INEEL

IDAHO NATIONAL ENGINEERING & ENVIRONMENTAL LABORATORY

LOCKHEED MARTIN

LOCKHEED MARTIN IDAHO TECHNOLOGIES COMPANY
FAX TRANSMITTAL

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Number of pages INCLUDING Cover page 11

NOTE/MESSAGE

GLENN: A&P HEPs worksheets.
These are the files you could not open.

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SPAR HRA Human Error Worksheet (Page 2 of 3)

Bottom

Plant:_____ **Initiating Event:**_____ **Sequence Number:**_____ **Basic Event Code:** HEP FW Start 1 of 2

Basic Event Context:_____

Basic Event Description:_____

Part II. ACTION

A. Evaluate PSFs for the action portion of the task, if any.

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 rate
	Time available time required	10 ☐	
	Nominal time	1 ☐	
	Time available>50 x time required	0.01 ☒	
Stress	Extreme	5 ☐	Problem recognized by operator
	High	2 ☒	
	Nominal	1 ☐	
Complexity	Highly complex	5 ☒	Multiple steps, not routine
	Moderately complex	2 ☐	
	Nominal	1 ☐	
Experience/Training	Low	3 ☐	
	Nominal	1 ☐	
	High	0.5 ☒	
Procedures	Not available	50 ☐	
	Available, but poor	5 ☐	
	Nominal	1 ☒	
Ergonomics	Missing/Misleading	50 ☐	Equipment available, well designed and matched to procedure
	Poor	10 ☐	
	Nominal	1 ☐	
	Good	0.5 ☒	
Fitness for Duty	Unfit	P(failure) = 1.0 ☐	
	Degraded Fitness	5 ☐	
	Nominal	1 ☒	
Work Processes	Poor	5 ☐	Crew practiced, conversant with procedures and one another
	Nominal	1 ☐	
	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/ Training	Procedures	Ergonomics	Fitness for Duty	Work Processes	
Action: 10E-3	x .01	x 2	x 5	x .5	x 1	x .5	x 1	x 5	= 1×10^{-5} Action Failure Probability

1 of 2

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SPAR HRA Human Error Worksheet (Page 3 of 3)

Plant:_____ Initiating Event:_____ Sequence Number:_____ Basic Event Code: HEP-FW-START 2 of 2

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).

Diagnosis Failure Probability: –

Action Failure Probability: + 1E-5

Task Failure Without Formal Dependence ($P_{w/od}$) = 1E-5

If all PSFs are nominal, then

Diagnosis Failure Probability: 10E-2

Action Failure Probability: +10E-3

$P_{(w/od)}$= 1.1x10E-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.
		Different		high	
	Not Close	Same	No Additional	high	
			Additional	moderate	If this error is the 4th error in the sequence, then the dependency is at least high.
		Different	No Additional	moderate	
			Additional	low	
Different	Close			moderate	This rule may be ignored only if there is compelling evidence for less dependence with the previous tasks. Explain above.
	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 + (*)/ = Task Failure Probability With Formal Dependence (P_{wd})

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SPAR HRA Human Error Worksheet (Page 2 of 3)

Plant:_____ **Initiating Event:**_____ **Sequence Number:**_____ **Basic Event Code:** semi-truth Code HEP-MKUP-START-E

Basic Event Context:_____

Basic Event Description:_____

Part II. ACTION

A. Evaluate PSFs for the action portion of the task, if any.

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 available time required	10 ☐	
	Nominal time	1 ☒	
	Time available>50 x time required	0.01 ☐	
Stress	Extreme	5 ☐	Operator has recognized that there is a problem
	High	2 ☒	
	Nominal	1 ☐	
Complexity	Highly complex	5 ☐	
	Moderately complex	2 ☐	
	Nominal	1 ☒	
Experience/Training	Low	3 ☒	no training.
	Nominal	1 ☐	
	High	0.5 ☐	
Procedures	Not available	50 ☒	no procedures.
	Available, but poor	5 ☐	
	Nominal	1 ☐	
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	5 ☐	
	Nominal	1 ☒	
	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/ Training	Procedures	Ergonomics	Fitness for Duty	Work Processes	
Action: 10E-3	x 1	x 2	x 1	x 3	x 50	x 1	x 1	x 1	= 3E-1 Action Failure Probability

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SPAR HRA Human Error Worksheet (Page 1 of 3)

Sensitivity Case

Plant:_____ **Initiating Event:**_____ **Sequence Number:**_____ **Basic Event Code:** HEP-REC6-FW LOF

Basic Event Context:_____

Basic Event Description:_____

Does this task contain a significant amount of diagnosis activity? YES ☒ (start with Part I, p. 1) NO ☐ (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 ☐	Extra time is available due to boil off and leakage rates.
	Barely adequate time 20 min	10 ☐	
	Nominal time 30 min	1 ☐	
	Extra time >60 min	0.1 ☒	
	Expansive time >24 hrs	0.01 ☐	
Stress	Extreme	5 ☐	Operator has observed a problem exists
	High	2 ☒	
	Nominal	1 ☐	
Complexity	Highly complex	5 ☐	
	Moderately complex	2 ☐	
	Nominal	1 ☒	
	Obvious diagnosis	0.1 ☐	
Experience/Training	Low	10 ☒	No training available
	Nominal	1 ☐	
	High	0.5 ☐	
Procedures	Not available	50 ☒	No procedure available
	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

(1) If all PSF ratings are nominal, then the Diagnosis Failure Probability = 10E-2

(2) Otherwise,

	Time	Stress	Complexity	Experience/ Training	Procedures	Ergonomics	Fitness for Duty	Work Processes	
Diagnosis: 10E-2 x	1	x 2	x 1	x 10	x 50	x 1	x 1	x 1	= 1 * Diagnosis Failure Probability

1 of 1

* Analyst judgement HEP = .5

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SPAR HRA Human Error Worksheet (Page 1 of 3)

Sensitivity Case

Plant:_____ **Initiating Event:** IE-LOC **Sequence Number:**_____ **Basic Event Code:** HE-RECG-FWSta

Basic Event Context:_____

Basic Event Description:_____

Does this task contain a significant amount of diagnosis activity? YES ☒ (start with Part I, p. 1) NO ☐ (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 ☐	Time is expansive due to boiling off and leakage rate
	Barely adequate time 20 min	10 ☐	
	Nominal time 30 min	1 ☐	
	Extra time >60 min	0.1 ☐	
	Expansive time >24 hrs	0.01 ☒	
Stress	Extreme	5 ☐	Operator has observed a problem exists
	High	2 ☒	
	Nominal	1 ☐	
Complexity	Highly complex	5 ☐	
	Moderately complex	2 ☐	
	Nominal	1 ☒	
	Obvious diagnosis	0.1 ☐	
Experience/Training	Low	10 ☒	No training provided
	Nominal	1 ☐	
	High	0.5 ☐	
Procedures	Not available	50 ☒	No procedure available
	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

(1) If all PSF ratings are nominal, then the Diagnosis Failure Probability = 10E-2

(2) Otherwise,

	Time	Stress	Complexity	Experience/ Training	Procedures	Ergonomics	Fitness for Duty	Work Processes	
Diagnosis: 10E-2x	.01	x 2	x 1	x 10	x 50	x 1	x 1	x 1	= .1

Diagnosis Failure Probability

1 of 1

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SPAR HRA Human Error Worksheet (Page 1 of 3)

Sensitivity Case

Plant:_____ **Initiating Event:**_____ **Sequence Number:**_____ **Basic Event Code:** HEP RECG-FWST-SU

Basic Event Context: Severe Weather

Basic Event Description:_____

Does this task contain a significant amount of diagnosis activity? YES ☒ (start with Part I, p. 1) NO ☐ (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 ☐	Time is expensive due to boil off and leakage rate
	Barely adequate time 20 min	10 ☐	
	Nominal time 30 min	1 ☐	
	Extra time >60 min	0.1 ☐	
	Expansive time >24 hrs	0.01 ☒	
Stress	Extreme	5 ☒	Stress is extreme due to severe weather
	High	2 ☐	
	Nominal	1 ☐	
Complexity	Highly complex	5 ☐	
	Moderately complex	2 ☐	
	Nominal	1 ☒	
	Obvious diagnosis	0.1 ☐	
Experience/Training	Low	10 ☒	no training
	Nominal	1 ☐	
	High	0.5 ☐	
Procedures	Not available	50 ☒	no procedure
	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

(1) If all PSF ratings are nominal, then the Diagnosis Failure Probability = 10E-2

(2) Otherwise,

	Time	Stress	Complexity	Experience/ Training	Procedures	Ergonomics	Fitness for Duty	Work Processes	
Diagnosis: 10E-2x	.01	x 5	x 1	x 10	x 50	x 1	x 1	x 1	= .25 Diagnosis Failure Probability

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Sensitivity Case

SPAR HRA Human Error Worksheet (Page 1 of 3)

Plant:_____ **Initiating Event:**_____ **Sequence Number:**_____ **Basic Event Code:** HERDIAG-SFPLP1

Basic Event Context:_____

Basic Event Description:_____

Does this task contain a significant amount of diagnosis activity? YES ☒ (start with Part I, p. 1) NO ☐ (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 ☐	Expansive time due to boil off and leakage ratio
	Barely adequate time 20 min	10 ☐	
	Nominal time 30 min	1 ☐	
	Extra time >60 min	0.1 ☐	
	Expansive time >24 hrs	0.01 ☒	
Stress	Extreme	5 ☐	High stress due to alarms
	High	2 ☒	
	Nominal	1 ☐	
Complexity	Highly complex	5 ☐	
	Moderately complex	2 ☐	
	Nominal	1 ☒	
	Obvious diagnosis	0.1 ☐	
Experience/Training	Low	10 ☒	No training
	Nominal	1 ☐	
	High	0.5 ☐	
Procedures	Not available	50 ☒	No procedures
	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

(1) If all PSF ratings are nominal, then the Diagnosis Failure Probability = 10E-2

(2) Otherwise,

	Time	Stress	Complexity	Experience/ Training	Procedures	Ergonomics	Fitness for Duty	Work Processes	
Diagnosis: 10E-2	x .01	x 2	x 1	x 10	x 50	x 1	x 1	x 1	= .1 Diagnosis Failure Probability

.1 x .05 = 5E-3

Combines diagnosis with HEP for Walbdown - HERWALKDWN - DEPEN (5E-2)

JAN 07 '00 04:25PM SSSSSSSSSSSSSS

SPAR HRA Human Error Worksheet (Page 2 of 3)

Sensitivity Case

Plant:_____ **Initiating Event:**_____ **Sequence Number:**_____ **Basic Event Code:** HEP-SFD-STRLP2

Basic Event Context: Severe Weather

Basic Event Description:

Part II. ACTION

A. Evaluate PSFs for the action portion of the task, if any.

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 ☐	Expansive time due to boil off and leakage ratio.
	Time available time required	10 ☐	
	Nominal time	1 ☐	
	Time available>50 x time required	0.01 ☒	
Stress	Extreme	5 ☒	Stress extreme due to severe weather
	High	2 ☐	
	Nominal	1 ☐	
Complexity	Highly complex	5 ☐	Complexity increased due to severe weather
	Moderately complex	2 ☒	
	Nominal	1 ☐	
Experience/Training	Low	3 ☒	No training
	Nominal	1 ☐	
	High	0.5 ☐	
Procedures	Not available	50 ☒	No procedures
	Available, but poor	5 ☐	
	Nominal	1 ☐	
Ergonomics	Missing/Misleading	50 ☐	Human machine interface degraded due to poor weather – wet, slippery, cold
	Poor	10 ☒	
	Nominal	1 ☐	
	Good	0.5 ☐	
Fitness for Duty	Unfit	P(failure) = 1.0 ☐	
	Degraded Fitness	5 ☐	
	Nominal	1 ☒	
Work Processes	Poor	5 ☐	
	Nominal	1 ☒	
	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/ Training	Procedures	Ergonomics	Fitness for Duty	Work Processes	
Action: 10E-3	x .01	x 5	x 2	x 3	x 50	x 10	x 1	x 1	= 1.5E-2 Action Failure Probability

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SPAR HRA Human Error Worksheet (Page 1 of 3)

Sensitivity case

Plant:_____ **Initiating Event:**_____ **Sequence Number:**_____ **Basic Event Code:** HER-DIAG-SFPLP2

Basic Event Context: Severe Weather

Basic Event Description:_____

Does this task contain a significant amount of diagnosis activity? YES ☒ (start with Part I, p. 1) NO ☐ (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 ☐	Expansive time due to boil off and leakage rates.
	Barely adequate time 20 min	10 ☐	
	Nominal time 30 min	1 ☐	
	Extra time >60 min	0.1 ☐	
	Expansive time >24 hrs	0.01 ☒	
Stress	Extreme	5 ☒	Stress is extreme due to severe weather
	High	2 ☐	
	Nominal	1 ☐	
Complexity	Highly complex	5 ☐	Complexity increased due to severe weather
	Moderately complex	2 ☒	
	Nominal	1 ☐	
	Obvious diagnosis	0.1 ☐	
Experience/Training	Low	10 ☒	no training
	Nominal	1 ☐	
	High	0.5 ☐	
Procedures	Not available	50 ☒	no procedures
	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

(1) If all PSF ratings are nominal, then the Diagnosis Failure Probability = 10E-2

(2) Otherwise,

	Time	Stress	Complexity	Experience/ Training	Procedures	Ergonomics	Fitness for Duty	Work Processes	
Diagnosis: 10E-2 x	.01	x 5	x 2	x 10	x 50	x 1	x 1	x 1	= .5 Diagnosis Failure Probability

.5 x .05 = 2.5E-2

Combines diagnosis with HEP for weather (5E-2)

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SPAR HRA Human Error Worksheet (Page 2 of 3)

Sensitivity Case

Plant:_____ **Initiating Event:**_____ **Sequence Number:**_____ **Basic Event Code:** HEP-SEP-STR-LP1

Basic Event Context:_____

Basic Event Description:_____

Part II. ACTION

A. Evaluate PSFs for the action portion of the task, if any.

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	Expansive time due to boil off and leakage rate
	Time available time required	10	
	Nominal time	1	
	Time available>50 x time required	0.01	
Stress	Extreme	5	High stress due to alarms
	High	2	
	Nominal	1	
Complexity	Highly complex	5	May involve valve line-up
	Moderately complex	2	
	Nominal	1	
Experience/Training	Low	3	no training
	Nominal	1	
	High	0.5	
Procedures	Not available	50	no procedures
	Available, but poor	5	
	Nominal	1	
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	5	
	Nominal	1	
	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/ Training	Procedures	Ergonomics	Fitness for Duty	Work Processes	
Action: 10E-3	x .01	x 2	x 2	x 3	x 50	x 1	x 1	x 1	= 6×10^{-3} Action Failure Probability

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