APPENDIX A

List of Performance Shaping Factors (PSF's)

APPENDIX A: LIST OF PERFORMANCE SHAPING FACTORS (PSF'S)

The list of Performance Shaping Factors is based on two possible representations of the SHEL model. For further explanation of the SHEL model and the ADREP system please refer to D1.1.0 section 3.2.

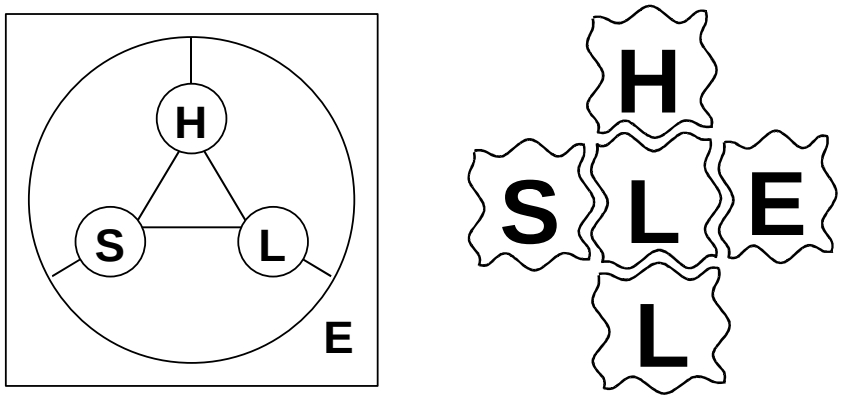

Figure 1: SHELL representation (Edwards, 1972); (Hawkins 1987).

The list contains main factors, sub factors and attributes, and it is divided into five sections:

1. Liveware
2. Liveware-Liveware
3. Liveware-Environment
4. Liveware-Hardware
5. Liveware-Software

The list has been developed on the basis of a list of explanatory factors taken from ECCAIRS 4 Data Definition Standard which again is based on ICAO's ADREP 2000 taxonomy.

References in the attributes column refers to sections in the ECCAIRS 4 Data Definition Standard – Explanatory Factors. This list is included as a PDF file with the name ADREP.PDF. The references have been made instead of long listings of attributes to make the list of factors as simple and transparent as possible. Since the references are made to a document developed for the aviation industry, it can in single cases happen that some attributes are found to be irrelevant to the maritime domain.

1.1.1 Main Factors (Liveware)	**1.1.2 Sub Factors**	**1.1.3 Attributes**
1.1 Physical		
	1.1.1 Anthropometrics	(see section 10 10 10 200)
	1.1.2 Sensory limitations	(see section 10 10 20 000)
1.2 Physiological		
	1.2.1 Illness / Incapacitation	(see section 10 20 10 000)
	1.2.2 Human impairment	(see section 10 20 20 000)
	1.2.3 Human fatigue / Alertness	(see section 10 20 30 000)
	1.2.4 Illusions	(see section 10 20 40 000)
1.3 Psychological		
	1.3.1 Personality and attitudes	(see section 10 30 90 000)
	1.3.2 Mental / Emotional state	(see section 10 31 00 000)
	1.3.3 Cognitive	
		1.3.3.1 Perceptual level (see section 10 30 40 000) (see section 10 30 80 000)
		1.3.3.2 Processing level (see section 10 30 20 000) (see section 10 30 30 000) (see section 10 30 60 000)
		1.3.3.3 Behavioural level (see section 10 30 10 000)
1.4 Personal		
	1.4.1 Personal experience and qualifications	(see section 10 50 10 000)
	1.4.2 Recency factors	(see section 10 50 20 000)
	1.4.3 Knowledge	(see section 10 50 30 000) (see section 10 30 70 000)
	1.4.4 Skills	(see section 10 40 00 000)
		(see section 10 30 50 000)

1.1.4 Main Factors (Liveware-Liveware)	**1.1.5 Sub Factors**	**1.1.6 Attributes**
2.1 Interaction		
	2.1.1 Team skills / CRM / BRM	(see section 50 20 10 000)
	2.1.2 Formal coordination	(see section 50 20 20 000)
	2.1.3 Shift/watch/team changeover	(see section 50 20 30 000)
	2.1.4 Other interactions	(see section 50 20 40 000)
2.2 Supervision		
	2.2.1 Operational supervision	(see section 50 30 10 000)
	2.2.2 Supervision during training	(see section 50 30 20 000)
	2.2.3 Quality control	(see section 50 30 30 000)
	2.2.4 Standards	(see section 50 30 40 000)
2.3 Regulatory activities		
	2.3.1 Regulatory procedures	(see section 50 40 10 000)
	3.3.2 Regulatory standards	(see section 50 40 20 000)
	2.3.3 Regulations	(see section 50 40 30 000)
	2.3.4 Inspections	(see section 50 40 40 000)
	2.3.5 Monitoring (organizations)	(see section 50 40 50 000)
	2.3.6 Surveillance	(see section 50 40 60 000)
	2.3.6 Audit	(see section 50 40 70 000)
	2.3.7 Checks	(see section 50 40 80 000)
2.4 Communication		
	2.4.1 Oral/aural communications	(see section 50 10 10 000)
	2.4.2 Written /read communications	(see section 50 10 20 000)
	2.4.3 Visual signals	(see section 50 10 30 000)

1.1.7 Main Factors (Liveware-Environment)	**1.1.8 Sub Factors**	**1.1.9 Attributes**
3.1 Physical		
	3.1.1 Navigable waters and aids for navigation	
		3.1.1.1 Harbours
		3.1.1.2 Traffic separation schemes
		3.1.1.3 Channels and waterways
		3.1.1.4 Lights and marks
		3.1.1.5....
	3.1.2 Workplace environment (onboard)	(see section 20 10 50 000)
	3.1.3 Weather conditions	
		3.1.4.1 Visibility
		3.1.4.2 Sea state
		3.1.4.3 Precipitation
		3.1.4.4 …
3.2 Organisational		
	3.2.1 Occupational and psychosocial factors	(see section 20 20 00 000)
	3.2.2 Organisational / Regulatory issues	(see section 20 30 00 000)
	3.2.3 Operational task demands	(see section 20 40 00 000)

1.1.10 Main Factors (Liveware-Hardware)	**1.1.11 Sub Factors**	**1.1.12 Attributes**
4.6 Workplace / Equipment		
	4.6.1 Layout, design, ergonomics	(see section 30 10 10 100) (see section 30 10 50 000) (see section 30 10 60 000)
4.7 Information flow / Data sources		(see section 30 20 00 000)
4.8 Human software/firmware interface		(see section 30 30 00 000)
4.9 Automation/automatic systems		
	4.9.1 Automation design	(see section 30 40 10 000)
	4.9.2 Use of automation	(see section 30 40 20 000)
	4.9.3 Automatic defences/warnings	(see section 30 50 00 000)

1.1.13 Main Factors (Liveware-Software)	**1.1.14 Sub Factors**	**1.1.15 Attributes**
5.1 Training		
	5.1.1 Basic/initial training	
	5.1.2 Specific training	
	5.1.3 Simulator training	
	5.1.4 On-the-job training	
	5.1.5 Emergency training	
	5.1.6 Crew/team resource management training	
	5.1.7 Recurrent training	
	5.1.8 Route training (pilotage)	
	5.1.9 Miscellaneous training issues	(see section 40 20 90 000)
5.2 Procedures		
	5.2.1 Standard Operating Procedures	
	5.2.2 Emergency and abnormal procedures	
	5.2.3 Port procedures	
	5.2.4 Maintenance procedures	
	5.2.5 Company procedures	
	5.2.6 Other procedures	
	5.2.7 Custom and practice	
5.3 Operational material		
	5.3.1 Fixed material	
		5.3.1.1 Procedures
		5.3.1.2 Manuals
		5.3.1.3 Checlists
		5.3.1.4 Charts and maps
		5.3.1.5 ...
	5.3.2 Variable material	
		5.3.2.1 Log-books
		5.3.2.2 Standing orders
		5.3.2.3 Voyage plans
		5.3.2.4 Maintenance documentation
		5.3.2.5 Freight and custom documents
		5.3.2.6 ...
5.4 Operations		

1.1.13 Main Factors (Liveware-Software)	**1.1.14 Sub Factors**	**1.1.15 Attributes**
	5.4.1 Navigation	
		5.4.1.1 Route planning
		5.4.1.2 Track keeping
		5.4.1.3 Collision avoidance
	5.4.2 Propulsion	
		5.4.2.1 Ship propulsion system
		5.4.2.2 Auxiliaries
	5.4.3 Cargo handling	
		5.4.3.1 Loading
		5.4.3.2 Keeping the cargo/PAX in good condition
		5.4.3.3 Unloading
	5.4.4 Platform maintenance	
		5.4.4.1 Keeping the ship in operational condition
		5.4.4.2 Keeping the equipment (and auxiliary equipment) in operational condition
		5.4.4.3 Keeping the crew in operational condition
	5.4.5 Ship management	
		5.4.5.1 Allocation of tasks and responsibilities
		5.4.5.2 Control and supervision
		5.4.5.3 Communication