



Team and Collective Training Needs Analysis (TCTNA)

Dr John Huddleston, Coventry University
john.huddleston@coventry.ac.uk



Learning Objectives

- Identify the areas of complexity of team and collective training that have to be addressed in the training needs analysis process.
- Recognise and describe the elements of the supporting models which underpin TCTNA.
- Describe the purpose and outputs of the key analytical stages of TCTNA, and how these inform subsequent stages of training design.
- Illustrate the interconnections between the main areas of analysis
- Outline how TCTNA can be applied iteratively in the acquisition process and in auditing existing means of training delivery.

Topics

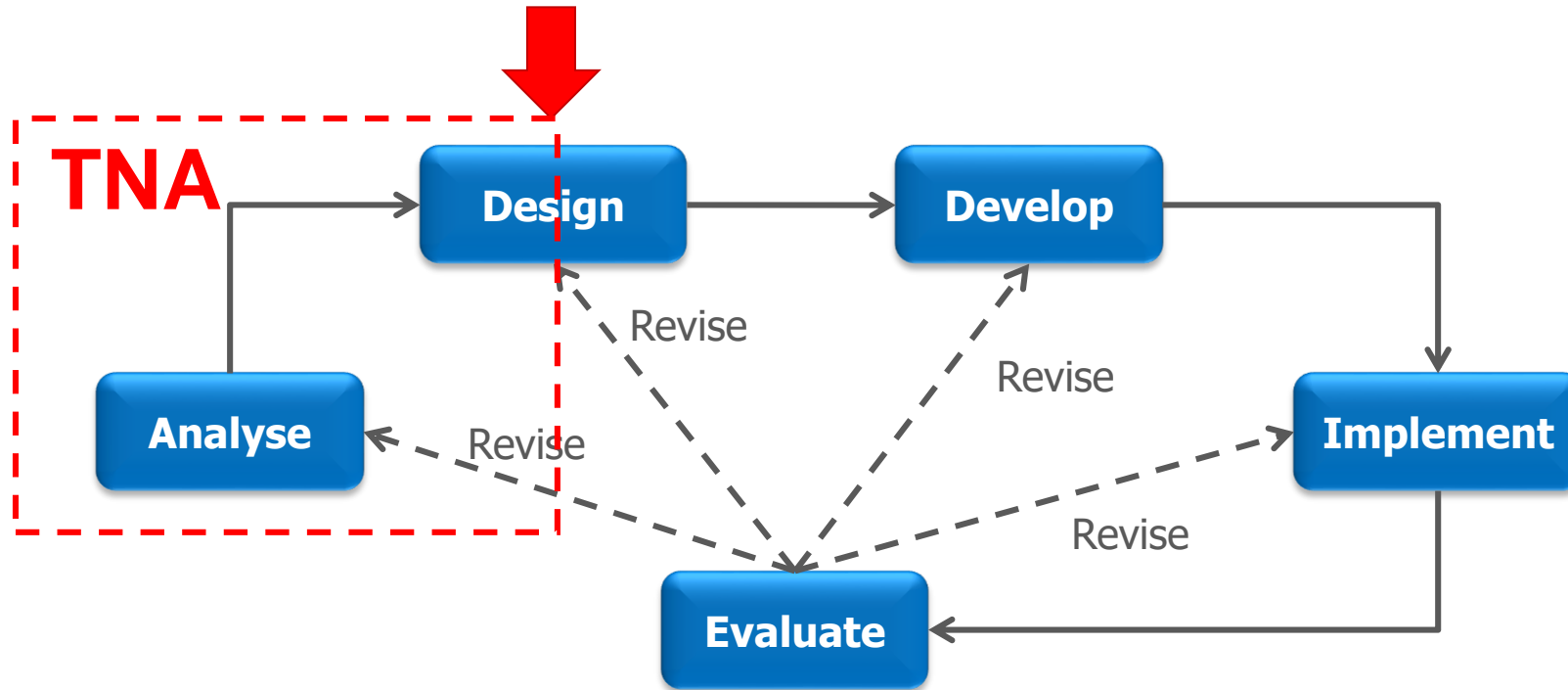
- Introduction
- Team and Collective Task Analysis
- Constraints, Assumptions, Risks and Opportunities Analysis
- Training Environment Analysis
- Training Overlay Analysis
- Training Options Analysis
- Iterative application of TCTNA in Acquisition
- Project Initiation

Introduction: Team Tasks, Task Environments and Training Environments

- Scale and complexity of team tasks and team training
- Viewing tasks as environmental transformations
 - Individual task model
 - Team task model differences
- Environmental challenges
 - Naturalistic environments and team stressors
 - Volatility, uncertainty, complexity and ambiguity in operational environments
- The Team Training Model
- Team and Collective Training Needs Analysis

TNA/Front End Analysis

Major financial decision point



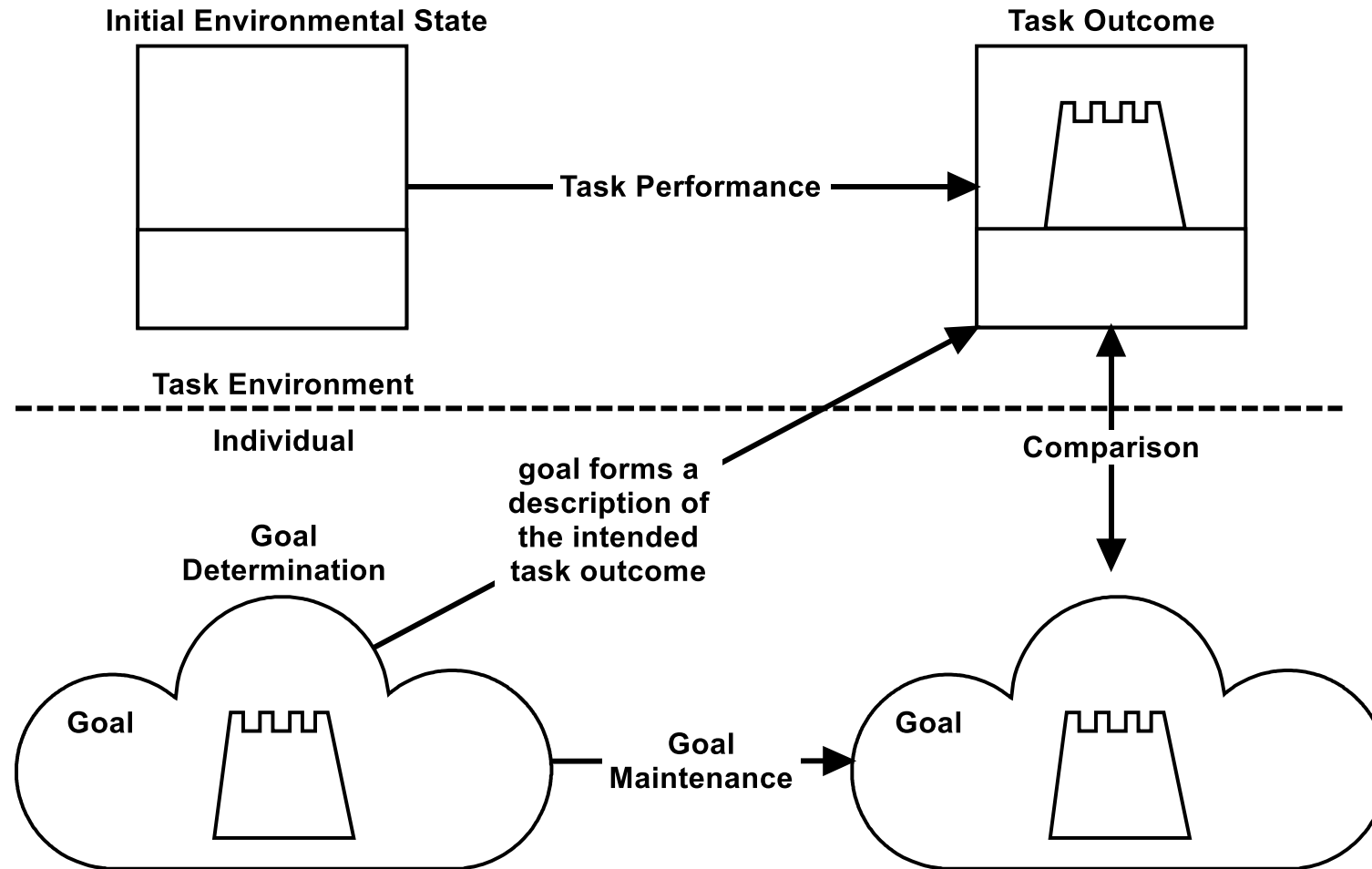
Team Tasks and Team Training: Scale and Complexity



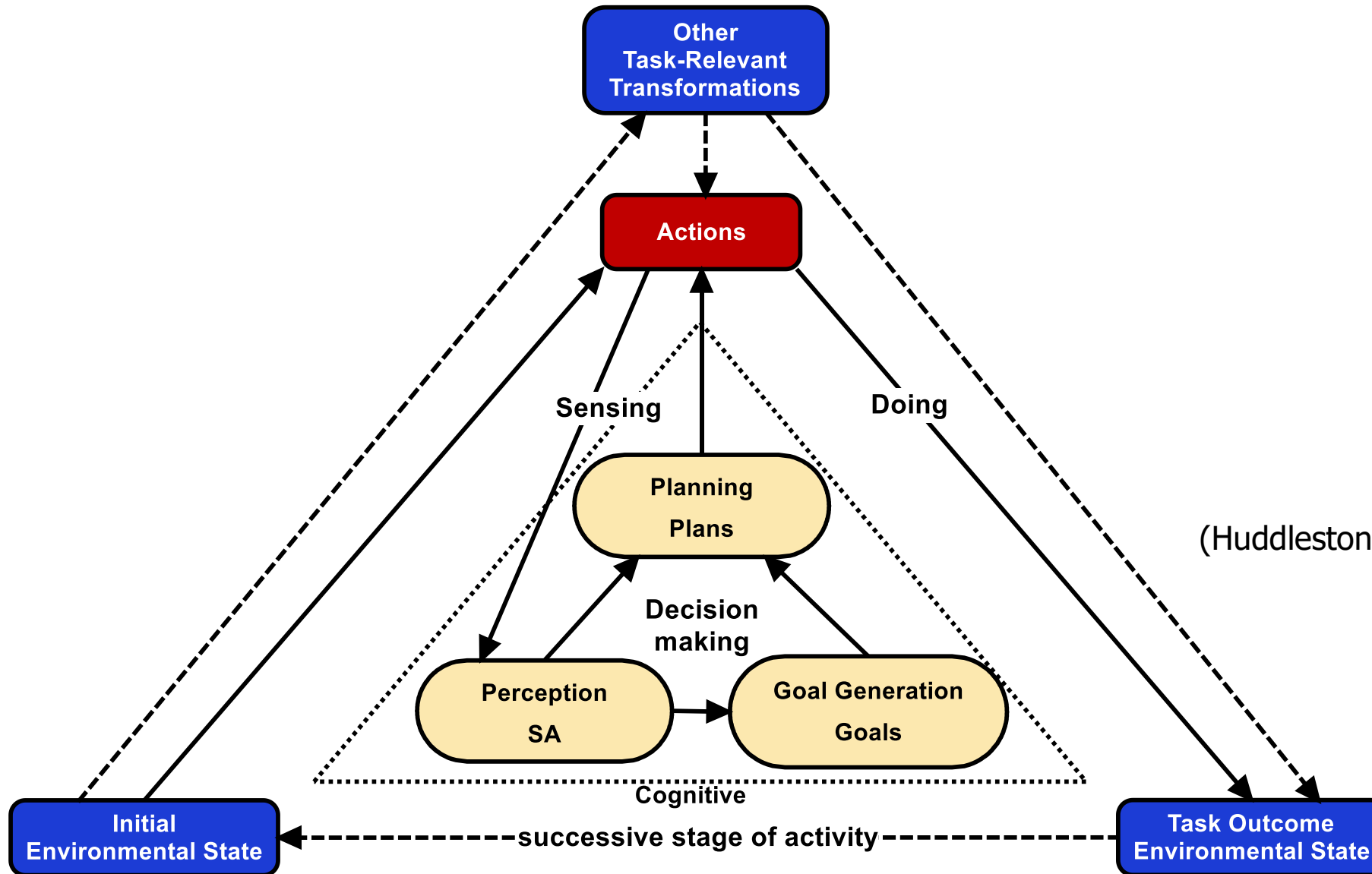
Example of an Individual Task



Environmental Transformations



Individual Task Model



(Huddlestone and Pike, 2016)

Example of a Team Task

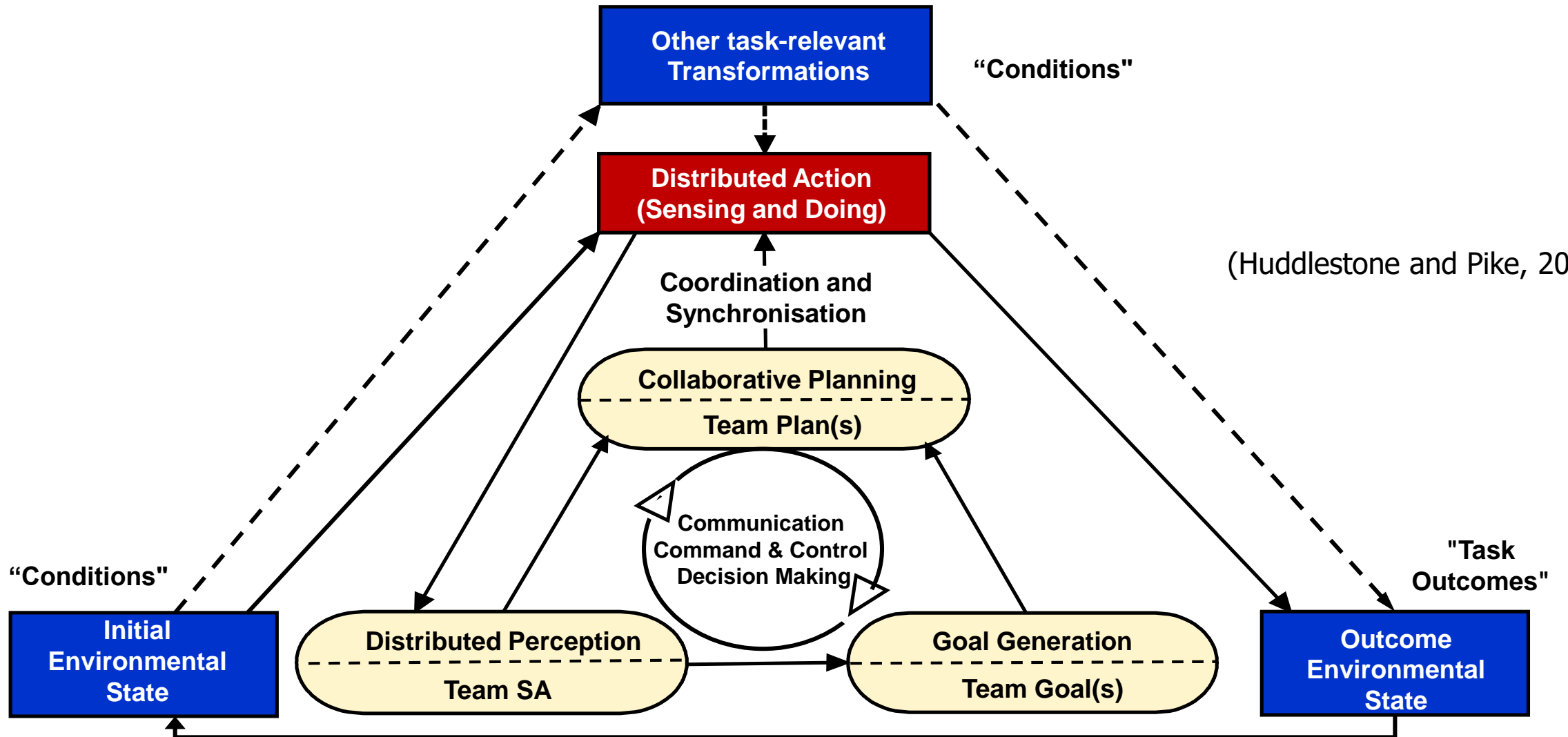


Team Task – Cups of Water

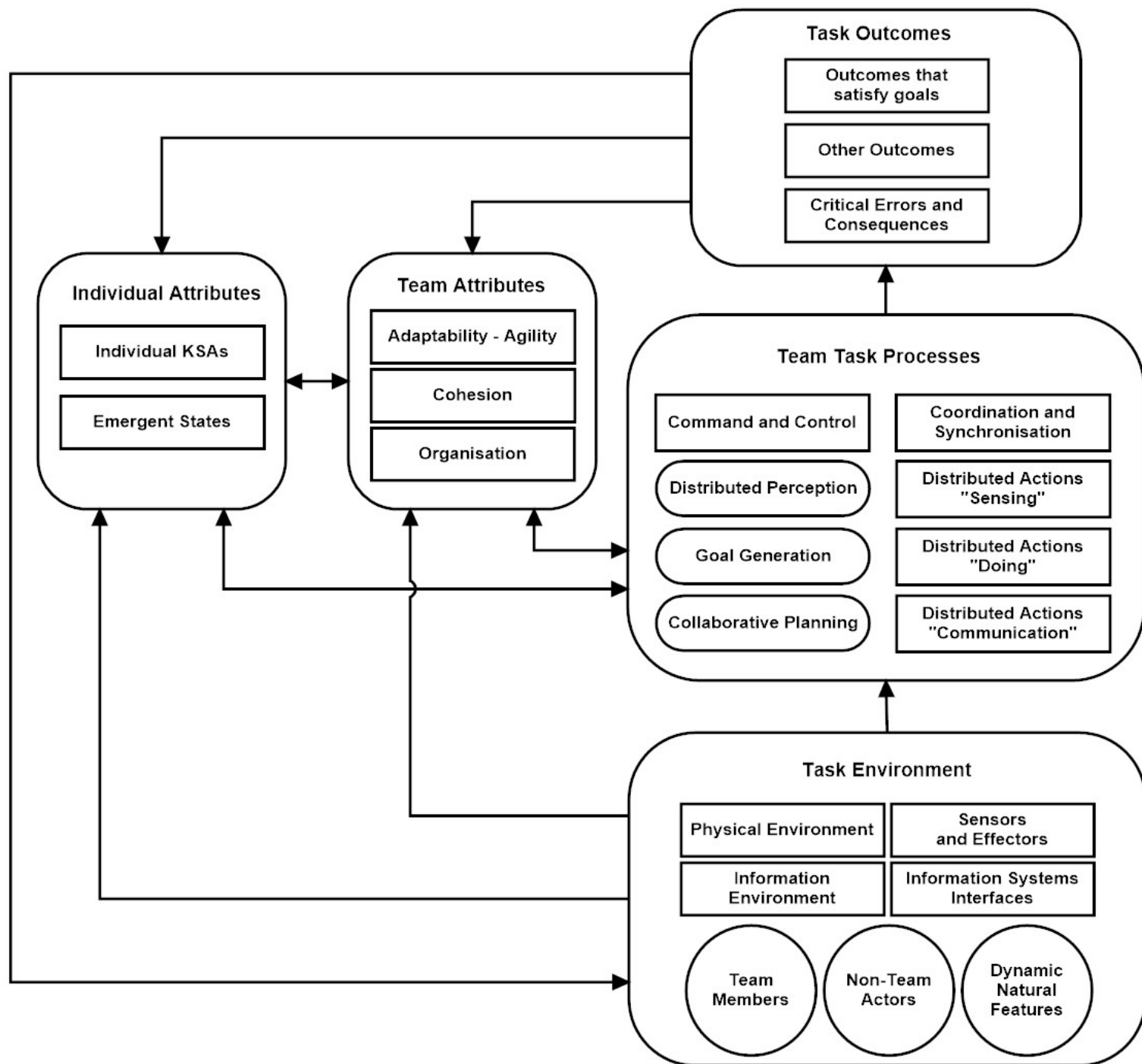
What is teamwork and how do we evaluate it?

- Communication
- Coordination
- Mutual performance monitoring
- Back-up behaviour
- Collaboration
- Conflict management

Team Task Model

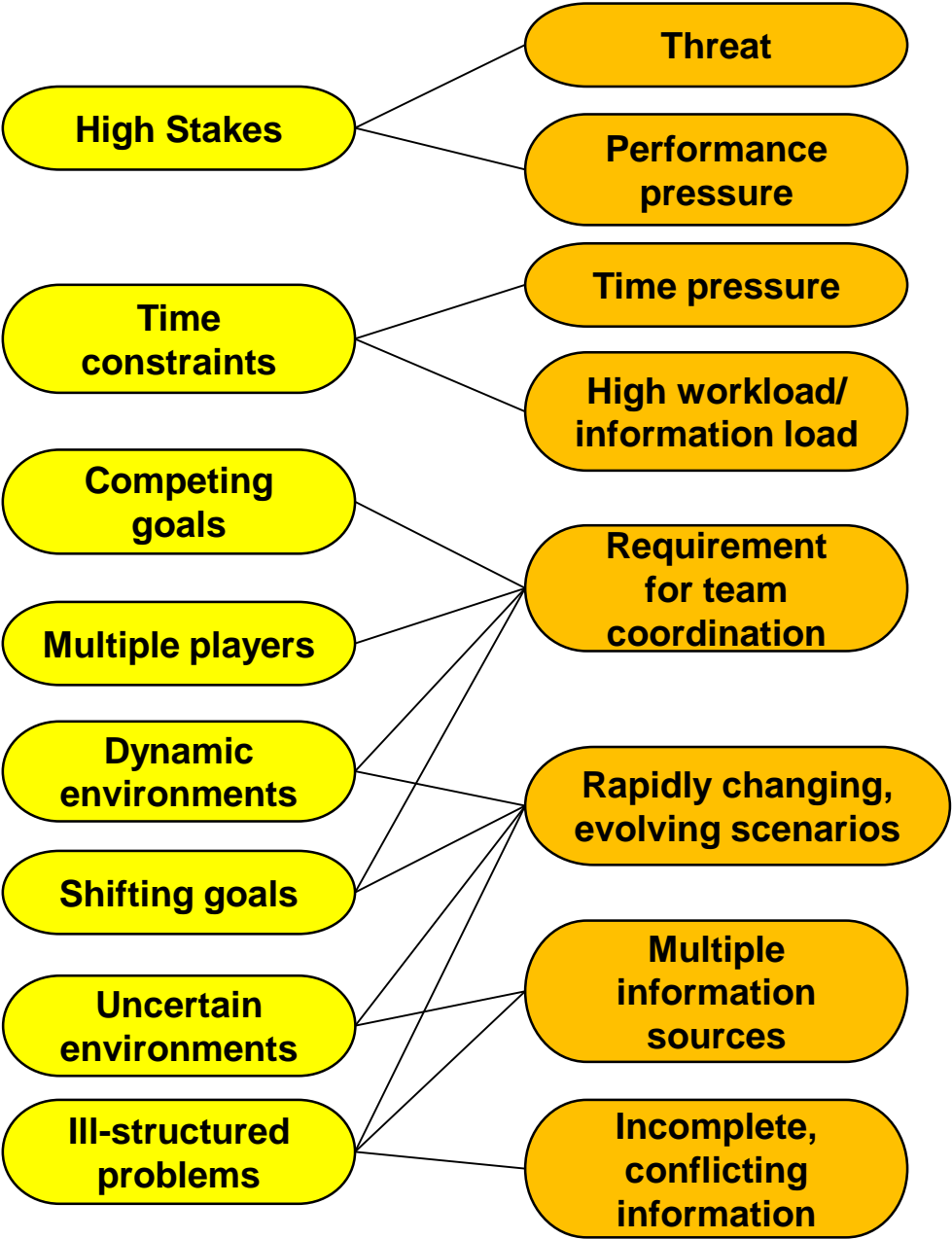


Detailed Team Performance Model



The Nature of Military Task Environments

Properties of Naturalistic Environments
(Oresanu, 1993)



Environmental Stressors
(Cannon-Bowers & Salas, 1998)

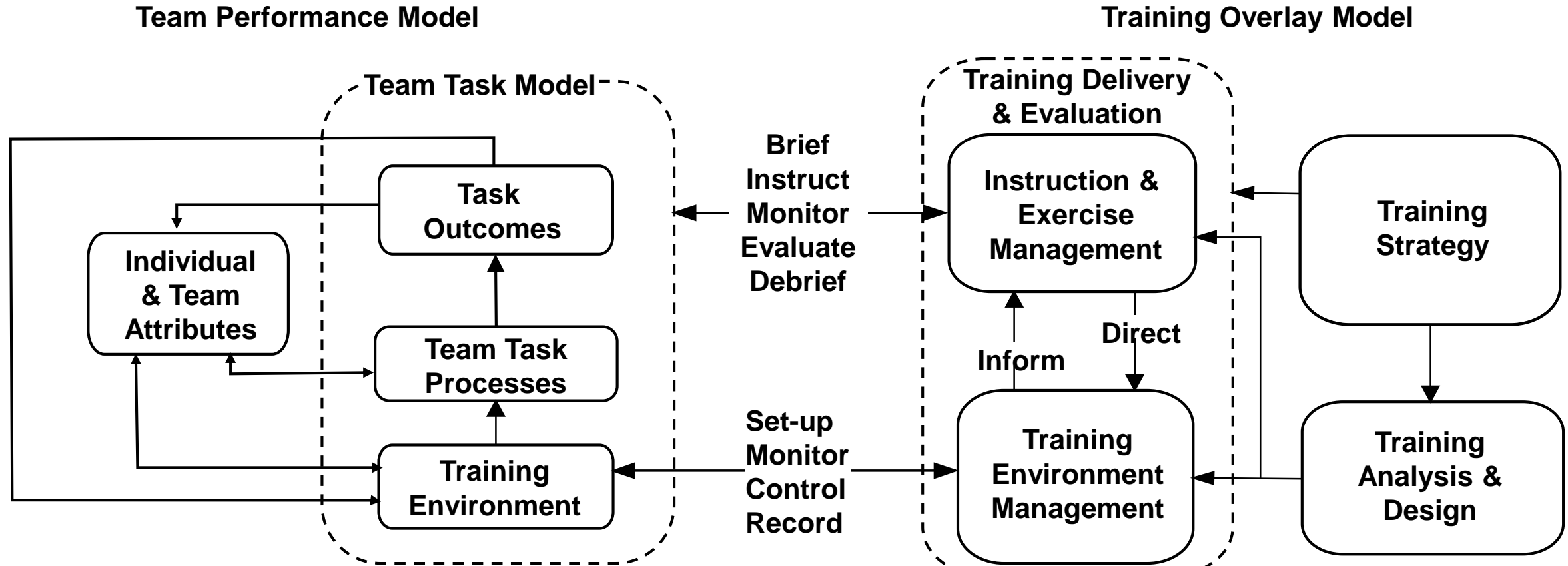
- Adverse physical conditions
- Auditory overload/Interference

Volatility, Uncertainty, Complexity and Ambiguity (VUCA)

- **Volatility:** The nature and dynamics of change, and the nature and speed of change forces and change catalysts
- **Uncertainty:** The lack of predictability, the prospects for surprise, and the sense of awareness and understanding of issues and events
- **Complexity:** The multiplex of forces, the confounding of issues, no cause-and-effect chain and confusion that surround an organization.
- **Ambiguity:** The haziness of reality, the potential for misreads, and the mixed meanings of conditions; cause-and-effect confusion

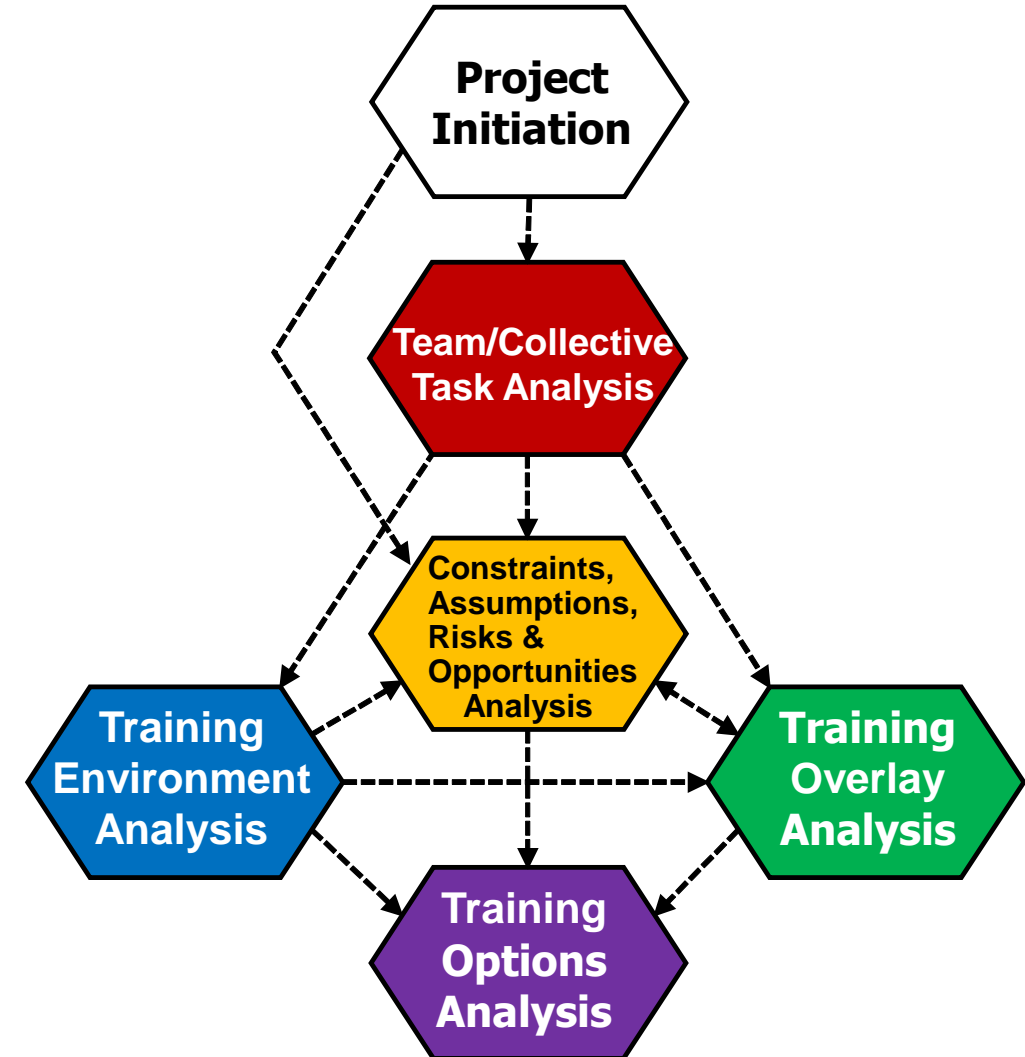
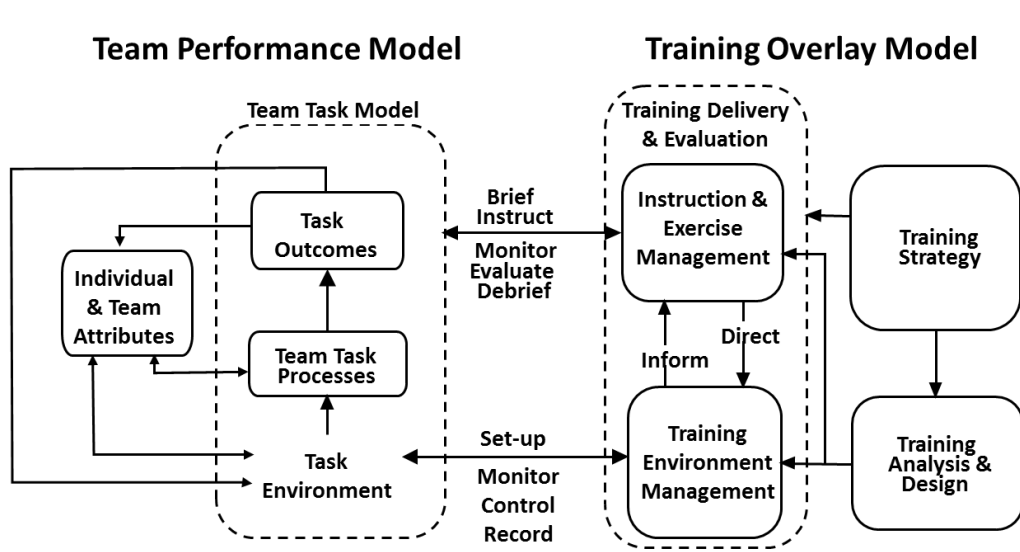
Stiehm, Judith Hicks and Nicholas W. Townsend (2002). The U.S. Army War College: Military Education in a Democracy. Temple University Press. p. 6. ISBN 1-56639-960-2.

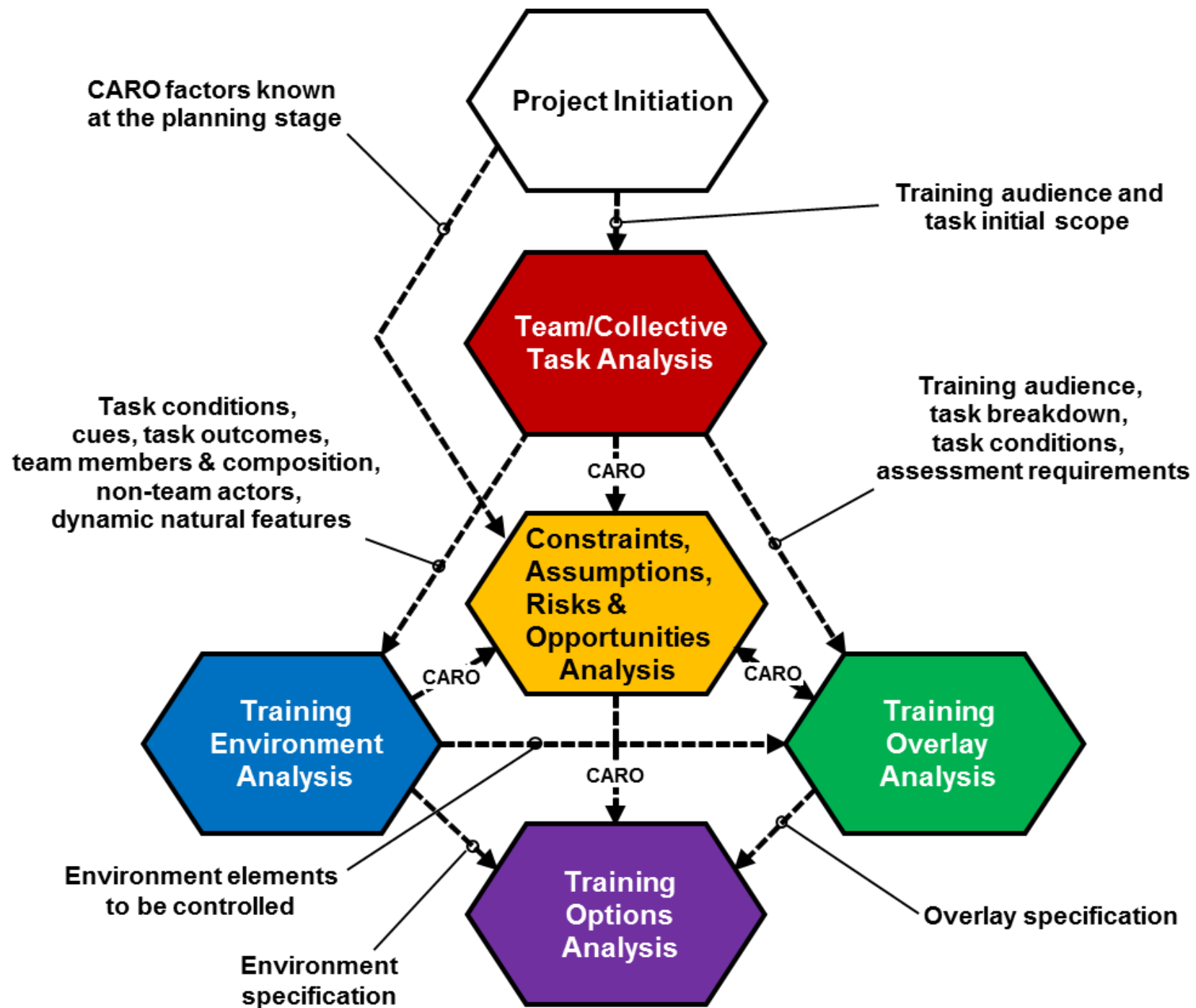
Team Training Model



(Huddlestons and Pike, 2016)

TCTNA Process Model





Case Study Example: Maritime Force Protection

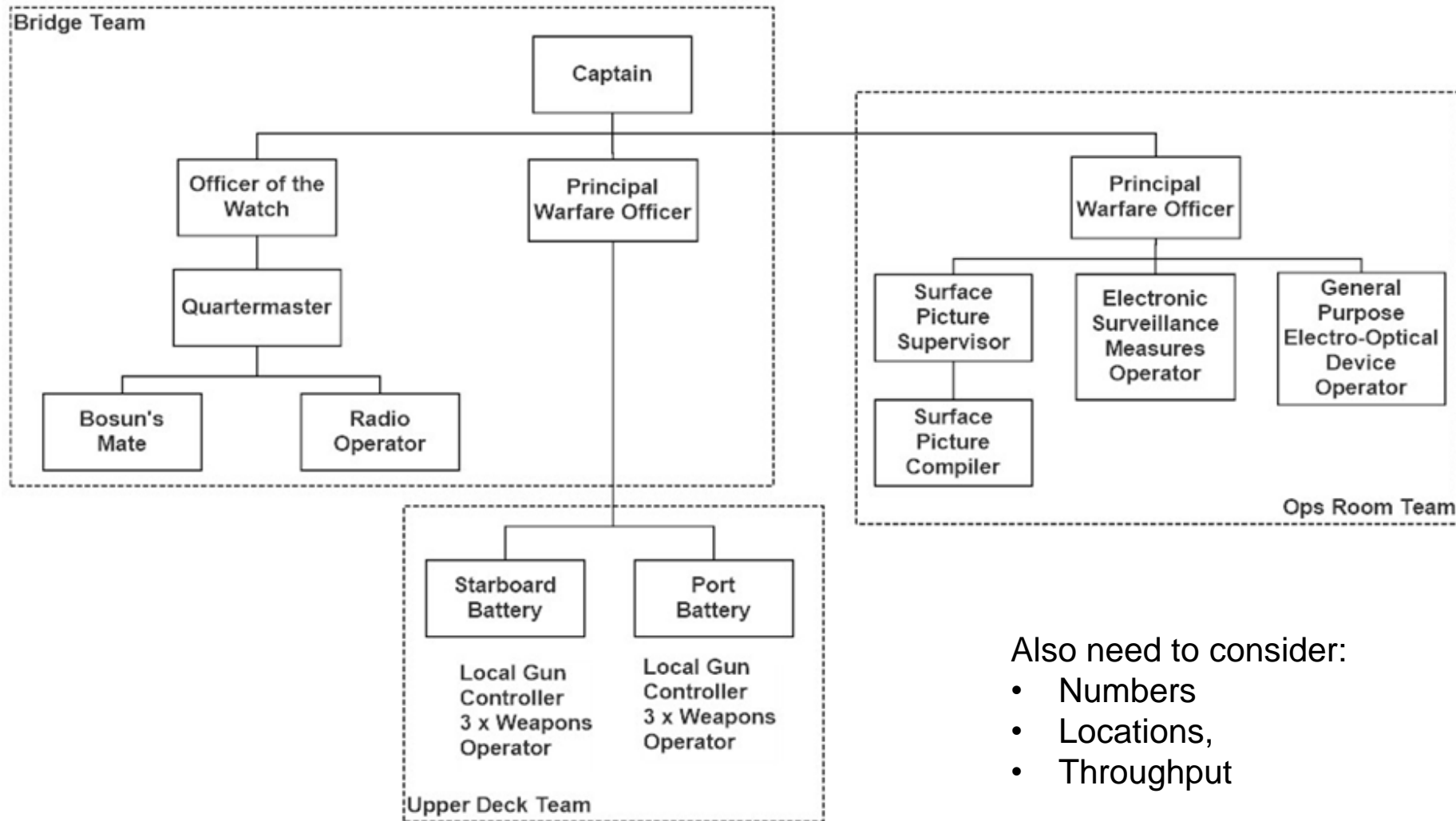


Team/Collective Task Analysis Steps

The process steps for Team/ Collective Task Analysis are:

- Establish the scope of the task.
- Describe the training audience.
- Identify the range of initial conditions in which the task may be executed.
- Conduct a detailed analysis of the task.
- Identify the teamwork-related Knowledge, Skills and Attitudes (KSAs) required to support task execution.

Organisational Chart



Also need to consider:

- Numbers
- Locations,
- Throughput

Team Role Table Entry Examples

Role	Description
Captain	Overall responsibility for the safety of the ship. Provides guidance to the Principal Warfare Officer (PWO) on tactical decision making and application of ROE.
Principal Warfare Officer (PWO)	Tactical command of the ship and integrated use of the sensors and weapons systems. Application of ROE. Issuing weapons control orders.
Weapons Operator	Search for and evaluate threats, prioritise targets. Operate weapons (General Purpose Machine Gun (GPMG), Mini-gun) including loading, firing, re-loading, and conducting stoppage drills.

If you were doing analysis at the collective (team of teams) level, what level would role entries be written at?

Task Scenario

Scenario	Maritime Force Protection of a Type 23 Frigate against an asymmetric threat, whilst at cruising watch in open waters.
Physical	Open waters leading to confined waters such as straits, transits and harbour approaches. Variable sea-state and possibility of poor visibility due to local weather conditions.
Information	Personal role radios and internal command lines on-board. Royal Navy Command Support System chat connection to higher command.
Human	Civilian Local shipping, Operators of local shipping (not hostile). Possibility of smugglers in fast moving small craft. Military Friendly forces: Command Headquarters. Neutral forces: None Enemy forces: asymmetric threat of non-conventional forces in small fast craft equipped with small arms, rocket propelled grenades, or operating waterborne improvised explosive devices. Possibility of simultaneous attack from multiple craft.
Resources:	Own ship equipment: Radar and Electro-optical sensors; GPMG x 4; Miniguns x2; Flares, Searchlight and Loudhailer.

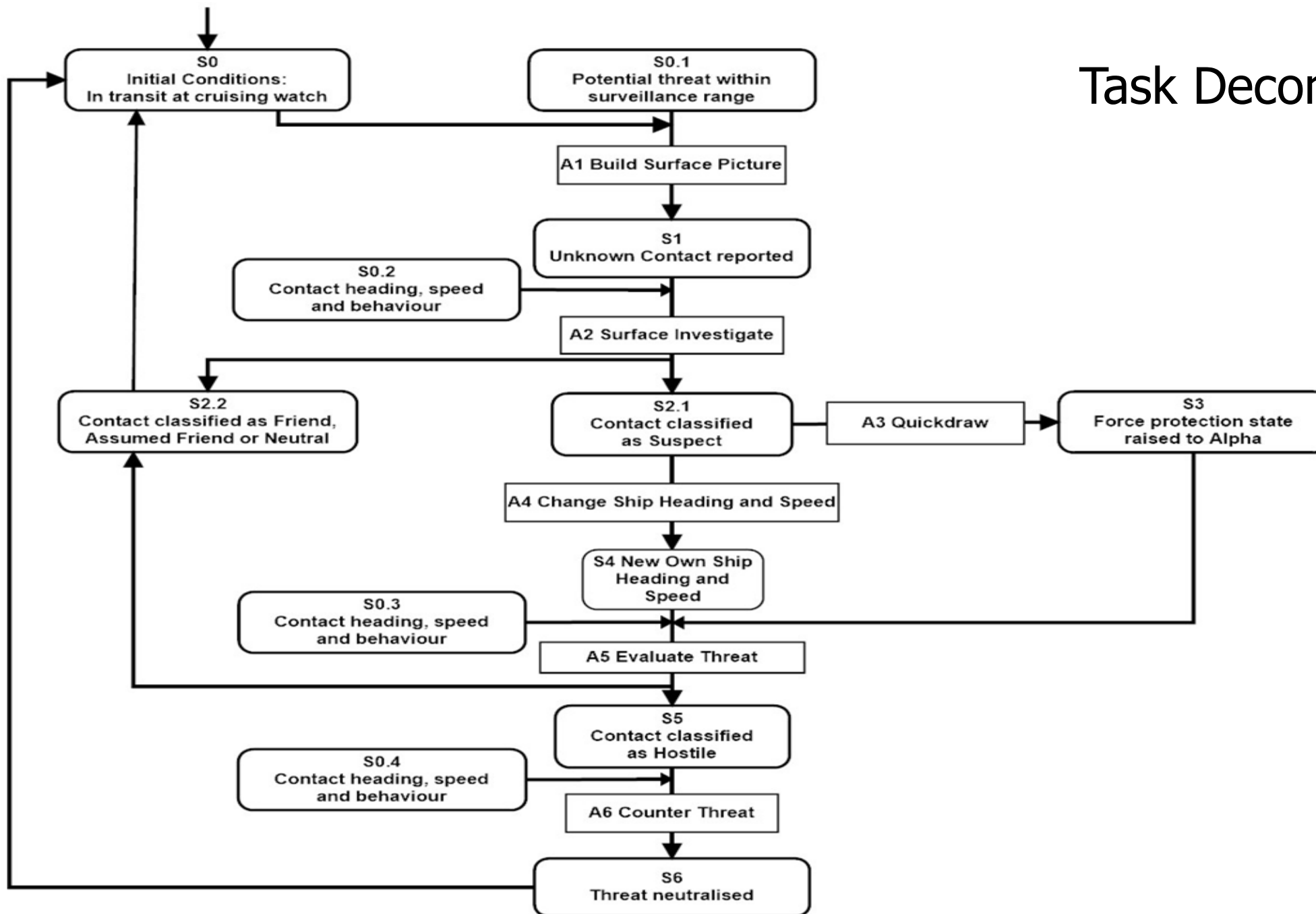
Task Conditions

Scenario ctd	Maritime Force Protection of a Type 23 Frigate against an asymmetric threat, whilst at cruising watch in open waters.
Events	<ul style="list-style-type: none">• Small, unidentified fast craft heads towards ship on collision heading, does not respond to escalation of force measures, turns to follow ship when ship changes heading and speed, opens fire on ship with small arms and rocket propelled grenades.• Small, unidentified fast craft heads towards ship on collision heading, does not respond to escalation of force measures, turns to follow ship when ship changes heading and speed, maintains collision course with ship (waterborne IED).• Smugglers in small fast craft heading towards ship, do not respond to escalation of force measures, but maintain their heading.• Fishing vessels on collision heading with the ship respond to escalation of force measures.

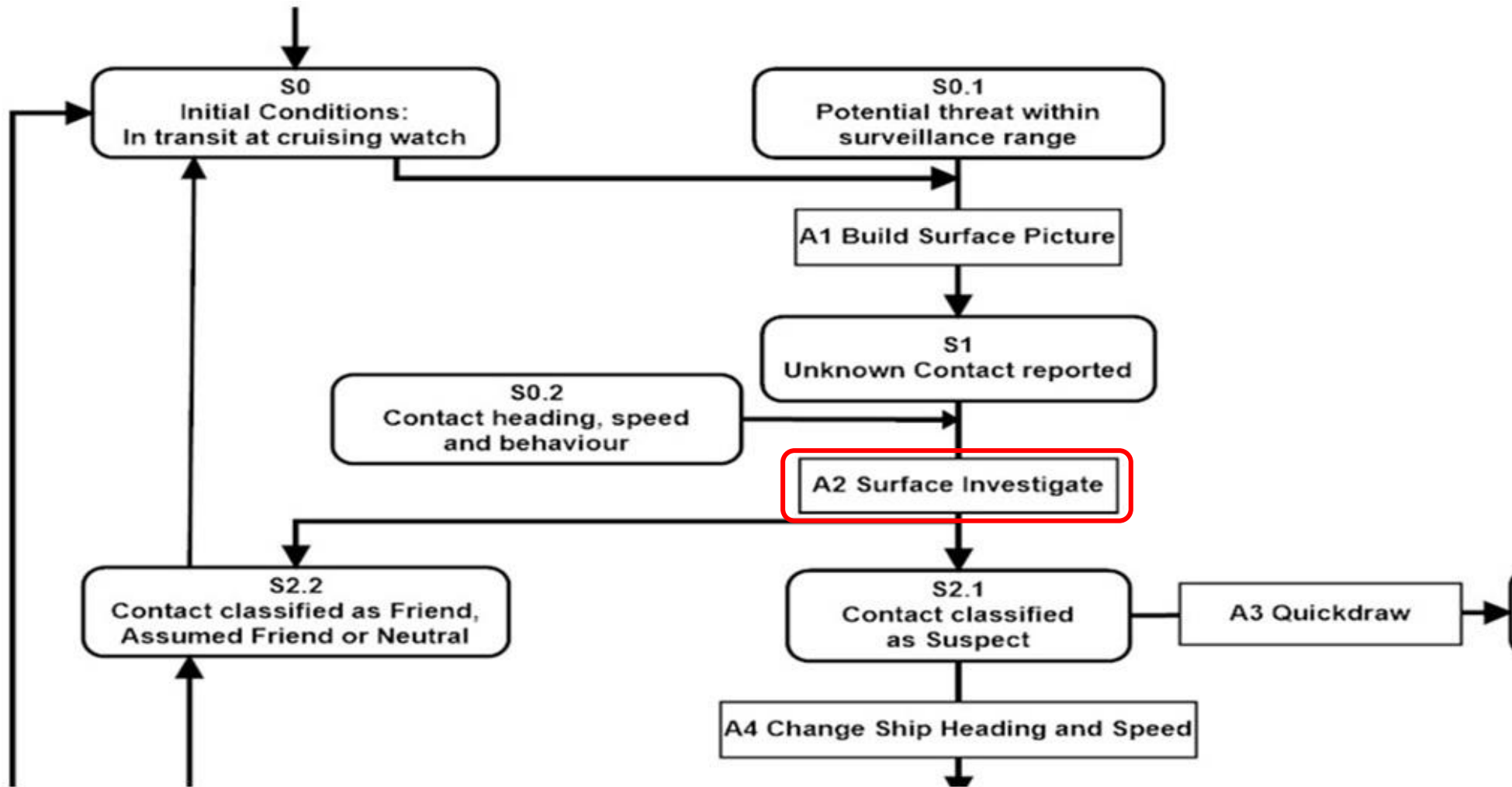
Task Conditions

Category	Description
Political	<p>Political conditions that might impact on task execution. Examples include:</p> <ul style="list-style-type: none">• Home popular support;• UN Security Council Resolution;• Host government support;• Host population support;• Presence of non-state actors;• Absence of the rule of law.
Economic	<p>Economic conditions that might impact on task execution. Examples include:</p> <ul style="list-style-type: none">• Economically failing country;• Presence of starvation and famine;• Economic interests of indigenous security forces;• Corruption amongst government and local officials.

Task Decomposition



Task Decomposition Expanded View



Task Description Table

A2.0 Surface Investigate		
<u>Inputs</u>	<u>Process</u>	<u>Output(s)</u>
<p>S3 Contact heading, range speed and behaviour</p>	<p>Participants: Bridge team & Ops room team</p> <p>Process Description: (including modes of action)</p> <ul style="list-style-type: none"> Each team member reports the information they have about the contact in accordance with the Surface Investigate SOP, which specifies the sequence of reporting. OOW synthesises the information and determines the classification. SPC manually enters contact if not seen on radar and adds classification <p>Key team interactions: Coordinated reporting ensuring no over-talk, broadcast of classification so all team members have SA about the contact</p> <p>Critical Errors and Consequences: Over-talk leading to information not being heard and potential for incorrect classification</p>	<p>S4 Contact classified as suspect S5 Contact classified as friend, assumed friend or neutral</p>
<p>Variables affecting difficulty: Volume of shipping in the area Multiple, simultaneous threats Sea state Visibility</p>	<p>Process assessment criteria Comprehensiveness of the search though all arcs</p> <p>Data capture requirements Observation and recording of team actions and communication</p>	<p>Output assessment criteria Timeliness, completeness accuracy of the report, on the correct circuits.</p> <p>Data Capture Requirements Recording of contact reports, time and originator. Surface picture</p>

Constraints, Assumptions, Risks and Opportunities Analysis

Constraints

Constraint	Consequence
Weapons effects cannot be trained live	Weapons effects need to be simulated.
A simulator system is classified	The simulator cannot be networked with unclassified simulation systems.
Augmentees are only available for two weeks per year for training	Duration of training with a fully augmented team is limited.
Instructional Role Players are only available for one week per year	Interactions with specific non-team actors may be limited. Tasks involving these non-team actors should be identified and prioritised.

Assumptions

Any assumptions made in the analysis should be recorded and reviewed periodically. Examples might include:

- Trainee availability
- Training throughput
- Starting date for training

Risks

Typically held in a risk register with entries such as:

- **Risk Description** : Availability of Subject Matter Experts to inform analysis and design
- **Cause**: SMEs not available in time to inform analysis and design
- **Effect**: TNA and training design incomplete; immature training solution
- **Probability**: Low
- **Impact**
 - **Performance** : Medium
 - **Time**: High
 - **Cost**: Low
- **Risk Owner**: TNA Steering Group
- **Mitigation Action**: Steering group to direct SME availability, including industrial SMEs
- **Mitigation Cost**: Minimal (e.g.travel)

Opportunities

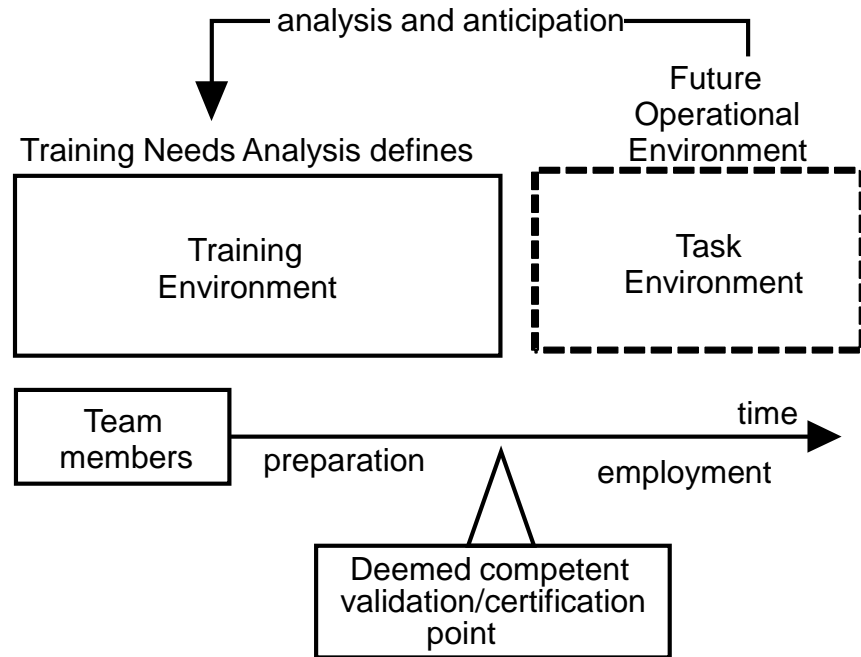
Opportunity	Description
Individual weapons training system due for refresh	<p>Team training solution could be based on an extension of the individual weapons training solution, provided there are:</p> <ul style="list-style-type: none">• enough weapons stations to cater for team training requirements,• suitable communication facilities and• adequate red force representation.

Training Environment Analysis

- Training Environment Model
- Fidelity (physical, functional and task)
- Specifying training environment components

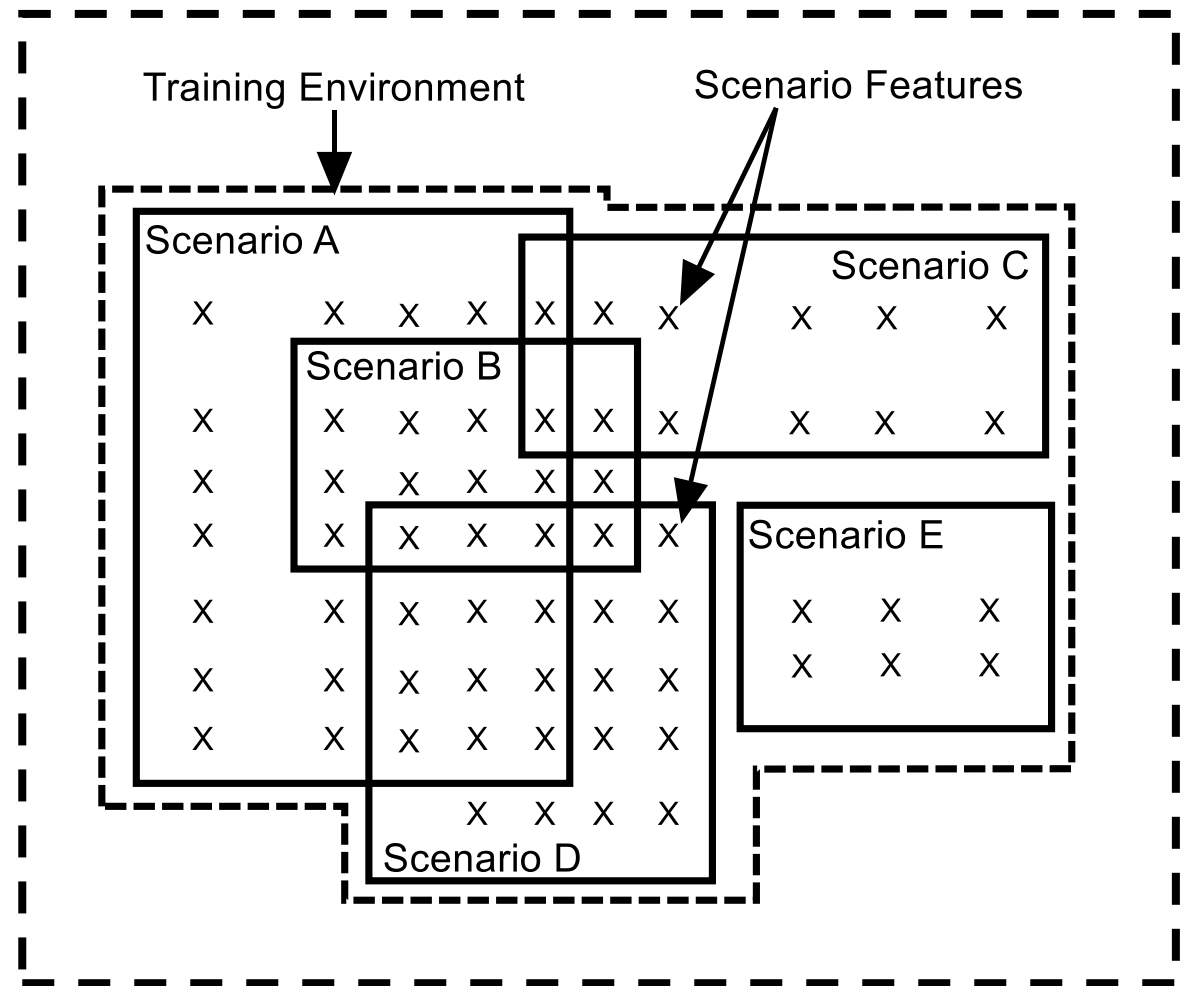


Relationship between Task and Training Environments

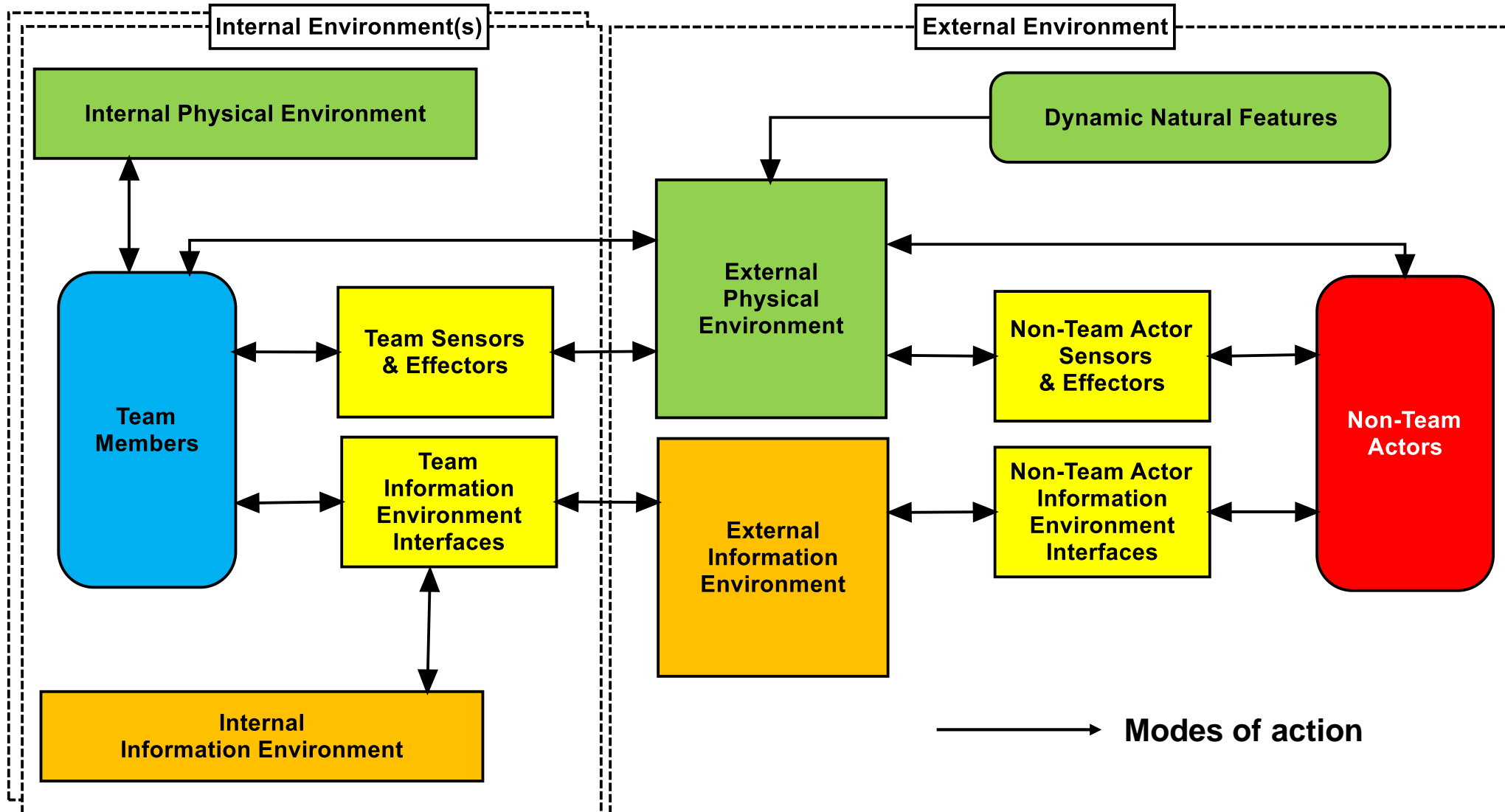


The training environment is a **subset** of the task environment containing **all the features** of the task environment **necessary** for **replicating the required range of credible tasks**.

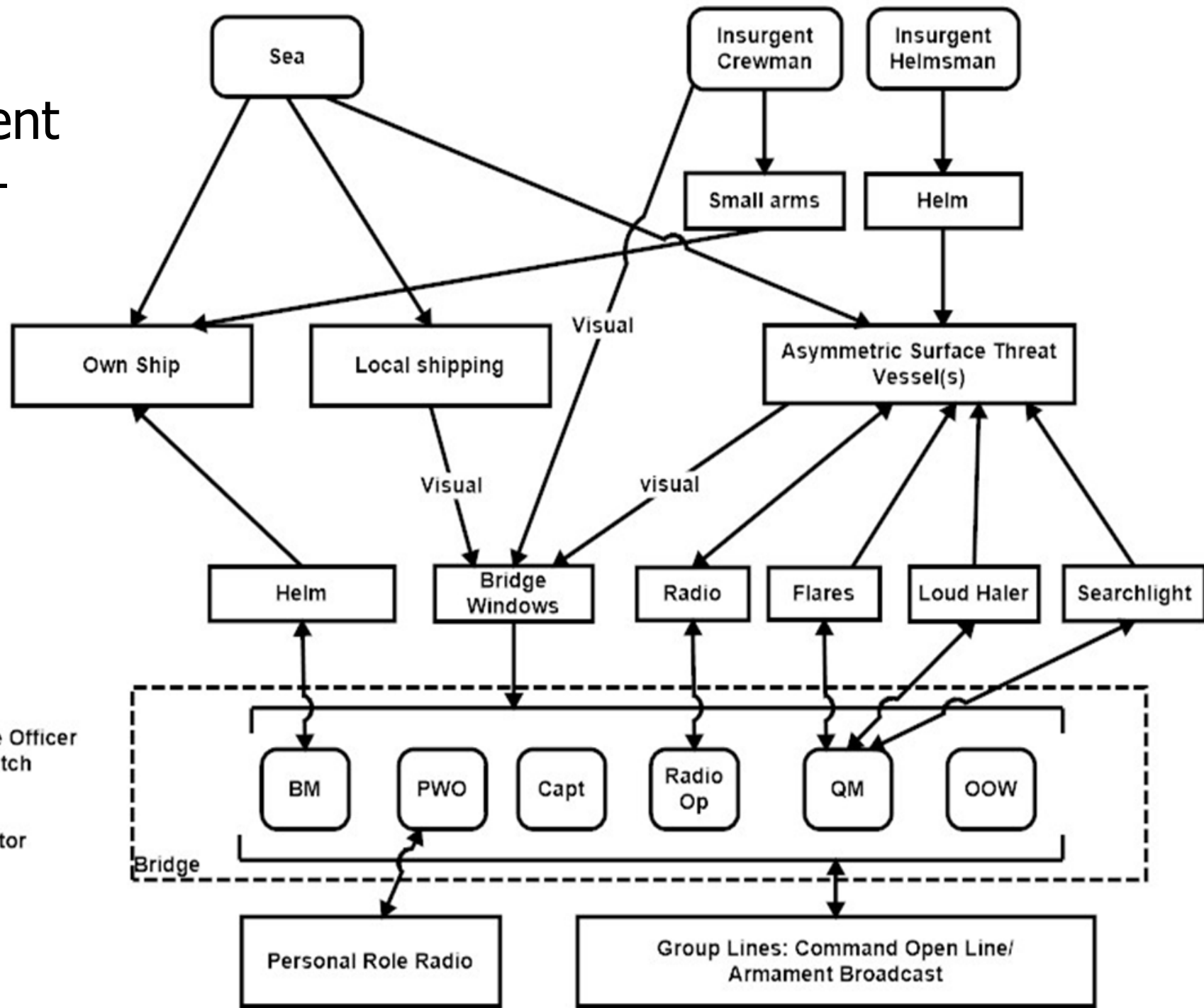
Task Environment



Training Environment Model



Training Environment Diagram – Bridge

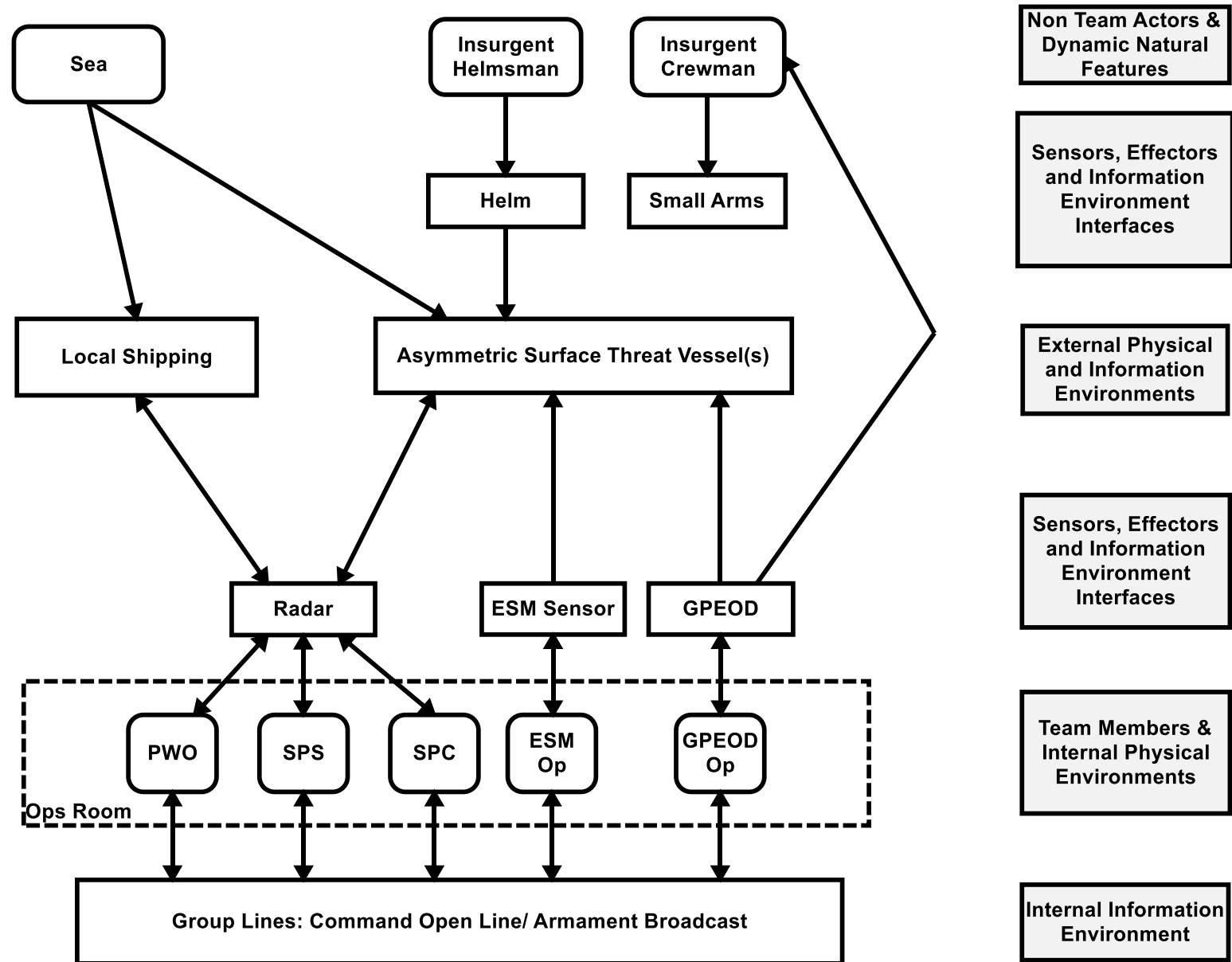


Capt - Captain
 PWO - Principal Warfare Officer
 OOW - Officer of the Watch
 BM - Bosun's Mate
 QM - Quarter Master
 Radio Op - Radio Operator

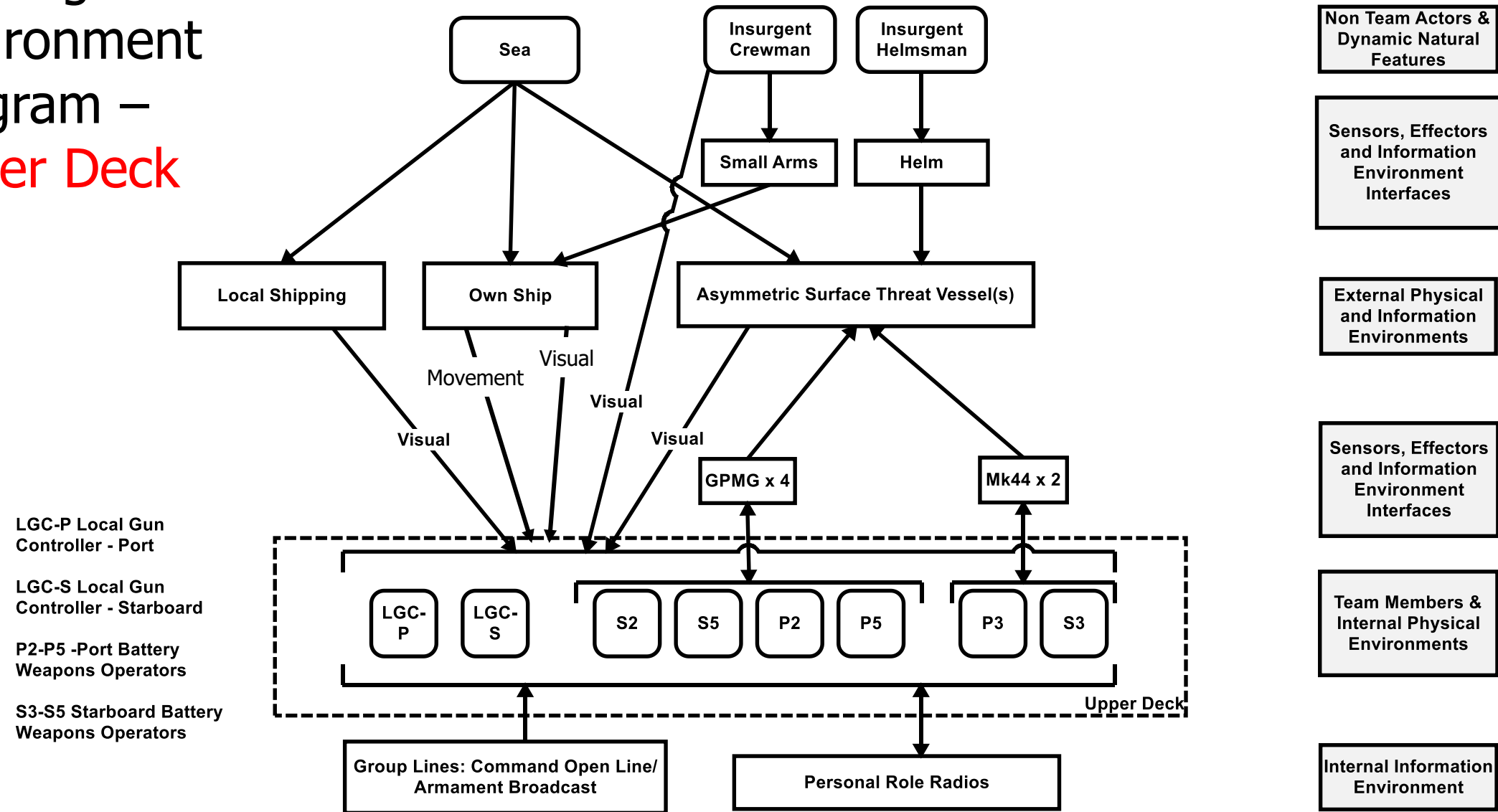
- Non Team Actors & Dynamic Natural Features
- Sensors, Effectors and Information Environment Interfaces
- External Physical and Information Environments
- Sensors, Effectors and Information Environment Interfaces
- Team Members & Internal Physical Environments
- Internal Information Environment

Training Environment Diagram – Ops Room

GPEOD - General Purpose
Electro-optical Device
ESM - Electronic Surveillance
Measures
SPC- Surface Picture Compiler
SPS - Surface Picture Supervisor
PWO - Principal Warfare Officer
GPEOD Op - GPEOD Operator
ESM OP - ESM Operator



Training Environment Diagram – Upper Deck



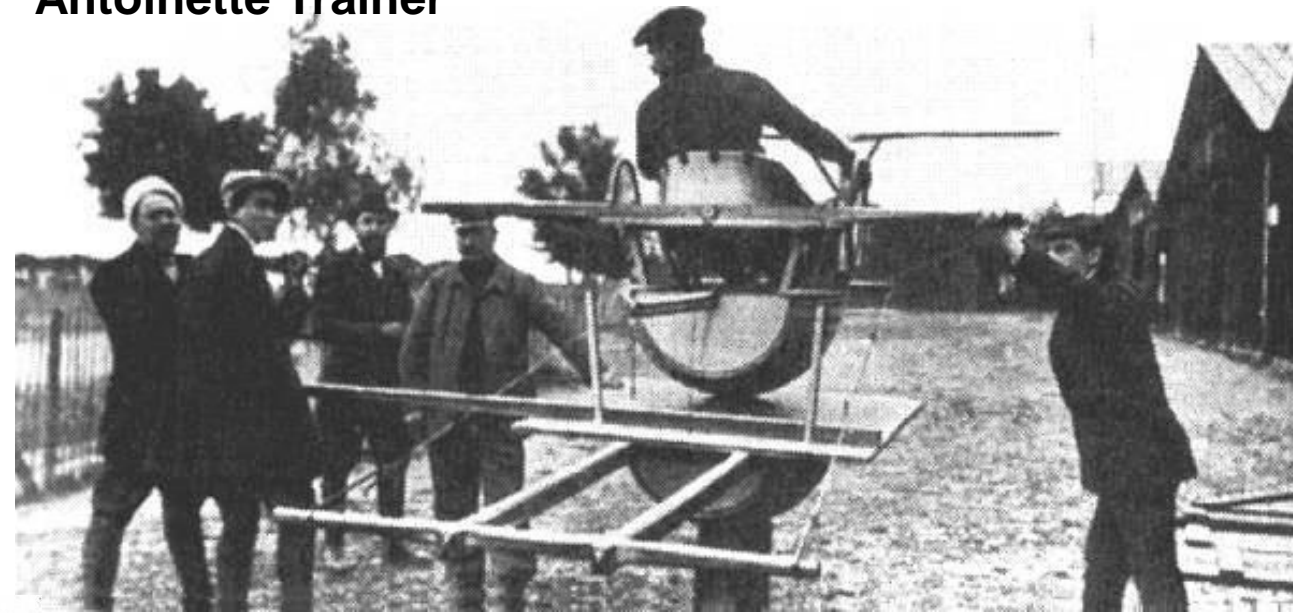
Specifying Training Environment Requirements to Support Training Tasks

- Physical and Functional Fidelity
- Templates for specifying training environment elements to support training tasks.

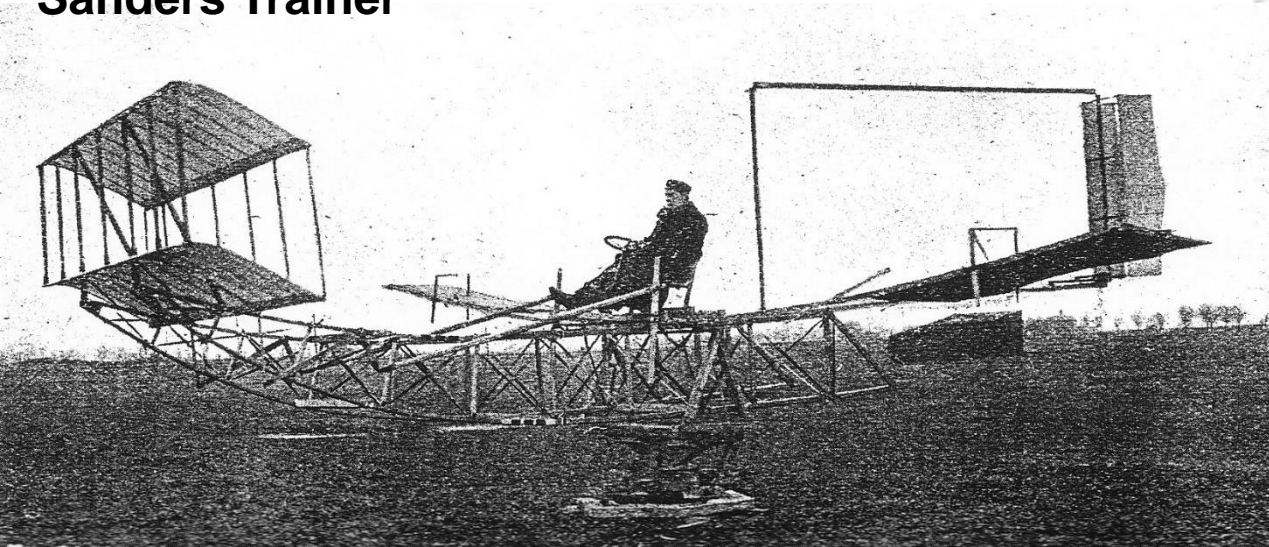
Physical and Functional Fidelity

Physical Fidelity: the physical attributes of the element, such as look, feel, weight, size and sound

Antoinette Trainer



Sanders Trainer



Functional Fidelity: does it respond and behave like the real thing i.e how the element functions in terms of the responses that it produces to the inputs that it receives.

Specifying Dynamic Natural Features

Environment Element	Physical Fidelity	Functional Fidelity
Dynamic Natural Environment Features	Description of the physical attributes of the element of significance for the task being executed: includes shape, size, colour, sound.	Description of the dynamic attributes of the element and its modes of action on other elements in the environment.
Sea		



Specifying Dynamic Natural Features

Environment Element	Physical Fidelity	Functional Fidelity
Dynamic Natural Environment Features	Description of the physical attributes of the element of significance for the task being executed: includes shape, size, colour, sound.	Description of the dynamic attributes of the element and its modes of action on other elements in the environment.
Sea	Colour, appearance, size of waves.	The waves associated with higher sea states cause vessels to pitch and roll. The movement of asymmetric threat vessels is significant because the weapons operators have to shoot at a moving target. The movement of the own ship is significant because upper deck movement affects the weapons operators' sight picture and the effective arc of the weapons.



Specifying External Physical Environment Elements

Environment Element	Physical Fidelity	Functional Fidelity
External Physical Environment Elements	Description of the physical attributes of the element of significance for the task being executed: includes shape, size, colour, sound etc.	Description of the dynamic attributes of the element and its responses to actions from other elements in the environment (e.g. in a car accident, what sorts of damage would be sustained by the vehicles for given impact velocities?).
Asymmetric Surface Threat Vessel		



Specifying External Physical Environment Elements

Environment Element	Physical Fidelity	Functional Fidelity
External Physical Environment Elements	Description of the physical attributes of the element of significance for the task being executed: includes shape, size, colour, sound etc.	Description of the dynamic attributes of the element and its responses to actions from other elements in the environment (e.g. in a car accident, what sorts of damage would be sustained by the vehicles for given impact velocities?).
Asymmetric Surface Threat Vessel	Representative physical appearance and size for types of craft considered to be in use by asymmetric forces.	Speed, acceleration and rate of turn should be representative for each type of craft considered to be in use by asymmetric forces.



Specifying Internal Physical Environments

Internal Physical Environments	<p>The following need to be captured for each working environment identified:</p> <ul style="list-style-type: none">• The number of people to be accommodated;• The sensor and effector user interfaces in the workspace;• Information systems interfaces (internal and external);• Other elements required in the workspace (e.g. desks, consoles);• Relative orientation and positioning of team-member workstations if deemed significant;• Any other physical features of the workspace that are considered relevant for task performance (e.g. lighting levels, background noise). <p>Whilst the description of the work environment is mainly concerned with physical attributes, there may be functional elements that need to be captured such as control of lighting levels.</p>	
<i>Upper Deck</i>	Team Members Interfaces:	




Specifying Internal Physical Environments

Internal Physical Environments	<p>The following need to be captured for each working environment identified:</p> <ul style="list-style-type: none"> • The number of people to be accommodated; • The sensor and effector user interfaces in the workspace; • Information systems interfaces (internal and external); • Other elements required in the workspace (e.g. desks, consoles); • Relative orientation and positioning of team-member workstations if deemed significant; • Any other physical features of the workspace that are considered relevant for task performance (e.g. lighting levels, background noise). <p>Whilst the description of the work environment is mainly concerned with physical attributes, there may be functional elements that need to be captured such as control of lighting levels.</p>	
<i>Upper Deck</i>	<p>Team Members: 3 starboard weapons operators, 3 port weapons operators.</p> <p>Interfaces: 4 GPMGs on mounts, 2 Mk 44 Miniguns on mounts, personal role radio for each weapons operator.</p>	<p>Each weapon position should be at the correct apparent height above sea level.</p> <p>Each weapon position should have a representative field of view, including any restrictions to lines of sight that are appropriate relative to its position on the ship.</p> <p>The weapon operators' angle of view of the sea and surface vessels, and the alignment of the weapon, should move in response to sea state and ship's manoeuvre.</p>




Sensor and Effector Specification: Minigun

User Interface Physical Fidelity	User Interface Functional Fidelity	Modes of Action Supported & Functional Fidelity
		

Note: applies to non-team actor interfaces too!

Sensor and Effector Specification: Minigun

User Interface Physical Fidelity	User Interface Functional Fidelity	Modes of Action Supported & Functional Fidelity
<p>Accurate representation of the physical attributes of the weapon and mount to include:</p> <ul style="list-style-type: none">• shape and size,• weight,• trigger,• safety catch,• cocking handle,• loading mechanism,• sight field of view and adjustment,• arcs of manoeuvre (lateral and vertical),• firing arc stops.	<ul style="list-style-type: none">• trigger pressure,• sight picture,• recoil,• manoeuvrability on the mount,• tracer visibility. 	<p>Modes: firing 7.62 rounds and tracer, continuously and in bursts.</p> <p>Fidelity: Accurate representation of:</p> <ul style="list-style-type: none">• rate of fire,• range,• muzzle velocity,• round trajectory, live round/tracer mix,• effects of fall of shot on the target.

Note: applies to non-team actor interfaces too!

Information Environment Specification

User Interface Physical Fidelity	User Interface Functional Fidelity	Modes of Action Supported & Functional Fidelity
Communications systems: hardware requirements for communications systems need to be identified such as control panels, speakers, headsets and visual displays, along with critical aspects of physical fidelity for each.	Communications systems: functional requirements such as channel selection, push to transmit, display adjustment that are critical to the task must be identified.	Communications systems: Modes of action information transmission and reception modes need to be identified (voice, video, data) Functional fidelity: the number of channels that need to be supported, reliability, quality
Example: Command line interface aboard ship		




Information Environment Specification

User Interface Physical Fidelity	User Interface Functional Fidelity	Modes of Action Supported & Functional Fidelity
Communications systems: hardware requirements for communications systems need to be identified such as control panels, speakers, headsets and visual displays, along with critical aspects of physical fidelity for each.	Communications systems: functional requirements such as channel selection, push to transmit, display adjustment that are critical to the task must be identified.	Communications systems: Modes of action information transmission and reception modes need to be identified (voice, video, data) Functional fidelity: the number of channels that need to be supported, reliability, quality
Example: Command line interface aboard ship		
Headsets with microphones. Control panel with switches to select transmit and receive on each channel.	Selection of multiple lines to receive (on Left/Right ear phones) and a single line to transmit.	Transmission to all users with receive selected on a given channel. Reception from all users transmitting on lines which are selected for receive.



Information Environment Specification

User Interface Physical Fidelity	User Interface Functional Fidelity	Modes of Action Supported & Functional Fidelity
<p>Information systems:</p> <p>Physical hardware requirements (often PC-based but may be bespoke)</p> <p>Software applications screen interfaces</p>	<p>Information systems:</p> <p>The key aspects of functionality associated with both the hardware interface and the applications interfaces for data entry and retrieval</p> 	<p>Information systems:</p> <p>the required capabilities for information transfer in and out of each application should be identified here, including latency</p> <p>Information Fidelity: Properties of the information in the system such as:</p> <ul style="list-style-type: none">Media typesContent and level of detailPerishability

Non-Team Actor Specification

Appearance	Behaviour	Knowledge and Skills
If the actor appears in the physical environment their relevant physical attributes such as their manner of dress and language need to be captured.	The actions which they take and sensors, effectors and information environment interfaces that they use must be defined. This may include cultural aspects of behaviour.	Specific knowledge and skills required to carry out the role (e.g. tactics, doctrine, operating equipment and systems interfaces, terminology)



Non-Team Actor Specification

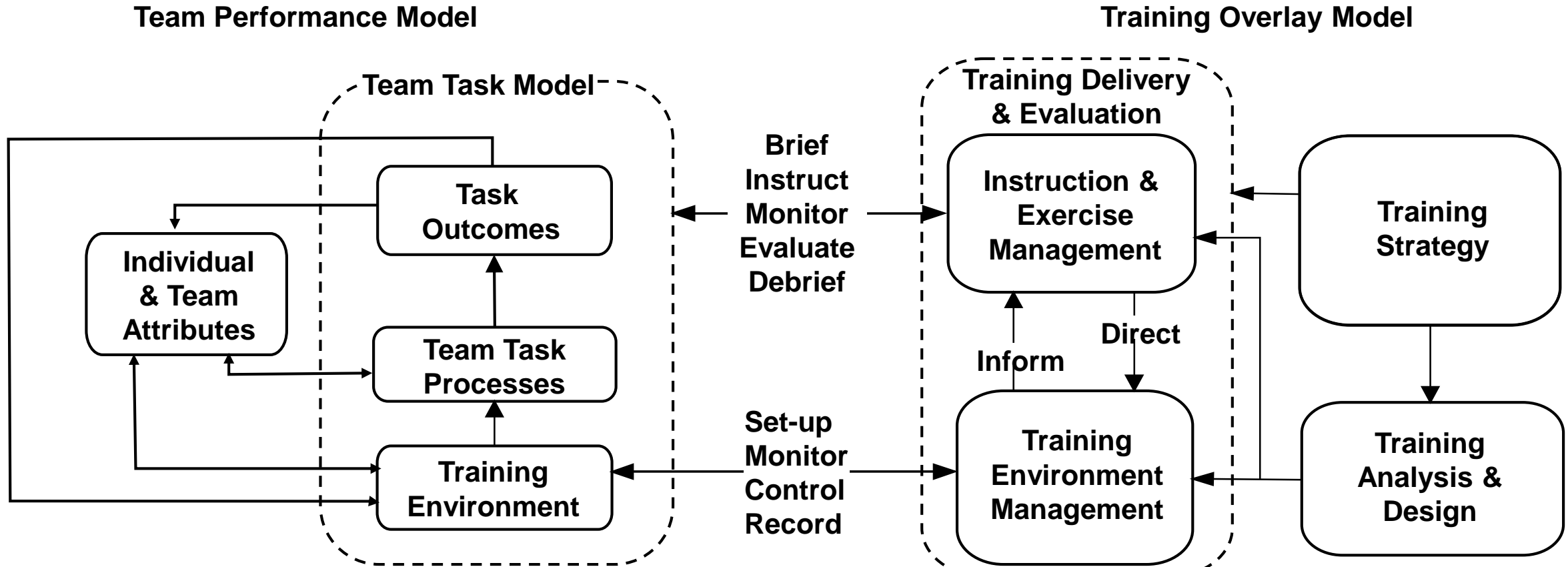
Appearance	Behaviour	Knowledge and Skills
If the actor appears in the physical environment their relevant physical attributes such as their manner of dress and language need to be captured.	The actions which they take and sensors, effectors and information environment interfaces that they use must be defined. This may include cultural aspects of behaviour.	Specific knowledge and skills required to carry out the role (e.g. tactics, doctrine, operating equipment and systems interfaces, terminology)
Dress consistent with the local population.	Manoeuvring of the insurgent craft in response to escalation of force measures and direct fire from the ship, consistent with known insurgent tactics.	Ability to helm the insurgent craft. Knowledge of insurgent tactics in response to escalation of force measures and direct fire.



Training Overlay Analysis

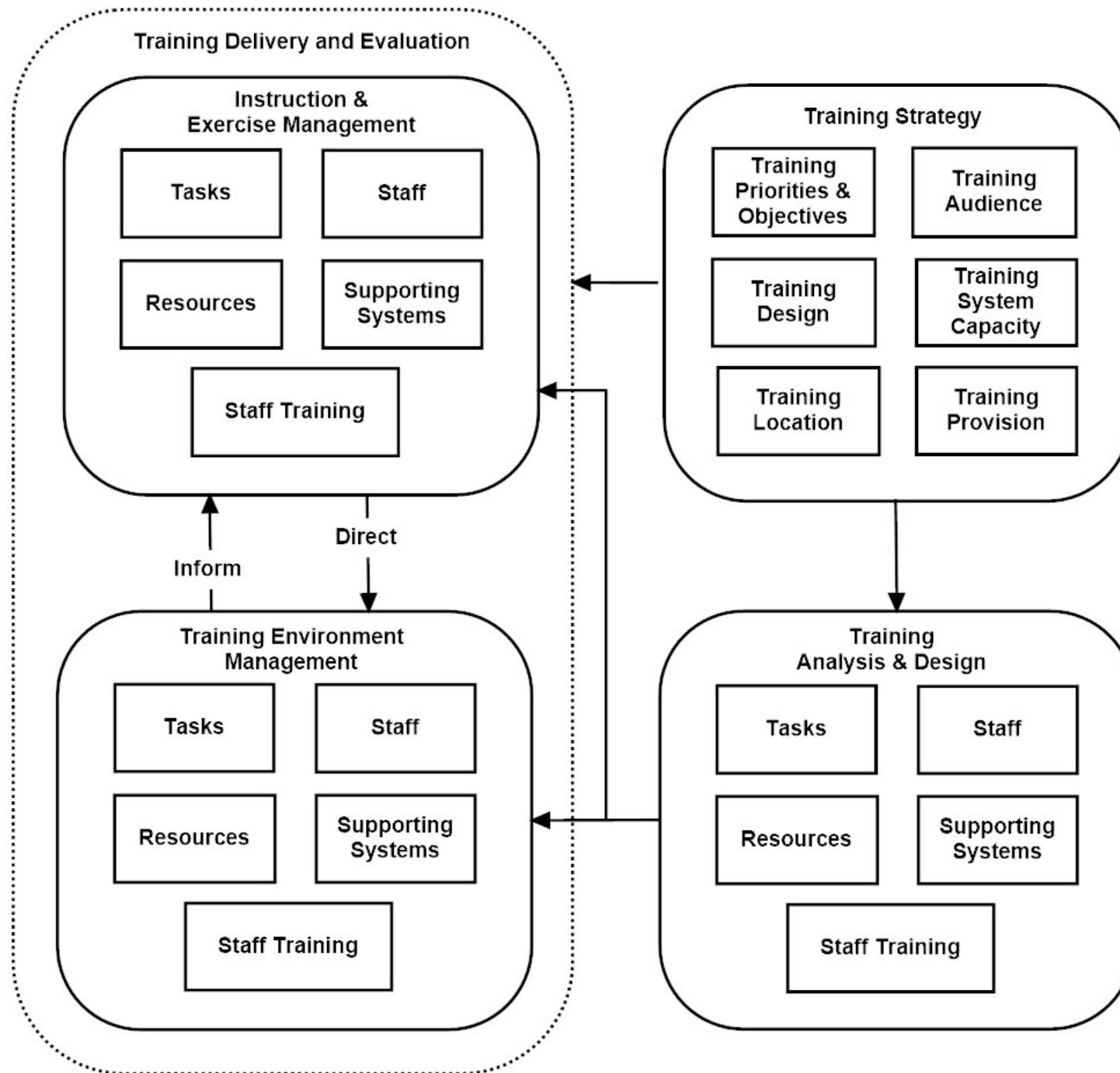
- Training overlay model
- Training strategy
- Training staff capability requirements
- Training overlay interfaces to the training environment

Team Training Model



(Huddlestons and Pike, 2016)

Training Overlay Model



Training Priorities – Risk Analysis

Task	Critical Error	Consequences	L*	S**	R** *	Train (Y, N)
1.0 Protect ship from an asymmetric waterborne threat	Ineffective search	Late detection of potential threat	L	M	L	N
	Contact not correctly categorised as suspect	Upper deck weapons not deployed in time to counter the threat – damage to ship, threat to life	L	H	M	Y
	Contact not correctly categorised as hostile	Contact able to get within range to attack the ship - damage to ship, threat to life	L	H	M	Y
	Inaccurate fire from upper deck weapons	Contact able to attack the ship - damage to ship, threat to life	H	H	H	Y



Training Objectives

Overarching conditions applicable to all training objectives:

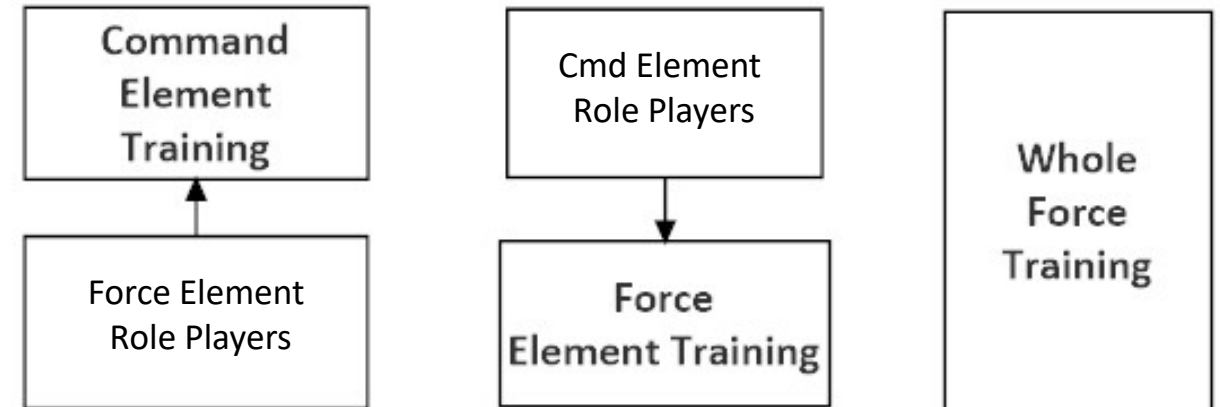
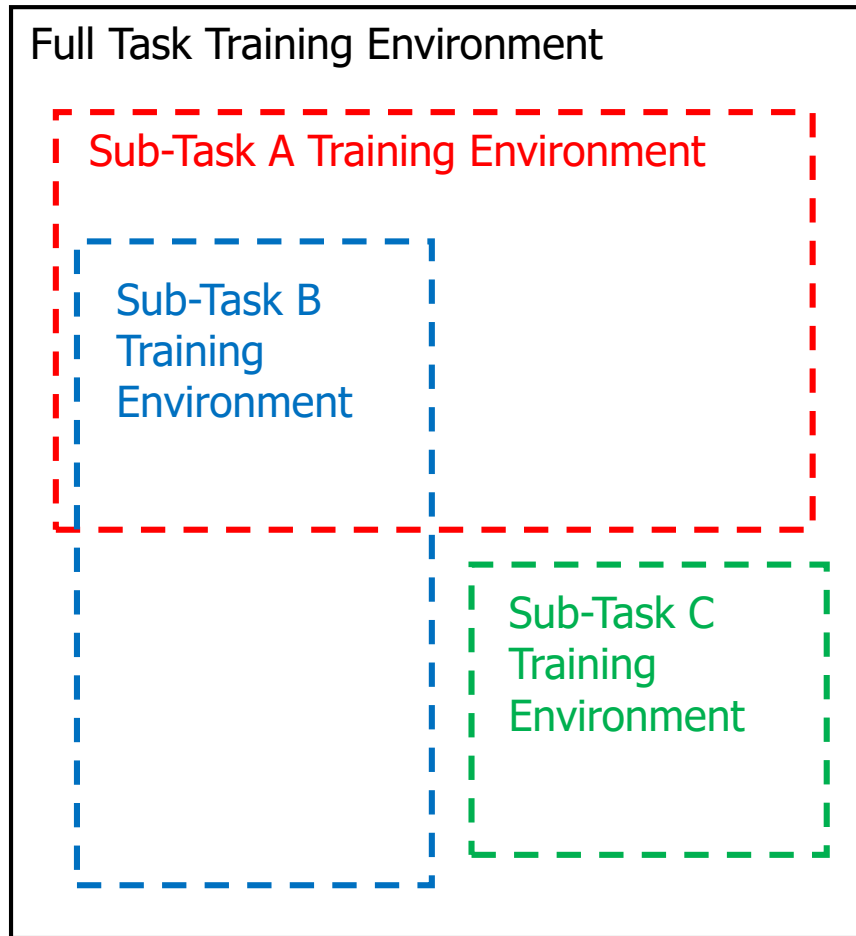
With the ship in transit, at cruising watch state, with all existing contacts classified, in an area where there is a potential asymmetric surface threat. (Detailed description provided by the training environment model)

Performance	Conditions	Standards
Task Execution		
1.0 Carry out the Surface Investigate procedure ensuring that: a. Team member responses are synchronised so that information is not lost and the process is not delayed by over-talk. b. The resulting contact classification is broadcast to the Bridge, Upper Deck Weapons and Ops Room teams to maintain team situational awareness.	Given a reported contact which is a potential threat.	Contact correctly classified. Team member responses synchronised in accordance with the Surface Investigate SOP. Classification broadcast to all appropriate teams.
Supporting KSAs		
1.0 Explain the surface investigate SOP	Given an example of a contact report and the data available to each team member involved in searching for contacts.	In accordance with the Surface Investigate SOP

Initial consideration of:

- Training Structure and Sequencing
- Training and Assessment Methods
- Training Duration
- Training System Capacity (Surge and steady state)
- Training Environment Selection

Training Strategy - Part Task Training

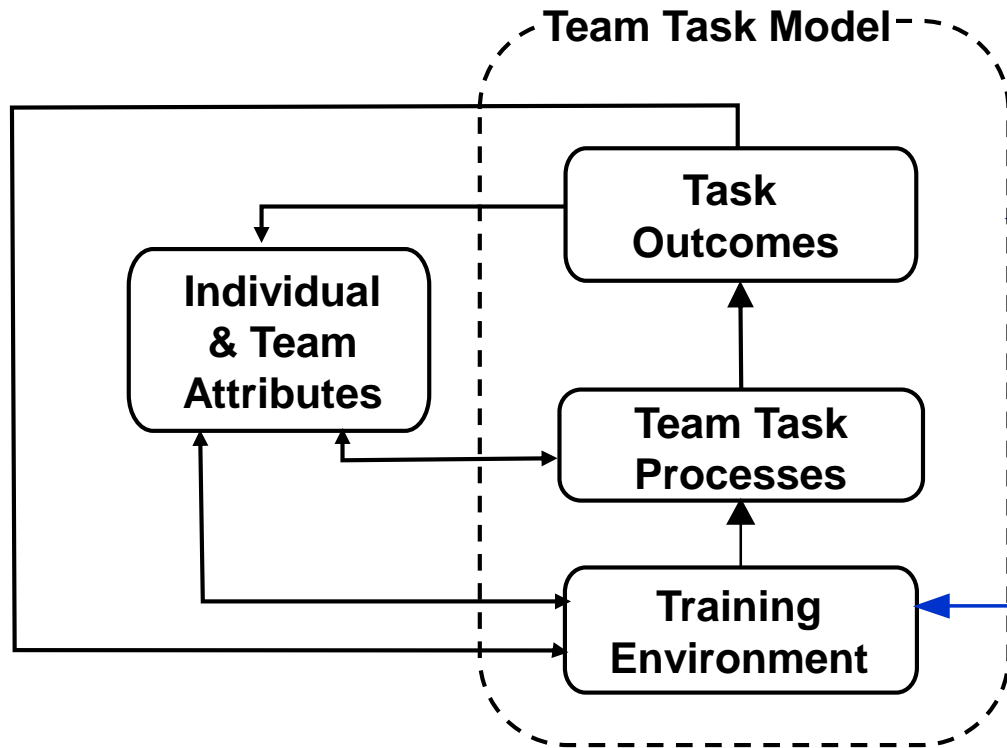


Training Staff Capability Requirements Examples

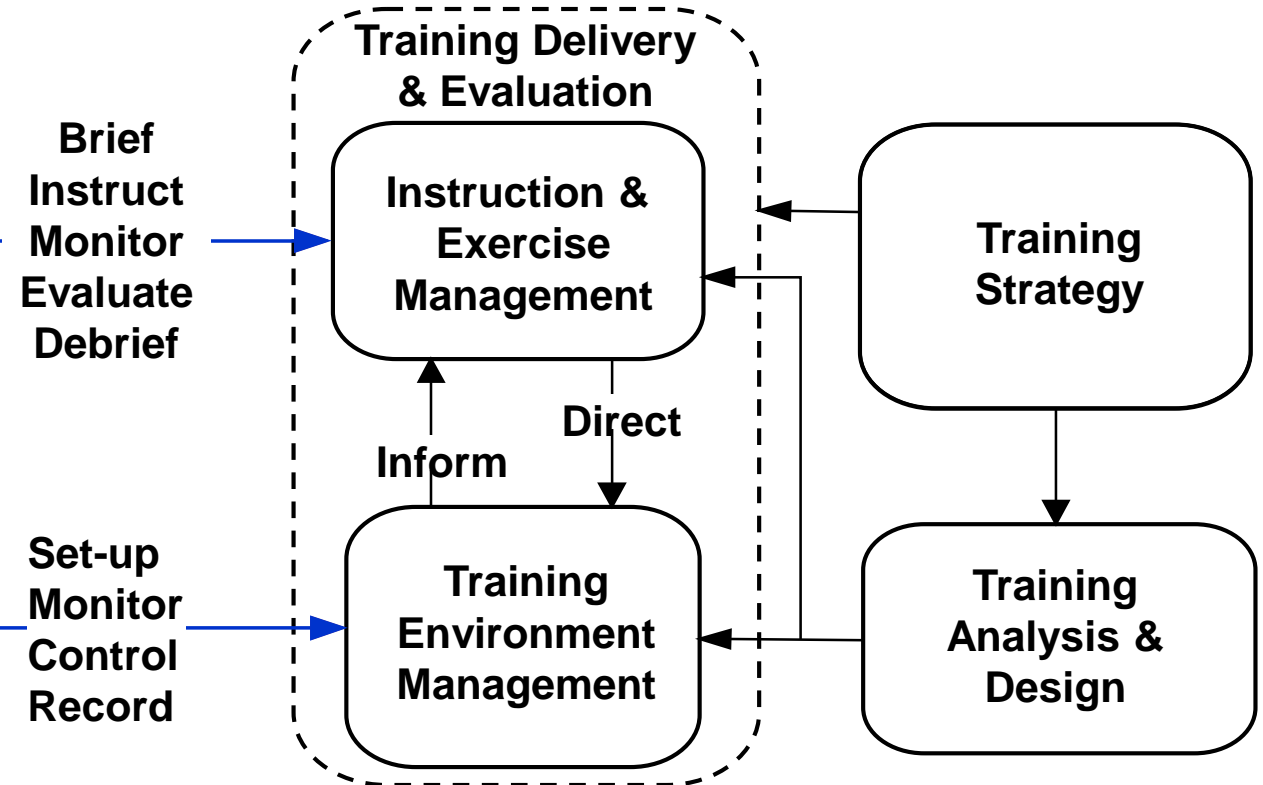
- Lieutenant Commander (Lt Cdr) Staff Warfare Officer (Above Water Warfare specialist) to plan the exercise and brief, monitor and debrief the PWOs and the Captain
- Lt Cdr Staff Warfare Officer (Navigation specialist) to brief, monitor and debrief the Bridge Team (with the exception of the PWO and Captain)
- Warrant Officer (WO) / Chief Petty Officer (CPO) Above Water Tactics Instructor to brief, monitor and debrief the Ops Room Team ratings
- WO/CPO Above Water Warfare (Gunner) to brief, monitor and debrief the Upper Deck Team

Training Overlay Connections to the Training Environment

Team Performance Model



Training Overlay Model



Brief
Instruct
Monitor
Evaluate
Debrief

Set-up
Monitor
Control
Record

Training Overlay Requirements



Task fidelity : can credible scenarios be created, run and adapted that require representative task performance?



Can appropriate data be captured and used for providing feedback including After Action Review?

Specification Template - Overlay Interfaces to the Training Environment

Training Environment Element	Training Overlay Requirements to interface to the Training Environment	
	Environment Management	Instruction and Exercise Management
Training Audience		
Asymmetric surface threat		
Sea State		
Upper Deck Weapons		



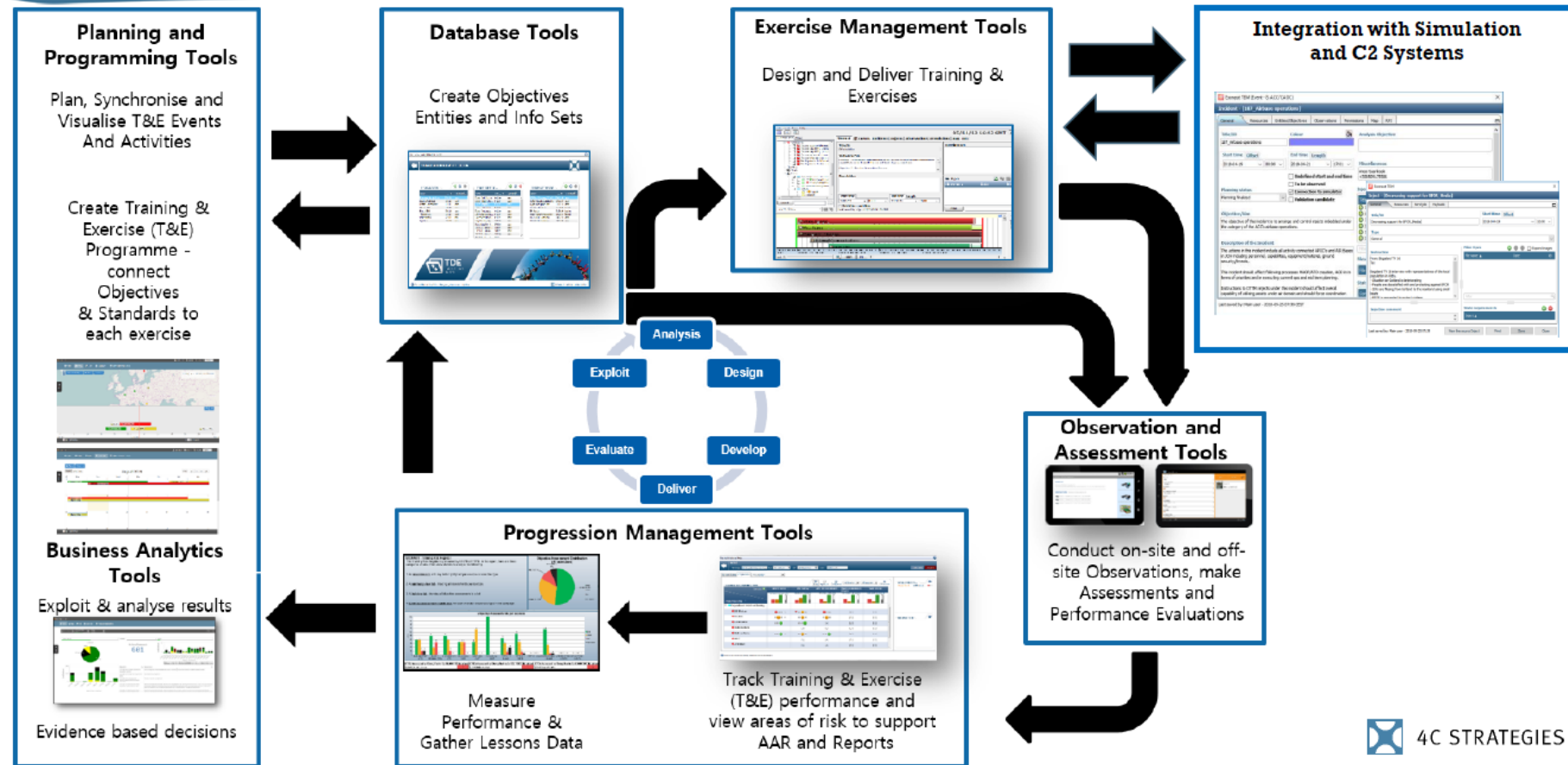
Specification Template - Overlay Interfaces to the Training Environment

Training Environment Element	Training Overlay Requirements to interface to the Training Environment	
	Environment Management	Instruction and Exercise Management
Training Audience	N/A	Brief, monitor, record, and debrief performance. Replay of actions for debrief.
Asymmetric surface threat	Set up of single or multiple contacts, control of course, speed and actions. View track and current position.	Recording of course and actions for debrief. View track and current position.
Sea State	Set the sea state for the exercise.	N/A
Upper Deck Weapons	Set/reset and monitor ammunition levels.	Recording of hits on target for debrief.



Example of a supporting system

EXONAUT ENABLED TRAINING AND READINESS MANAGEMENT



Slide courtesy of 4C Strategies showing their EXONAUT® software product

Training Options Analysis

- Evaluation criteria development
- Training option identification and description
- Comparison of training options

Evaluation Criteria Examples

- Performance:
 - Coverage of the training objectives;
 - Provision of the required range of conditions in the training environment;
 - Support for the training overlay functions.
- Costs;
- Capacity to support the required training throughput (surge and steady state);
- Flexibility (e.g. adaptability to meet future changes);
- Interoperability (e.g. potential for a synthetic training system to be connected to other synthetic training systems);
- Development time relative to key dates such as In Service Date;
- Staff training requirements

Sources of Cost

Capital Cost Items

- Training Media
- Integration into Existing Training Solutions
- Training Support Systems
- First of Class Training
- Reference Documentation
- Training Design
- New or Refurbished Training Infrastructure
- IT Infrastructure
- Risk Mitigation

Annual Through Life Support Costs

- Live and Workplace Training Instructors
- Train the Trainer Courses
- Training Support Staff
- Training Administrators
- Travel and Subsistence
- Consumables and Utilities
- Training Design
- Training Publications
- Facilities Management

Training Option Descriptions

- Overview
- Training environment provision
- Staff tasks
- Staff requirements
- Supporting systems
- Resources
- Staff training requirements
- Training linkages (to other components in the individual – collective continuum)
- Equipment
- Infrastructure
- Training information management
- Organisational responsibilities
- Logistics
- Interoperability

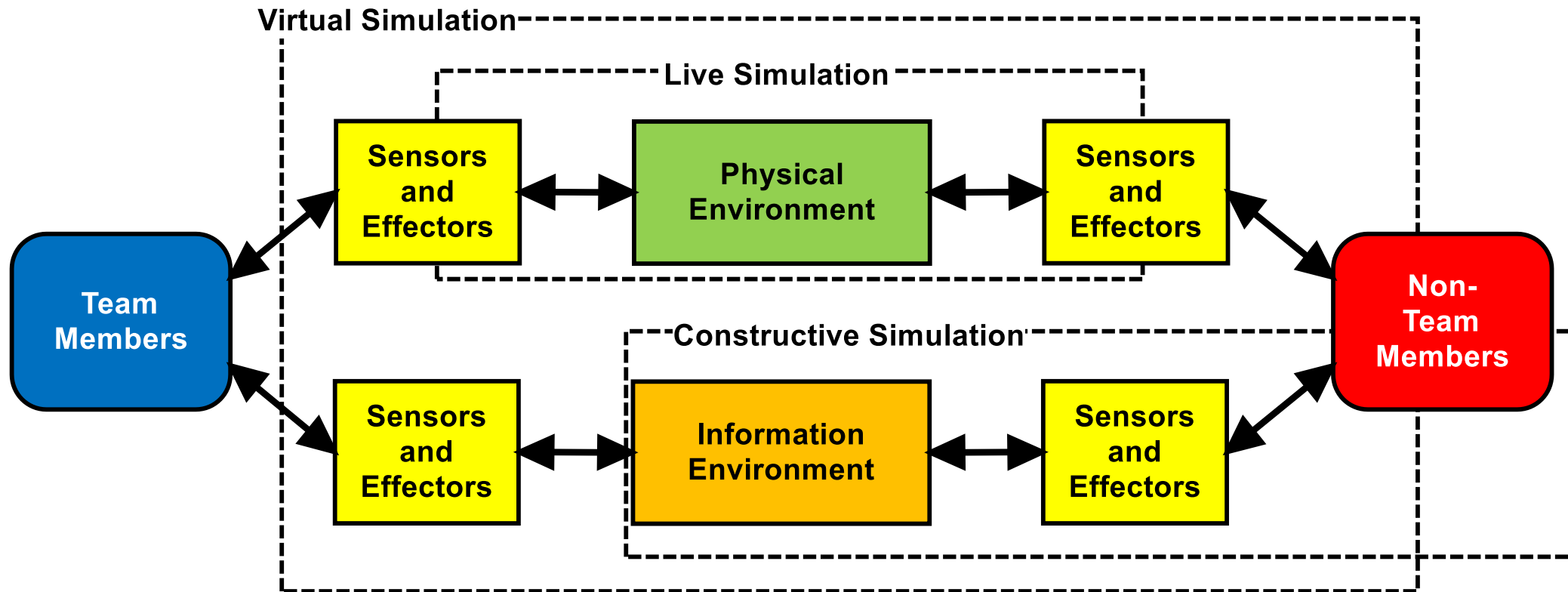
Evaluating the Capability of Existing Systems (Evaluation Matrix)

Environment Elements	Existing Systems (Evaluation of environment and overlay requirements)				
	Live with Ships RIB as the Asymmetric Threat	Live with contracted RIBs as the Asymmetric Threat	Maritime Synthetic Training System (MaST)	Close Range Weapons Trainer	Bridge Trainer
Sea					
Insurgent Crewman					
Insurgent Helmsman					
Local shipping					
Own ship					
Asymmetric Threat	Limited	Limited			
Asymmetric Threat Small arms	Critically Limited – no weapons effects	Critically Limited – no weapons effects			
Radar					
ESM					
GPEOD					
Helm					
Bridge Windows					
Radio					
GPMG	Critically Limited – no weapons effects	Critically Limited – no weapons effects		Limited – only 2 GPMGs	

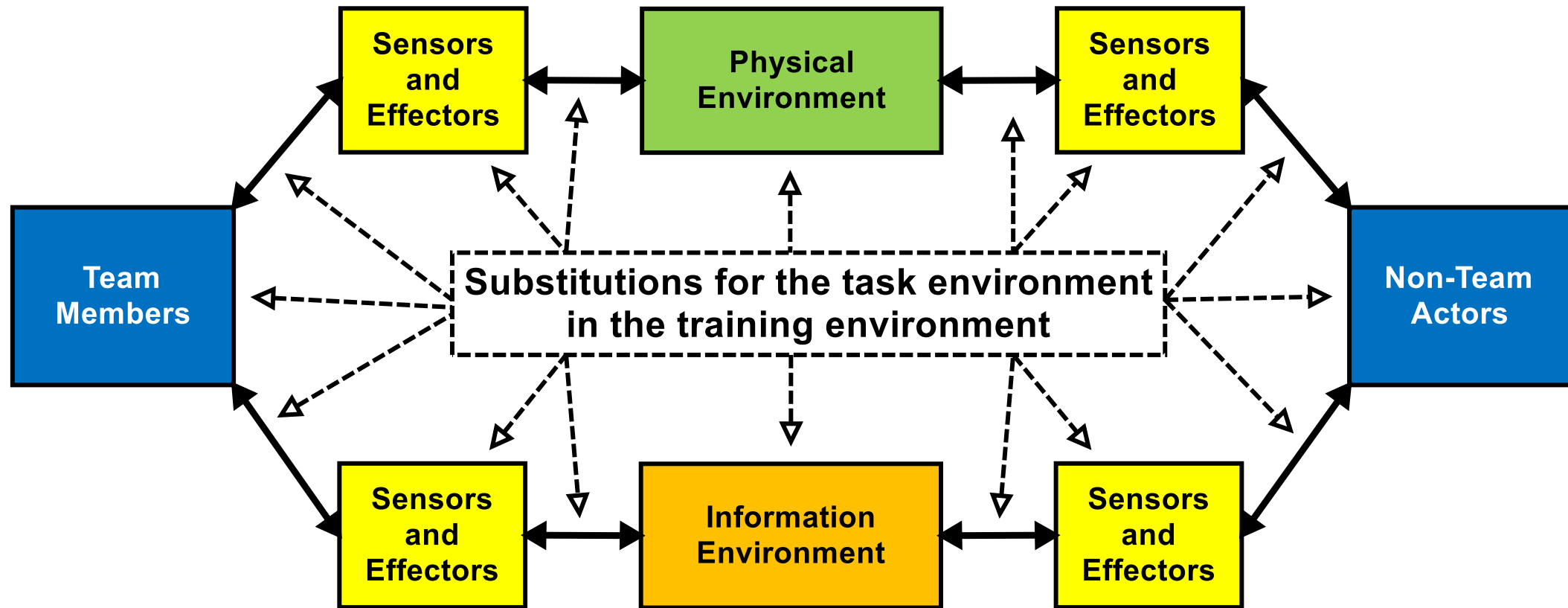
	Fully meets the requirement		Partially meets the requirement		Does not meet the requirement
--	-----------------------------	--	---------------------------------	--	-------------------------------



Types of Simulation Mapped onto Training Environment Model Components



Synthetic Substitutions in Training Environments



Continual innovation in possible substitutions demonstrated daily on the IITSEC exhibition

Evaluation Criteria Examples

- Performance:
 - Coverage of the training objectives
 - Provision of the required range of conditions in the training environment
 - Support for the training overlay functions
- Costs
- Capacity to support the required training throughput (surge and steady state)
- Flexibility (e.g. adaptability to meet future changes)
- Interoperability (e.g. potential for a synthetic training system to be connected to other synthetic training systems)
- Development time relative to key dates such as ISD
- Staff training requirements

Evaluation Matrix

Evaluation Criteria	Options		
	Live with Ships RIB as the Asymmetric Threat	Live + remote controlled boat	Enhanced Close Range Weapons Trainer + MCTS
1. Availability			High at Devonport
2. Accessibility			At Devonport
3. Cost			
Training Objectives	Training Objective Coverage		
TO 1 Search for Threat			
TO5 Counter Threat	No weapons effects	No weapons effects from threat	
Environment Elements	Evaluation of environment and overlay requirements		
Sea			
Insurgent Crewman			
Insurgent Helmsman			
Local shipping			
Own ship			
Asymmetric Threat	Limited	1/3 scale	
Asymmetric Threat Small arms	Critically Limited – no weapons effects		
GPMG Mode of action	No fall of shot		
GPMG Overlay reqts	No hit indication		
Mk44 HMI			
MK44 Mode of Action	No fall of shot		
Mk44 Overlay Reqts	No hit indication		

	Fully meets the requirement
	Partially meets the requirement
	Does not meet the requirement

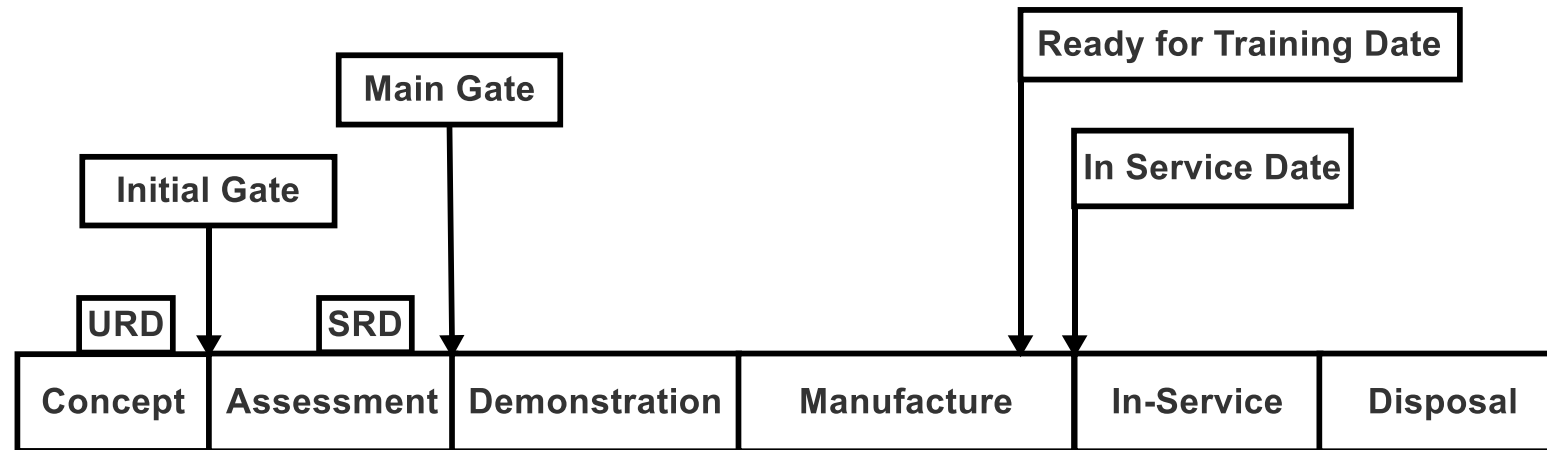


Iterative application of TCTNA in acquisition

- Issues
- Iteration of TCTNA

Issues

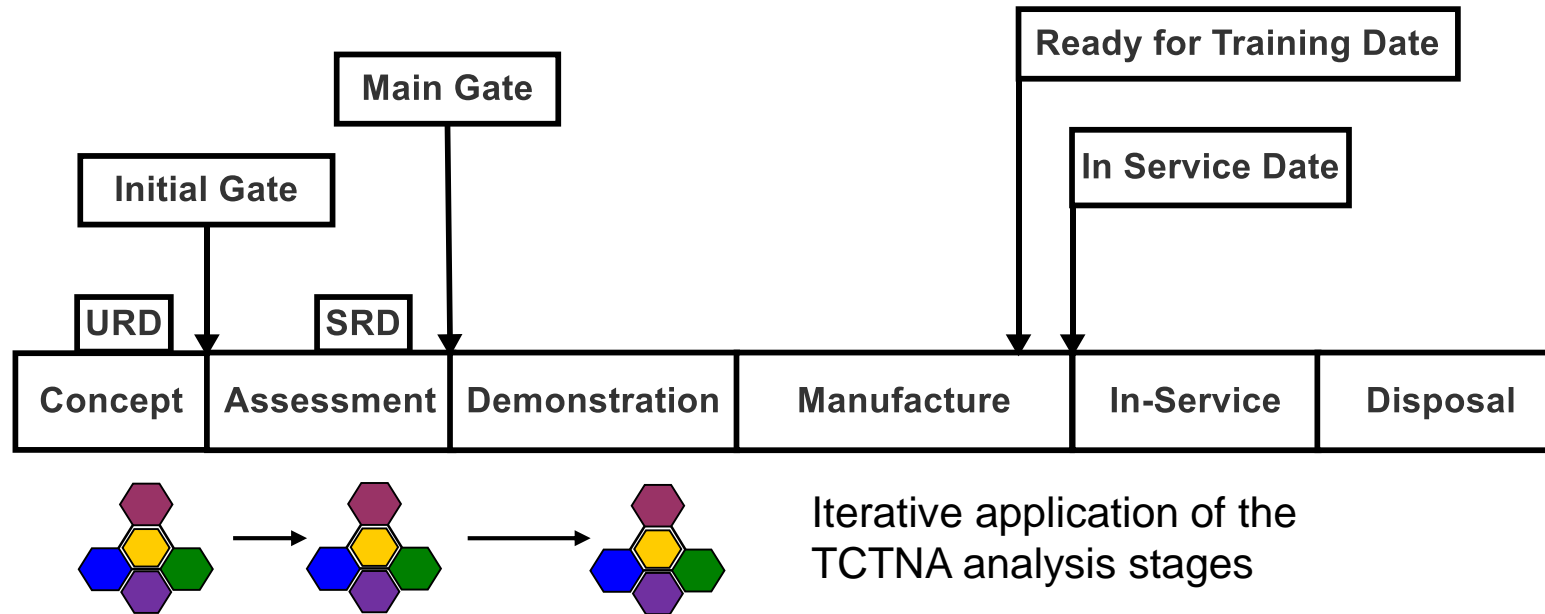
URD - User Requirements Document
SRD - System Requirements Document



- Information for detailed TNA not usually available until during demonstration/manufacture
- TNA outputs (notably Rough Order of Magnitude costs) required to inform Initial Gate and Main Gate Business Cases

Iteration of TCTNA

URD - User Requirements Document
SRD - System Requirements Document



Project Initiation

- Purpose and Output of Project Initiation
- Steering Group Composition

Purpose of Project Initiation

Project management and planning activity to:

- Define the requirement
- Define the deliverables
- Develop a plan to meet the requirement

Output of Project Initiation

The output of this phase is the Project Initiation Document which details:

- Aim of the TCTNA;
- Context of the TCTNA;
- Links to other Training Analyses;
- Required Outputs;
- Key Project Data;
- Management Structure and Process;
- Data Sources and Points of Contact;
- Resources;
- Methodology;
- Plan and Timescales;
- CARO

Steering Group Composition

- **Chair:** It is suggested that the Chair would be a represent the sponsor of the TCTNA.
- **User Representative:** To provide the organisational perspective of the capability requirements.
- **Training Delivery Organisation Representative:** To provide the training delivery organisation perspective on extant training capability and the implications for adopting alternative training solutions, which may include infrastructure requirements and logistics.
- **Human Resources Representative:** To advise on personnel issues.
- **Quality Assurance Personnel:** Ensures coherence with applicable Policy and Guidance.
- **Industry:** At the Chair's discretion if contracts have been let. Could be prime contractor and / or training solution / analysis contractor.
- **Subject Matter Experts (SMEs):** As required. It should be noted that many SMEs may not have experience of the new capability, but will have experience of similar legacy capabilities.
- **Acquisition Organisation Human Factors Representative:** To advise on the integration and coordination of TCTNA activity with broader human factors activity associated with system/platform acquisition.

Any Questions?

- Identify the areas of complexity of team and collective training that have to be addressed in the training needs analysis process.
- Recognise and describe the elements of the supporting models which underpin TCTNA.
- Describe the purpose and outputs of the key analytical stages of TCTNA, and how these inform subsequent stages of training design.
- Illustrate the interconnections between the main areas of analysis
- Outline how TCTNA can be applied iteratively in the acquisition process and in auditing existing means of training delivery.

Bibliography

