Goal-Directed Task Analysis or similar approach, ensuring they reflect the information and decisions that are critical to successful task performance.

Related THOF	• Cognitive demands • Sensory perception • Situation awareness • Physical work environment • User-centred design
Resource demand	MEDIUM
Useful resources	**The Tool:** Handbook of Human Factors and Ergonomics Methods – Situation Awareness Measurement and the SAGAT • Situation Awareness Analysis and Measurement • Measuring situation awareness in command and control: Comparison of methods study.

The National Aeronautics and Space Administration Task Load Index

Purpose: The National Aeronautics and Space Administration Task Load Index (NASA-TLX) is a measure of perceived workload demands.

Benefits: The tool can be used to identify tasks, roles, or activities that place high cognitive, physical, or time-related demands on workers. Results can be useful for evaluating changes to work, processes, equipment, technology, or organisational arrangements. Additionally, output from the NASA-TLX can help to establish baseline workload measurements before a change is implemented, and support meaningful comparisons over time. Comparing workload before and after a change can help organisations determine whether workload has increased, decreased, or been redistributed, and whether any unintended consequences have emerged.

The NASA-TLX examines workload across 6 dimensions, including:

- Mental demand
- Physical demand
- Temporal demand
- Performance
- Effort
- Frustration

This tool can be accessed through the NASA-TLX iOS app or paper-and-pencil version.

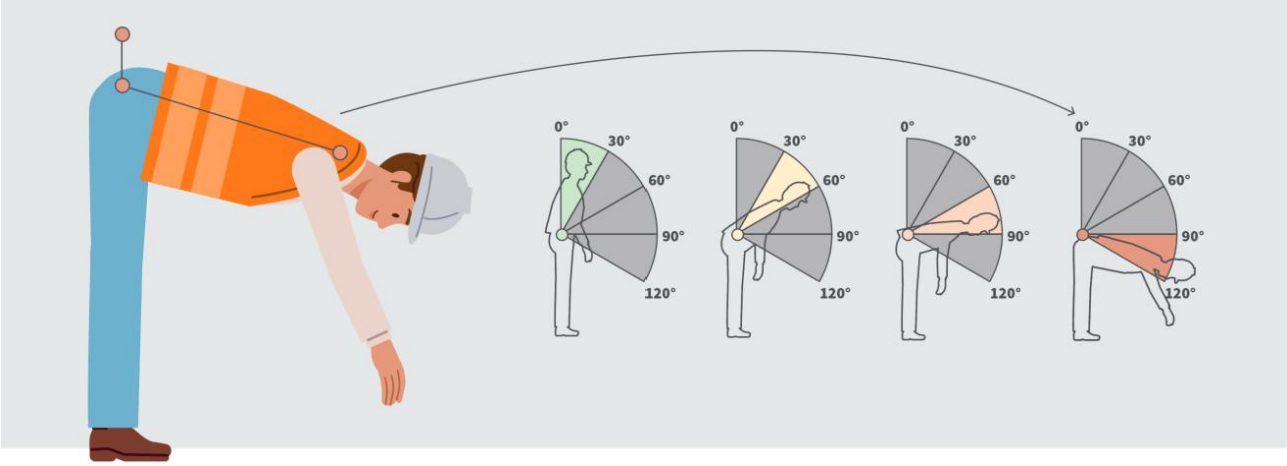
Related THOF	• Cognitive demands • Fatigue • Psychosocial hazards
Resource demand	LOW
Useful resources	**The Tool:** NASA Task Load Index

Rapid Entire Body Assessment

Purpose: The Rapid Entire Body Assessment (REBA) can be used to assess the risk of work-related musculoskeletal disorders (WRMSDs).

Benefits: Results from the REBA may support improvements in anthropometry, the design of physical workspaces, and processes and procedures when carrying out a task. REBA can also be implemented before and after an intervention to evaluate the effectiveness of the intervention.

REBA seeks to identify the posture of different regions of the body as a task is carried out. These postures are scored based on the musculoskeletal risk they pose, before calculating an overall musculoskeletal risk score for the task.



Related THOF	• Anthropometry • Work environment
Resource demand	LOW
Useful resources	**The Tool:** Institute of Ergonomics and Hygiene – Rapid Entire Body Assessment • Handbook of Human Factors and Ergonomics Methods – Rapid Entire Body Assessment

Fatigue Factors Checklist

Purpose: The fatigue factors checklist can be used to examine fatigue risks across multiple domains in support of developing a more holistic understanding of how work is organised and performed.

Benefits: The findings can be used to identify fatigue-related hazards, to better understand the demands associated with specific roles and tasks, to inform work and role design, and to guide the implementation of targeted risk controls. The checklist may also assist organisations in identifying systemic issues that contribute to fatigue, rather than focusing solely on individual behaviour or decisions.

The checklist comprises a series of questions designed to explore a broad range of factors that may contribute to fatigue risk, including:

- Shift type and length
- Rest breaks
- Overtime
- Sleep
- Fitness for work
- Personal factors
- Working conditions
- Cultural expectations
- Fatigue critical tasks
- Work demands

By examining fatigue risks across multiple domains, the checklist supports a more holistic understanding of how work is organised and performed.

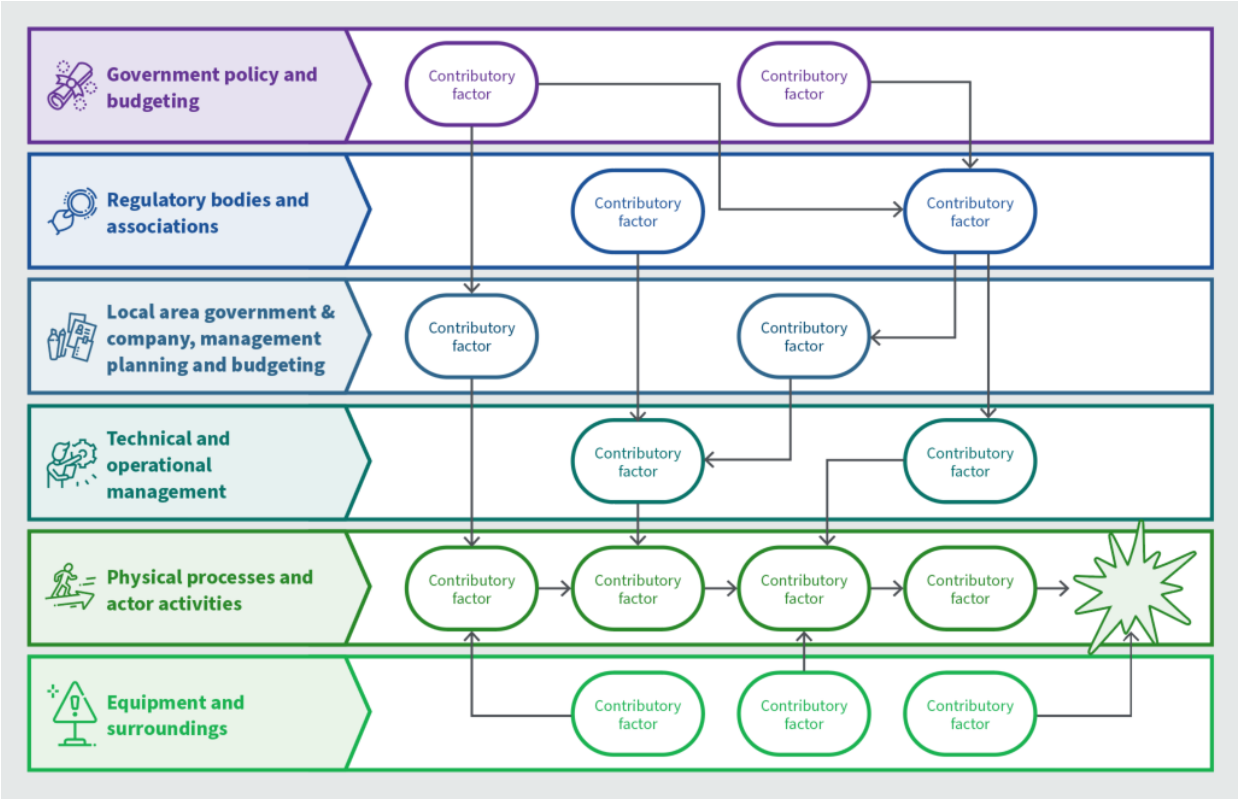
While it can provide valuable insights into potential fatigue risks, this checklist should be used as one component of a broader Fatigue Risk Management System (FRMS).

Related THOF	• Fatigue • Stress and burnout • Psychosocial hazards • Alcohol and other drugs
Resource demand	LOW
Useful resources	**The Tool:** Fatigue Factors Checklist

Accident Mapping

Purpose: Accident Mapping (AcciMap) is a systems thinking-based method for mapping the causes of a safety event.

Benefits: The AcciMap method can help organisations identify the underlying systemic causes of an event. With this understanding, response actions can be better aimed at underlying issues with the greatest impact on safety performance, rather than surface-level symptoms.



Rather than seeking a single root cause, AcciMap examines the multiple interacting factors, decisions, and actions that combined to create the conditions that underscored the incident. This is mapped across the broader socio-technical system (see diagram). AcciMaps can be applied to near misses, low-consequence incidents, and significant safety events. Insights generated through an AcciMap can help identify targeted risk controls and improvement actions.

Related THOF	This tool is intended to identify a range of factors relevant to a specific safety event.

Resource demand	MEDIUM

Useful resources	**The Tool:** Handbook of Systems Thinking Methods – Chapter 9 AcciMap • AcciMap Generator • Risk Management in a Dynamic Society • Learning from High Reliability Organisations – Chapter 10 Guidelines for AcciMap Analysis

System-Theoretic Process Analysis

Purpose: The System-Theoretic Process Analysis (STPA) is a systems thinking-based method which uses system and control modelling to identify possible unsafe control actions.

Benefits: STPA enables organisations to identify and address vulnerabilities early in design, development, or in the change management process, before they become embedded within the system.

Unlike traditional approaches that focus primarily on equipment failures, STPA is a method which views safety as a control problem. The method analyses system control structures, interactions, and feedback loops to identify unsafe control actions and other conditions that could lead to hazardous outcomes. In this way, STPA helps identify vulnerabilities that may not be evident through conventional methods.

Related THOF	This tool may identify several factors relevant to the system and related control structures.

Resource demand	MEDIUM

Useful resources	**The Tool:** Handbook of Systems Thinking Methods – Chapter 4 STPA Method • STPA Handbook

References

COPSOQ Australia. (n.d.). *COPSOQ Australia: Assess psychosocial working conditions*. https://www.copsoq.au/

COPSOQ International Network. (n.d.). *Welcome to COPSOQ international network*. https://www.copsoq-network.org/

COPSOQ International Network. (2020, June 29). *Licence, guidelines & questionnaire*. https://www.copsoq-network.org/licence-guidelines-and-questionnaire

Crandall, B., Klein, G. A., & Hoffman, R. R. (2006). *Working minds: A practitioner's guide to cognitive task analysis*. MIT Press. https://doi.org/10.7551/mitpress/7304.001.0001

Endsley, M. R., & Garland, D. J. (Eds.). (2000). *Situation awareness analysis and measurement.* Lawrence Erlbaum Associates. https://doi.org/10.1201/b12461

Hignett, S., & McAtamney, L. (2000). Rapid entire body assessment (REBA). *Applied Ergonomics, 31*(2), 201–205. https://doi.org/10.1016/S0003-6870(99)00039-3

Hoffman, R. R., Crandall, B., Klein, G., Jones, D. G., & Endsley, M. R. (2008). *Protocols for cognitive task analysis* (Technical Report). Florida Institute for Human and Machine Cognition. https://www.ihmc.us/wp-content/uploads/2025/06/Protocols-for-Cognitive-Task-Analysis.pdf

Hollnagel, E., Pariès, J., Woods, D., & Wreathall, J. (2011). Epilogue: RAG–The resilience analysis grid. In E. Hollnagel, J. Pariès, D. D. Woods, & J. Wreathall (Eds), *Resilience engineering in practice: a guidebook* (pp. 275-296). Ashgate. https://doi.org/10.1201/9781317065265

International Atomic Energy Agency. (2016). *Performing safety culture self-assessments (Safety Reports Series No. 83)*. International Atomic Energy Agency. https://www.iaea.org/publications/10742/performing-safety-culture-self-assessments

Kovesdi, C. R., Spielman, Z. A., Hill, R. A., Miyake, T. M., & Mohon, J. D. (2021, November). *Use of cognitive work analysis in developing a nuclear power plant new-state vision* (INL/CON-21-61937-Revision-0). Idaho National Laboratory. https://inldigitallibrary.inl.gov/content/uploads/50/2026/04/Sort_34195.pdf

Leveson, N. G., & Thomas, J. P. (2018). *STPA handbook* (MIT-STAMP-001). Massachusetts Institute of Technology, Partnership for a Systems Approach to Safety and Security (PSASS). http://psas.scripts.mit.edu/home/get_file.php?name=STPA_handbook.pdf

Lynn McAtamney, & Sue Hignett. (2004). Rapid Entire Body Assessment. In N. A. Stanton, A. Hedge, K. Brookhuis, E. Salas, & H. W. Hendrick (Eds.), *Handbook of Human Factors and Ergonomics Methods* (pp. 97–108). CRC Press. https://doi.org/10.1201/9780203489925-17

Naikar, N. (2011). *Cognitive work analysis: Foundations, extensions, and challenges* (DSTO-GD-0680). Defence Science and Technology Organisation, Air Operations Division. https://www.dst.defence.gov.au/sites/default/files/publications/documents/DSTO-GD-0680%20PR.pdf

NATO Research and Technology Organization. (2000). *Cognitive task analysis* (RTO Technical Report No. RTO-TR-024). NATO Research and Technology Organization. https://www.sto.nato.int/document/cognitive-task-analysis/

Parker, S. K., & Knight, C. (2024). The SMART model of work design: A higher order structure to help see the wood from the trees. *Human Resource Management, 63*(2), 265–291. https://doi.org/10.1002/hrm.22200

Rahimi, M., Arnold, B., LaMontagne, A. D., & Riley, P. (2025). Validation and benchmarks for the Copenhagen Psychosocial Questionnaire (COPSOQ III) in an Australian working population sample. *BMC Public Health, 25*, Article 21845. https://doi.org/10.1186/s12889-025-21845-x

Rasmussen, J. (1997). Risk management in a dynamic society: A modelling problem. *Safety Science, 27*(2-3), 183-213. https://doi.org/10.1016/S0925-7535(97)00052-0

Read, G. J. M., Salmon, P. M., & Lenné, M. G. (2018). The cognitive work analysis design toolkit. In N. A. Stanton, P. M. Salmon, G. H. Walker, & D. P. Jenkins (Eds.), *Cognitive work analysis: Applications, extensions and future directions* (pp. 251–270). CRC Press. https://doi.org/10.1201/9781315572536

Roth, E., O'Hara, J., Dickerson, K., & Hughes, N. (2020). *Cognitive task analysis: Technical basis and guidance development* (Research Information Letter RIL-2020-07). U.S. Nuclear Regulatory Commission, Office of Nuclear Regulatory Research. https://www.nrc.gov/docs/ML2208/ML22087A406.pdf

Salmon, P. M., Stanton, N. A., Walker, G. H., Hulme, A., Goode, N., Thompson, J., & Read, G. J. M. (2023). *Handbook of systems thinking methods*. CRC Press. https://doi.org/10.1201/9780429281624

Salmon, P. M., Stanton, N. A., Walker, G. H., Jenkins, D. P., Ladva, D., & Rafferty, L. (2007). Measuring situation awareness in command and control: Comparison of methods study. In *Proceedings of the ECCE 2007*

Conference (pp. 27–34). European Conference on Cognitive Ergonomics. https://dl.acm.org/doi/pdf/10.1145/1362550.1362559

Stanton, N. A., Hedge, A., Brookhuis, K., Salas, E., & Hendrick, H. W. (2004). Situation awareness measurement and the situation awareness global assessment technique. In Handbook of human factors and ergonomics methods (pp. 445-453). CRC Press. https://doi.org/10.1201/9780203489925

Work Design for Mental Health. (n.d.). Case Studies. https://www.workdesignformentalhealth.org/case-studies

Work Design for Mental Health. (n.d.). Psychosocial Hazard Work Re-Design Tool (PHReD-T). https://www.workdesignformentalhealth.org/phred-t

Workplace Health and Safety Queensland. (2020). Tool 1: Fatigue factors checklist. In *Preventing and managing fatigue-related risk in the workplace* (pp. 19-29). State of Queensland. https://www.worksafe.qld.gov.au/__data/assets/pdf_file/0018/26109/preventing-and-managing-fatigue-related-risk-in-the-workplace.pdf