

Risktec Solutions

risk management and assessment for business

Safety Critical Task Analysis – Lessons from Industry

David Keane, Human Factors Principal Consultant
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Originally presented by Derek Porter, Human Factors Technical Expert

Hazards 34, Manchester, 6th November 2024

A Bit about Me

- David Keane
- Human Factors Principal Consultant, Risktec Solutions Limited



- Previous Experience
 - Defence – air and land sectors
 - Healthcare – through a PhD



Introduction and Aims

- Safety Critical Task Analysis (SCTA) has become the predominant Human Failure Assessment (HFA) method for the UK oil & gas & chemicals sector
- Risktec has been providing SCTA support to onshore and offshore operators for several years
- This has given us valuable insights into the practical challenges faced when applying the approach in industry
- In this presentation, I will discuss some of the key lessons learned and offer suggestions to help ensure effective application of the methodology
- I will provide a brief overview of the SCTA process then focus on the key steps of Safety Critical Activity Screening and Human Failure Assessment
- I am not able to cover everything so please read the paper for additional guidance

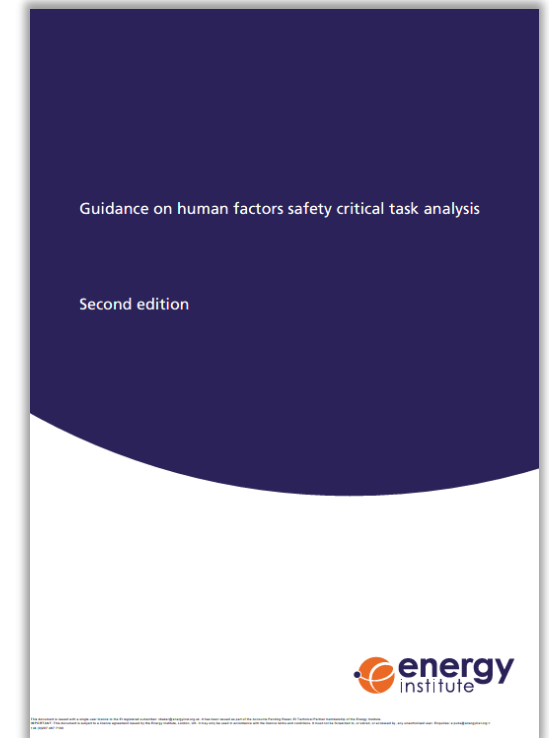


Safety Critical Task Analysis

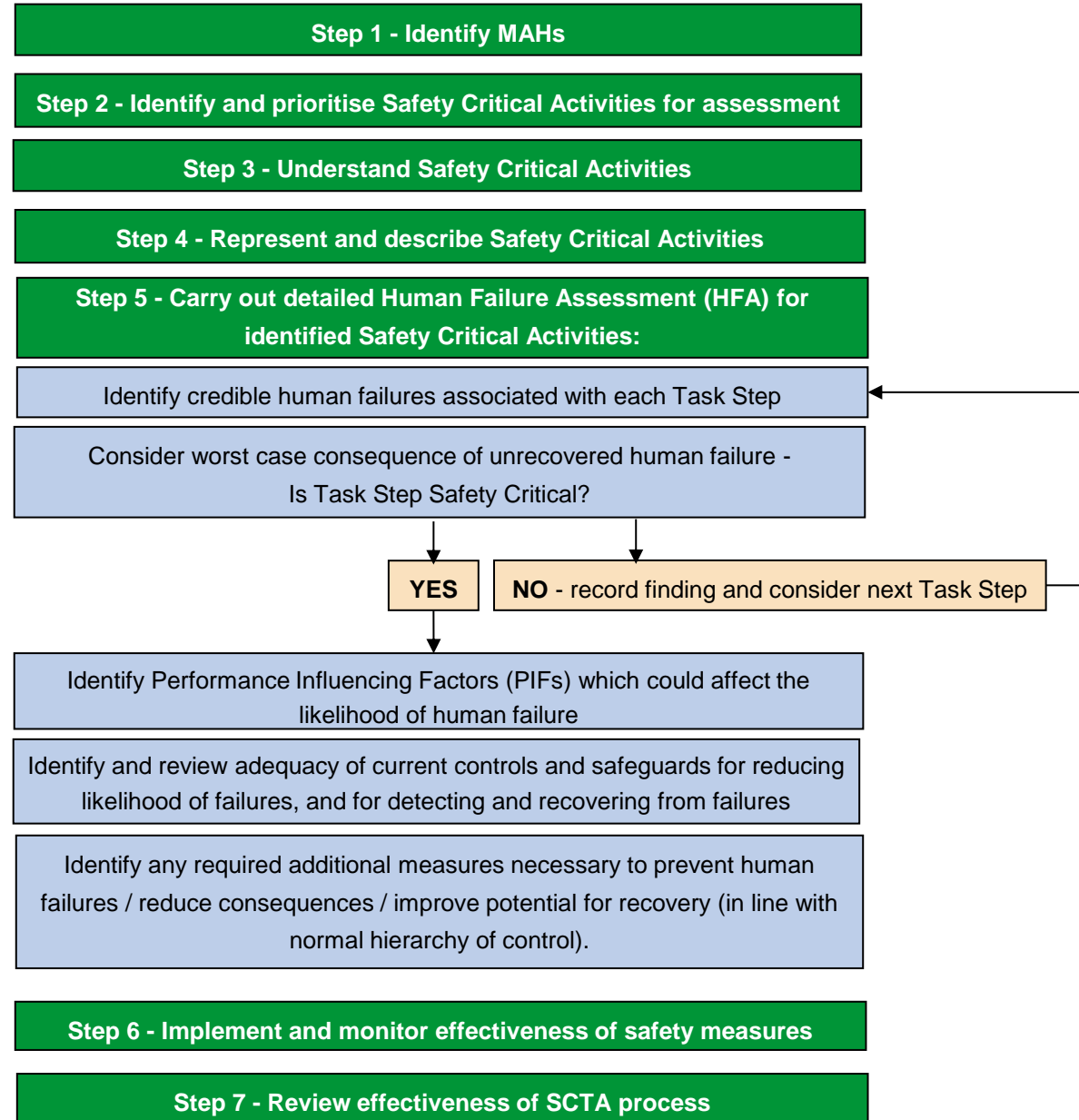
- SCTA covers the whole human failure identification and assessment process
- Key principle - activities and tasks are screened and detailed HFA is only carried out for Safety Critical Tasks (SCTs)
- SCTs typically defined in relation to the potential for Major Accidents (MAs)

“A task in which human action or inaction could initiate, fail to control or fail to mitigate a major accident, including operations, maintenance and emergency response.”

CIEHF. How to carry out Human Factors assessments of critical tasks. 2023



SCTA process overview



Adapted from Energy Institute: Guidance on Human Factors Safety Critical Task Analysis 2020

Safety Critical Activity Screening – Building the Activity List

- There is a requirement to screen all relevant activities - but it can be difficult to obtain a comprehensive and accurate list
- Not all activities may be captured in procedures and work instructions
- The list of activities or procedures may be extremely large (particularly for offshore facilities)
- Some procedures may already be identified as ‘safety critical’ but may not be suitable or appropriate for HFA (as they don’t reflect a step-by-step process)



Safety Critical Activity Screening – Building the Activity List

- Don't rely solely on lists of procedures: check with personnel who are familiar with site activities whether the list is comprehensive or if other activities are carried out
- Consider pre-filter review by HF specialist prior to the main screening session
- Screen out any procedures or activities that are not appropriate for HFA:
 - Company policies / general safety management arrangements and controls
 - Procedures that do not reflect step-by-step activities with a clear start and end point
 - Generic activities that are not equipment / location specific



Safety Critical Activity Screening – Dealing with MIT and Emergency Response Activities

- Activities associated with Maintenance, Inspection & Testing (MIT) and emergency response should be screened, alongside operational activities
 - Human failures during maintenance can sometimes directly result in a MA
 - Failure to maintain or correctly reinstate equipment may impact on reliability of safety systems, removing a barrier or control that helps prevent or mitigate MAs
- There can be a very large number of MIT activities – it may not be necessary, or appropriate, to screen them all
- Emergency response activities are by their definition ‘safety critical’ - however, depending on their content, some emergency procedures may not be suitable for HFA



Safety Critical Activity Screening – Dealing with MIT and Emergency Response Activities

MIT Activities

- Exclude 'generic' activities (e.g. 'inspection' or 'maintenance')
- Exclude tasks which relate to a single scheduled test or function check (e.g. annunciation of indicator)
- Include maintenance undertaken on safety critical equipment and systems
- Include maintenance of major plant and equipment carried out infrequently and/or involving long sequence of steps
- Consider excluding routine preventative maintenance by approved specialist suppliers and contractors working to their own procedures

Emergency Response

- Include emergency response activities in screening
- If consensus is that further assessment is required, then decide on the best approach - HFA may not always be the optimal method
- Key aspects to evaluate will include defined roles and responsibilities and associated competencies, robustness of procedural instructions, and communications arrangements

Safety Critical Activity Screening – Developing the Assessment Programme

- There is a need to prioritise activities and ensure an achievable assessment programme
- Use two levels of screening where appropriate to determine overall priority (i.e. EI, HSE questions) – use of a numbered scoring scheme (i.e. not just H/M/L categories) enables greater differentiation
- Count applicable MAs, consider previous incidents / near misses
- Assess all High scoring activities and at least a representative sample of Medium scoring activities
- Consider grouping similar MIT tasks (e.g. proof tests), carry out detailed HFA on one activity, then apply the lessons to similar tasks
- Consider a similar approach for tasks carried out on multiple sites, but ensure site-specific Performance Influencing Factors (PIFs) are assessed
- Consider developing generic HFAs for commonly performed activities as starting-point for site-specific HFAs

| | | | | |
|-------------|---|----------------------------|---|---|
| Consequence | H | 3 | 6 | 9 |
| | M | 2 | 4 | 6 |
| | L | 1 | 2 | 3 |
| | | 1 | 2 | 3 |
| | | Level of human involvement | | |

| | Diagnostic | Definition | Guide and Score | | |
|---|--|---|--|---|---|
| | | | Low (1) | Medium (2) | High (3) |
| 1 | How hazardous is the system involved? | Task involves systems with intrinsically hazardous substances or conditions | Small amount of low hazard substance / condition | Large amount of low hazard or small amount of a high hazard | High amount of a high hazard / condition |
| 2 | To what extent are ignition sources introduced into the task when it is performed? | Task uses or may produce heat, sparks or flames | Static spark or low current electrical supply | High current electrical supply, sparks from grinding | Flame for welding or cutting, internal combustion engines |
| 3 | To what extent does the task involve changes to the operating configuration? | Task involves valve, moves, temporary connections, change to process flows | Simple changes to valve process status | Complex or multiple changes to valve and process status, or temporary connections | Complex and multiple changes and temporary connections |
| 4 | To what extent could incorrect performance of the task cause damage? | Deviations from best practices may have detrimental effect on equipment integrity | Equipment weakened with potential to cause damage in the long term | Equipment requires repair but maintains integrity | Equipment fails catastrophically |
| 5 | To what extent does the task involve defeating protection devices? | Task requires bypass or override of indications, alarms or trips | Disabling gauges, meters or electronic displays | Disabling alarms | Overriding trip systems or isolating safety valves |

Human Failure Assessment – Regulatory Expectations

- Not just a theoretical paper-based exercise
- The HFA must be carried out on the activity as it is actually performed – the task steps must be accurate
- The HFA should take account of the physical location, equipment, environment, etc.
- The key requirement is to identify any PIFs to be addressed and additional control measures necessary to reduce risk associated with human reliability to ALARP
- Where genuine PIFs are identified, appropriate recommendations should be identified to address them



Human Failure Assessment – Accurately Capturing Task Steps

- Written procedures and work instructions usually available as a starting point
- However, instructions may not yet exist or may be out-of-date
- Where no written instructions exist - carry out Task Analysis
- Where instructions exist - must check that task sequencing is correct, there are no missing steps, and task descriptions are accurate
- Confirm accuracy via observation / task walk-through – may be able to task operators to do this
- Walk-Through / Talk-Through to identify PIFs – if not possible for HF specialist to complete (location, budget) then provide company HSE specialist with PIF identification training and checklist

Human Failure Assessment – Reducing the Burden on Operator Time

- It is a challenge to schedule workshops and minimise the time burden on operators
- Can be difficult to determine how much time is needed – reasonable assumption for planning is to allow 1 day for HFA of a single safety critical activity unless it is particularly short
- Consider partial pre-population of worksheet by HF specialist, for review by attendees at start of workshop
 - Initial screening to identify steps where there is clearly no safety critical consequence
 - Preliminary identification of human failures for some task steps
- Utilise both face-to-face and remote workshops - carry out activity walk-throughs and start HFA during a site visit, but then run remote workshops to complete
- Consider grouping tasks for assessment when considered appropriate (e.g. valve line-up, pre-requisite checks)

Human Failure Assessment – Running an Effective Workshop

- Provide a suitable briefing to attendees - methodology, objectives and need for operator openness and input
- Ensure any PIFs captured in the HFA relate to issues identified in relation to the specific task under assessment (in the context of where it is carried out, how it is performed, etc.) - do not list generic PIFs
- Have photographs and videos to hand to help visualise the location and potential issues
- Use Piping and Instrumentation Diagrams (P&IDs) where applicable – useful where processes under assessment are complex and involve multiple operator interactions with valves, pumps, and other equipment



Final Thoughts

- SCTA programme can be resource intensive and span several years - important to develop internal company competence
 - Obtain appropriate training in Human Factors and SCTA
 - Use Human Factors specialists in a mentoring or peer review capacity
- Ensure that the purpose and output of the required Human Factors assessment is understood so that the most appropriate approach can be taken
- Don't assume that SCTA / HFA is always the optimal process to follow



Where the focus is on step-by-step tasks requiring operator inputs and the objective is to confirm the adequacy of existing controls to manage human failure risk associated with MA consequence, then SCTA is a proven and effective approach

Thank you for your attention

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