

SPAR HRA Human Error Worksheet (Page 1 of 3) Sensitivity Case

Plant: _____ Initiating Event: _____ Sequence Number: _____ Basic Event Code: HEP-FW-START-SW

Basic Event Context: _____

Basic Event Description: _____

Does this task contain a significant amount of diagnosis activity? YES (start with Part I, p. 1) NO X (skip Part I, p. 1; start with Part II, p. 2) Why? _____

Part I. DIAGNOSIS

A. Evaluate PSFs for the diagnosis portion of the task.

PSFs PSF Levels Multiplier for Diagnosis If non-nominal PSF levels are selected, please note specific reasons in this column

| | | | |
|---------------------|-------------------------------|------------------|--|
| Available Time | Inadequate time | P(failure) = 1.0 | |
| | Barely adequate time <20 min | 10 | |
| | Nominal time \approx 30 min | 1 | |
| | Extra time >60 min | 0.1 | |
| | Expansive time >24 hrs | 0.01 | |
| Stress | Extreme | 5 | |
| | High | 2 | |
| | Nominal | 1 | |
| Complexity | Highly complex | 5 | |
| | Moderately complex | 2 | |
| | Nominal | 1 | |
| | Obvious diagnosis | 0.1 | |
| Experience/Training | Low | 10 | |
| | Nominal | 1 | |
| | High | 0.5 | |
| Procedures | Not available | 50 | |
| | Available, but poor | 5 | |
| | Nominal | 1 | |
| | Diagnostic/symptom oriented | 0.5 | |
| Ergonomics | Missing/Misleading | 50 | |
| | Poor | 10 | |
| | Nominal | 1 | |
| | Good | 0.5 | |
| Fitness for Duty | Unfit | P(failure) = 1.0 | |
| | Degraded Fitness | 5 | |
| | Nominal | 1 | |
| Work Processes | Poor | 2 | |
| | Nominal | 1 | |
| | Good | 0.8 | |

B. Calculate the Diagnosis Failure Probability

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| (2) Otherwise, | Time | Stress | Complexity | Experience/ Training | Procedures | Ergonomics | Fitness for Duty | Work Processes | |
|---------------------|------|--------|------------|-------------------------|------------|------------|---------------------|-------------------|---|
| Diagnosis: 10E-2x__ | x__ | x__ | x__ | x__ | x__ | x__ | x__ | x__ | =__ Diagnosis Failure Probability |

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Part II. ACTION

A. Evaluate PSFs for the action portion of the task.

| PSFs | PSF Levels | Multiplier for Action | If non-nominal PSF levels are selected, please note specific reasons in this column | |
|---------------------|--|-----------------------|---|---|
| Available Time | Inadequate time | P(failure) = 1.0 | Time expansive due to boil off and leakage ratio | |
| | Time available \approx time required | 10 | | |
| | Nominal time | 1 | | |
| | Time available $> 50 \times$ time required | 0.01 | | |
| Stress | Extreme | 5 | X | Stress is assumed extreme due to severe weather. |
| | High | 2 | | |
| | Nominal | 1 | | |
| Complexity | Highly complex | 5 | X | Multiple steps, not routine. |
| | Moderately complex | 2 | | |
| | Nominal | 1 | | |
| Experience/Training | Low | 3 | X | No training. |
| | Nominal | 1 | | |
| | High | 0.5 | | |
| Procedures | Not available | 50 | X | No procedures. |
| | Available, but poor | 5 | | |
| | Nominal | 1 | | |
| Ergonomics | Missing/Misleading | 50 | | Human machine interface degraded due to poor weather – wet, slippery, cold, inaccessible. |
| | Poor | 10 | X | |
| | Nominal | 1 | | |
| | Good | 0.5 | | |
| Fitness for Duty | Unfit | P(failure) = 1.0 | | |
| | Degraded Fitness | 5 | | |
| | Nominal | 1 | X | |
| Work Processes | Poor | 5 | | |
| | Nominal | 1 | X | |
| | Good | 0.5 | | |

B. Calculate the Action Failure Probability

(1) If all PSF ratings are nominal, then the Action Failure Probability = $10E-3$

(2) Otherwise, Time Stress Complexity Experience/ Procedures Ergonomics Fitness Work

| | | | | Training | | | | | for Duty Processes |
|---------------|-------------|-----------|-----------|-----------|------------|------------|-----------|-----------|--|
| Action: 10E-3 | <u>x.01</u> | <u>x5</u> | <u>x5</u> | <u>x3</u> | <u>x50</u> | <u>x10</u> | <u>x1</u> | <u>x1</u> | = <u>.375</u> Action Failure Probability |

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PART III. CALCULATE THE TASK FAILURE PROBABILITY WITHOUT FORMAL DEPENDENCE ($P_{w/od}$)

Calculate the Task Failure Probability Without Formal Dependence ($P_{w/od}$) by adding the Diagnosis Failure Probability (from Part I, p.1) and the Action Failure Probability (from Part II, p. 2).

If all PSFs are nominal, then

Diagnosis Failure Probability: _____

Diagnosis Failure Probability: 10E-2

Action Failure Probability: + _____

Action Failure Probability: +10E-3

Task Failure Without
Formal Dependence ($P_{w/od}$) = _____

$P_{(w/od)} = 1.1 \times 10E-2$

Part IV. DEPENDENCY

For all tasks, except the first task in the sequence, use the table and formulae below to calculate the Task Failure Probability With Formal Dependence (P_{wd}).

If there is a reason why failure on previous tasks should not be considered, explain here: _____

Dependency Condition Table

| Crew (same or different) | Time (close in time or not close in time) | Location (same or different) | Cues (additional or not additional) | Dependency | Number of Human Action Failures Rule - Not Applicable. Why? _____ |
|--------------------------------|--|------------------------------------|--|------------|---|
| Same | Close | Same | - | complete | If this error is the 3rd error in the sequence , then the dependency is at least moderate . |
| | | | | | If this error is the 4th error in the sequence , then the dependency is at least high . |
| | Not Close | Different | - | high | This rule may be ignored only if there is compelling evidence for less dependence with the previous tasks. Explain above. |
| | | Same | No Additional | high | |
| | | | Additional | moderate | |
| | | Different | No Additional | moderate | |
| Additional | low | | | | |
| Different | Close | - | - | moderate | |
| | Not Close | - | - | low | |

Using $P_{w/od}$ = Probability of Task Failure Without Formal Dependence (calculated in Part III, p. 3):

For Complete Dependence the probability of failure is 1.

For High Dependence the probability of failure is $(1 + P_{w/od})/2$

For Moderate Dependence the probability of failure is $(1 + 6 \times P_{w/od})/7$

For Low Dependence the probability of failure is $(1 + 19 \times P_{w/od})/20$

For Zero Dependence the probability of failure is $P_{w/od}$

Calculate P_{wd} using the appropriate values:

$(1 + (\quad * \quad))/ \quad = \quad \text{Task Failure Probability With Formal Dependence } (P_{wd})$