



Maritime &
Coastguard
Agency

Consultation Report:
Cadet Training & Modernisation
Programme Syllabus Review – Seventh
Group of Consultation Templates

July 2023

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Foreword

The Maritime and Coastguard Agency (MCA), an executive Agency of the Department for Transport (DfT), carried out a public consultation on behalf of the Cadet Training and Modernisation (CT&M) Programme from 17th April to the 15th May 2023 regarding the Cadet Training Syllabus Review. The consultation was published on 17th April 2023 and notification of the consultation was sent to all participants of the CT&M Programme for wider dissemination through the maritime industry. This was also promoted on social media platforms and maritime news outlets.

The proposed amendments to the Cadet training syllabus were published in multiple formats and feedback on these amendments was gathered through surveys hosted on Smart Survey.



1 Key Findings

1.1 Introduction

- 1.1.1 Through the process of the consultation, it has been found that the majority of survey respondents agreed with the changes suggested by CT&M Sub-Group 1.2.



1.2 Consultation

- 1.2.1 The seventh consultation was carried out between 17th April and 15th May 2023 and can be found at: www.gov.uk
- 1.2.2 A total of 17 responses were received across the six templates. With all respondents answering every question posed on their survey. A summary of consultee responses and the action taken by CT&M Sub-Group 1.2 as a result can be found in **Annex A**. A more detailed summary can be found in the accompanying 'Detail of feedback received' section of the consultation page. The answers given have been fully and carefully considered.
- 1.2.3 This consultation has been completed in order to ensure best practice has been followed and provide the opportunity for feedback from the entire maritime industry. There was no legal requirement to undertake this consultation.



Consultation Outcome



2 Summary of responses

2.1 Introduction

- 2.1.1 A total of 23 outcomes over six templates were posed in the seventh consultation.
- 2.1.2 These outcomes, together with the consultees comments and the Cadet Training & Modernisation Sub-Group 1.2's response, are shown in detail in the accompanying 'Detail of feedback received' section of the consultation page. However, the main points are summarised below at Annex A.
- 2.1.3 Finalised versions of each module can also be found in the 'Detail of outcome' section of the consultation page.



3 Our response

3.1 What happens next?

- 3.1.1 The MCA will make the appropriate amendments to the syllabus templates. These will then be used to create academic modules that will form the new Cadet training syllabus with a view to complete this process by the end of 2023.
- 3.1.2 Once these academic modules have been created, it will take approximately 12 to 18 months to implement the new syllabus.
- 3.1.3 Cadet Assessment and the Training Record Book will also be amended to reflect these changes.



ANNEX A

SUMMARY OF THE CONSULTATION OUTCOMES, CONSULTEE FEEDBACK AND SUB-GROUP 1.2 RESPONSES TO THE FEEDBACK

Each module had its own survey which included the recommendations of Sub-Group 1.2:

Deck - Marine Engineering Systems			
Outcome	Sub-Group 1.2 Recommended Action	Consultation Support %	Changes made as a result of industry feedback
Outcome 1: Describe the operating principles of marine power plants.	Keep	100%	None
1.1 Operating principles of power plants	Keep	100%	None
1.2 Factors affecting fuel consumption and accurately perform fuel calculations.	Modernise	100%	None
1.3 Power source and storage (Battery technology) Safety and efficiency	Add	100%	None
Outcome 2: Describe the function and operation of a vessel's auxiliary machinery	Contextualise	100%	None
2.1 Function and operational limitations	Keep	100%	None
2.2 Awareness of the relevant regulations	Contextualise	80%	None
2.3 Steering and manoeuvring systems	Keep	100%	None
Outcome 3: Define engineering terms and describe the concepts of control systems.	Modernise	80%	None
3.1 Marine engineering terms	Keep	100%	None

3.2 Operation of vessel monitoring and control systems.	Keep	100%	None
Outcomes for this competency, above and beyond STCW which would be needed due to use of modern technology and impact of future fuels onboard:			
How would you deliver this outcome/ objective?	How would you assess this outcome/ objective?	Action required	Consultation Support %
Ensure all outcomes are contextualised to help Cadets understand what they are learning in relation to what they will experience at sea.	While some outcomes are intrinsically linked to work carried out at sea, some need to be contextualised to show how they apply to work on board. Where this is the case, it is important to make sure Cadets clearly understand how the outcome relates to work at sea and it is essential to make sure that this context is given with reference to current and future seagoing technologies and practices.	Where outcomes do not specifically cover a topic which relates to work carried out at sea, more must be done to contextualise the outcome and make it relevant to the maritime industry, giving specific shipping examples of how the outcome may be applied in a modern shipping context. Not every template has contextualisation recommendations but please do add any you feel may have been missed.	100%
Include Human Element Factors throughout the syllabus	To provide seafarers with a contextualised understanding of the Human Element in the maritime industry, showing how they can put theory into practice in the work they carry out at sea.	Raise awareness throughout the Cadet's training of the areas in which human element factors will have an impact. Recommendations on where this can be included have been noted throughout the entire syllabus. Not every template has Human Element Factor recommendations but please do add any you feel may have been missed.	100%

<p>Include Data Science skills throughout the syllabus</p>	<p>Data Science Skills (Comprehension, Analysis, Presentation, etc...) are already required within much of the syllabus. A further, specific focus on these skills needs to be taught where relevant.</p>	<p>A specific topic will need to be introduced to improve Cadets' Data Science skills. Practical application of data science skills should be highlighted throughout the syllabus. Not every template has Data Science recommendations but please do add any you feel may have been missed.</p>	<p>80%</p>
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Deck - Passage Planning			
Outcome	Sub-Group 1.2 Recommended Action	Consultation Support %	Changes made as a result of industry feedback
Outcome 1: Appraise the intended passage	Modernise	100%	None
1.1 Principles of passage planning	Keep	100%	None
1.2 Passage planning legislation	Keep	100%	None
1.3 Charts and publications	Modernise	75%	None
1.4 Sailings, great circle sailings and tidal calculations	Remove tidal calculations from this outcome	75%	None
1.5 Availability of navigational aids	Keep	100%	None
1.6 Ship reporting and weather routeing	Keep	100%	None
1.7 Landfall and confined water procedures	Contextualise	100%	None
Outcome 2: Prepare and document a passage plan.	Modernise	100%	None
2.1 Great circle, composite great circle and rhumb line routes	Modernise	75%	None
2.2 Distance and courses on great circle, composite great circle and rhumb line route	Keep	100%	None
2.3 Use, and the understanding of the implication, of Tidal heights, times, and streams to ensure the passage is made safely	Modernise	100%	None
2.4 Co-tidal/co-range charts	Remove	100%	None
2.5 Landfall and port approaches	Keep	100%	None
2.6 No go areas and navigational hazards	Keep	100%	None
2.7 Accuracy of position fixing	Modernise	100%	None

2.8 Wheel over positions	Keep	100%	None
2.9 Document the passage plan	Keep	100%	None
Outcome 3: Evaluate a completed passage plan.	Modernise	75%	None
3.1 Factors affecting the execution of the passage plan including:	Amend	100%	None
3.2 Tidal considerations for underkeel and air draft clearance	Keep	100%	None
3.3 Traffic considerations	Keep	100%	None
3.4 Navigational accuracy	Amend	100%	None
3.5 Meteorological conditions	Keep	100%	None
3.6 Condition of the vessel	Keep	100%	None
3.7 Vessel traffic systems and reporting schemes	Keep	100%	None
3.8 Monitoring the passage plan	Keep	100%	None
Outcome 4: Implement and monitor appropriate solutions for situations which arise during a passage.	Modernise	75%	None
4.1 Contingency plans for critical navigational areas	Keep	100%	None
4.2 Adjustments to the passage plan for routine changes	Keep	100%	None
4.3 Adjustments required to the plan for adverse environmental conditions	Keep	100%	None
Outcome 5: Perform calculations relating to a vessel's position	Modernise	75%	None
5.1 Solution and evaluation of astronomical observations including resolution of the 'cocked hat' problem	Remove the requirement to assess this outcome.	75%	None

5.2 Adjustments required to the plan to comply with Search and Rescue (SAR) or medical emergencies	Keep	100%	None
Outcomes for this competency, above and beyond STCW which would be needed due to use of modern technology and impact of future fuels onboard:			
How would you deliver this outcome/ objective?	How would you assess this outcome/ objective?	Action required	Consultation Support %
Ensure all outcomes are contextualised to help Cadets understand what they are learning in relation to what they will experience at sea.	While some outcomes are intrinsically linked to work carried out at sea, some need to be contextualised to show how they apply to work on board. Where this is the case, it is important to make sure Cadets clearly understand how the outcome relates to work at sea and it is essential to make sure that this context is given with reference to current and future seagoing technologies and practices.	Where outcomes do not specifically cover a topic which relates to work carried out at sea, more must be done to contextualise the outcome and make it relevant to the maritime industry, giving specific shipping examples of how the outcome may be applied in a modern shipping context. Not every template has contextualisation recommendations but please do add any you feel may have been missed.	100%
Include Human Element Factors throughout the syllabus	To provide seafarers with a contextualised understanding of the Human Element in the maritime industry, showing how they can put theory into practice in the work they carry out at sea.	Raise awareness throughout the Cadet's training of the areas in which human element factors will have an impact. Recommendations on where this can be included have been noted throughout the entire syllabus. Not every template has Human Element Factor recommendations but please do add any you feel may have been missed.	100%

<p>Include Data Science skills throughout the syllabus</p>	<p>Data Science Skills (Comprehension, Analysis, Presentation, etc...) are already required within much of the syllabus. A further, specific focus on these skills needs to be taught where relevant.</p>	<p>A specific topic will need to be introduced to improve Cadets' Data Science skills. Practical application of data science skills should be highlighted throughout the syllabus. Not every template has Data Science recommendations but please do add any you feel may have been missed.</p>	<p>75%</p>
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ETO - Electronic Fault Finding			
Outcome	Sub-Group 1.2 Recommended Action	Consultation Support %	Changes made as a result of industry feedback
Outcome1: Explain the techniques of fault diagnosis in electronic circuits and systems	Keep	100%	None
1.1 Sequential and non-sequential fault location methods	Keep	100%	None
1.2 Systematic fault location methods eg input to output, output to input, half-split	Keep	100%	None
1.3 Fault location methods in complex systems eg divergence, convergence, alternative path	Keep	100%	None
1.4 Exceptional faults eg manufacturing faults, multiple faults, catastrophic failure	Keep	100%	None
1.5 Faults in micro-controllers in digital electronic circuits	Add	100%	None
Outcome 2: Implement a fault location strategy in an electronic system	Keep	100%	None
2.1 Identify risks and use safe working practices	Keep	100%	None
2.2 Identify fault symptoms in terms of system operation	Keep	100%	None
2.3 Interpret fault symptoms using test equipment and/or diagnostic aids	Keep	100%	None
2.4 Locate faulty circuit using system documentation and test equipment	Keep	100%	None

2.5 Design and analyse simple analogue and digital circuits	Add	100%	None
Outcome 3: Locate faults to component level in digital and analogue circuits	Contextualise	100%	None
3.1 Identify risks and use safe working practices	Keep	100%	None
3.2 Identify fault symptoms in terms of system operation	Keep	100%	None
3.3 Select a suitable fault location method	Keep	100%	None
3.4 Locate a fault to component level on an analogue system	Keep	100%	None
3.5 Locate a fault to component level on a digital system	Keep	100%	None
3.6 Use appropriate test equipment	Keep	100%	None
3.7 Correct use of a circuit diagram	Keep	100%	None
3.8 Using shoreside assistance for fault finding.	Add	100%	None
Outcomes for this competency, above and beyond STCW which would be needed due to use of modern technology and impact of future fuels onboard:			
How would you deliver this outcome/ objective?	How would you assess this outcome/ objective?	Action required	Consultation Support %
Ensure all outcomes are contextualised to help Cadets understand what they are learning in relation to what they will experience at sea.	While some outcomes are intrinsically linked to work carried out at sea, some need to be contextualised to show how they apply to work on board. Where this is the case, it is important to make sure Cadets clearly understand how the outcome relates to work at sea and it is essential to make sure that this context is given with	Where outcomes do not specifically cover a topic which relates to work carried out at sea, more must be done to contextualise the outcome and make it relevant to the maritime industry, giving specific shipping examples of how the outcome may be applied in a modern shipping context. Not every template has	100%

	reference to current and future seagoing technologies and practices.	contextualisation recommendations but please do add any you feel may have been missed.	
Include Human Element Factors throughout the syllabus	To provide seafarers with a contextualised understanding of the Human Element in the maritime industry, showing how they can put theory into practice in the work they carry out at sea.	Raise awareness throughout the Cadet's training of the areas in which human element factors will have an impact. Recommendations on where this can be included have been noted throughout the entire syllabus. Not every template has Human Element Factor recommendations but please do add any you feel may have been missed.	100%
Include Data Science skills throughout the syllabus	Data Science Skills (Comprehension, Analysis, Presentation, etc...) are already required within much of the syllabus. A further, specific focus on these skills needs to be taught where relevant.	A specific topic will need to be introduced to improve Cadets' Data Science skills. Practical application of data science skills should be highlighted throughout the syllabus. Not every template has Data Science recommendations but please do add any you feel may have been missed.	100%

Marine Engineering: Heat Engine Principles(Management Level)			
Outcome	Sub-Group 1.2 Recommended Action	Consultation Support %	Changes made as a result of industry feedback
Outcome1: Apply the fundamental properties of thermodynamics to a process	Keep	100%	None
1.1 Relationship between p, V and T for polytropic and adiabatic processes	Keep	100%	None
1.2 Work transfer for reversible processes	Keep	100%	None
1.3 Heat transfer for reversible processes	Keep	100%	None
1.4 Specific heat at constant pressure and constant volume	Keep	100%	None
1.5 Change of entropy of a perfect gas	Keep	100%	None
1.6 P–V and T–S diagrams	Keep	100%	None
1.7 Avogadro's Law	Keep	100%	None
1.8 Universal Gas Constant	Keep	100%	None
Outcome 2: Evaluate and apply marine heat engine cycles	Contextualise	100%	None
2.1 Second law of thermodynamics	Keep	100%	None
2.2 Comparison of the Carnot cycle with ideal heat engines, its thermal efficiency and the application of Carnot's principle to the second law of thermodynamics	Keep	100%	None
2.3 Comparison of the Carnot cycle with ideal heat engine cycles	Keep	100%	None

2.4 Ideal engine cycles described using P-V and T-S diagrams and practical counterparts applied to Marine engines	Keep	100%	None
2.5 Thermal efficiency, indicated and brake mean effective pressure, work done and air standard efficiency of Ideal cycles	Keep	100%	None
2.6 Thermal efficiency, work, and heat transfer of Gas Turbines	Keep	100%	None
Outcome 3: Calculate heat transfer through complex systems	Keep	100%	None
3.1 Fourier's Law for conductive heat transfer	Keep	100%	None
3.2 Heat transfer through thick cylinders, single and double lagged pipes, spheres, and hemispherical ends of cylinders	Keep	100%	None
3.3 Heat transfer through boundary layers	Keep	100%	None
3.4 Overall heat transfer coefficient 'U' for composite flat plates and composite lagged pipes, using thermal conductivity and surface heat transfer coefficient	Keep	100%	None
3.5 Stefan Boltzmann constant	Keep	100%	None
3.6 Black body' radiation and 'emissivity factor	Keep	100%	None
Outcome 4: Calculate the properties of constituent parts during combustion of marine fuels	Keep	100%	None

4.1 Combustion of fuel by mass and volume	Keep	100%	None
4.2 Stoichiometric, insufficient, and actual air supply and the proportional gravimetric constituents of a fuel from flue gas analysis	Keep	100%	None
4.3 Higher and Lower Calorific Values of fuels and the heat energy released by the various constituents	Keep	100%	None
4.4 Dalton's laws to stoichiometric and other mixtures of gaseous fuels and air	Keep	100%	None
4.5 Dew point' of water vapour from flue gas analysis	Keep	100%	None
4.6 Heat carried away in flue gases and heat transfer from gas to water heat exchangers	Keep	100%	None
Outcomes for this competency, above and beyond STCW which would be needed due to use of modern technology and impact of future fuels onboard:			
How would you deliver this outcome/ objective?	How would you assess this outcome/ objective?	Action required	Consultation Support %
Add an outcome to: "Calculate the power output for non-combustible future marine fuels". Looking beyond the burning of diesel-based fuel	As technology advances, we will move beyond traditional fuel cells, it is essential that we ensure that future seafarers are prepared for these changes.	Add this outcome to the module and suggest its addition as part of the IMO's STCW Comprehensive Review.	100%
Ensure all outcomes are contextualised to help Cadets understand what they are learning in relation to what they will experience at sea.	While some outcomes are intrinsically linked to work carried out at sea, some need to be contextualised to show how they apply to work on board. Where this is the case, it is important to make sure Cadets clearly understand how the outcome relates to work at sea and it is essential to make sure that	Where outcomes do not specifically cover a topic which relates to work carried out at sea, more must be done to contextualise the outcome and make it relevant to the maritime industry, giving specific shipping examples of how the outcome may be applied in a modern shipping context. Not	100%

	<p>this context is given with reference to current and future seagoing technologies and practices.</p>	<p>every template has contextualisation recommendations but please do add any you feel may have been missed.</p>	
<p>Include Human Element Factors throughout the syllabus</p>	<p>To provide seafarers with a contextualised understanding of the Human Element in the maritime industry, showing how they can put theory into practice in the work they carry out at sea.</p>	<p>Raise awareness throughout the Cadet's training of the areas in which human element factors will have an impact. Recommendations on where this can be included have been noted throughout the entire syllabus. Not every template has Human Element Factor recommendations but please do add any you feel may have been missed.</p>	<p>100%</p>
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Marine Engineering: Applied Thermodynamics (Management Level)			
Outcome	Sub-Group 1.2 Recommended Action	Consultation Support %	Changes made as a result of industry feedback
Outcome1: Analyse the use of multistage reciprocating air compressors	Keep	100%	None
1.1 P-V diagrams to describe ideal and actual cycles for multistage compression	Keep	100%	None
1.2 Effect of intercooling between stages by calculating heat transfer during compression and cooling	Keep	100%	None
1.3 Work transfer for ideal and actual cycles including clearance for multistage compression	Keep	100%	None
1.4 Isothermal efficiency	Keep	100%	None
1.5 Indicated and input power requirements	Keep	100%	None
Outcome 2: Apply the concept of reverse heat engine to refrigeration and recognise the properties of common refrigerants	Keep	100%	None
2.1 Concept of entropy to refrigeration using tables and formulae	Keep	100%	None
2.2 Vapour compression cycles and reversed Carnot cycle using p-H and T-S diagrams	Keep	100%	None
2.3 Effects of superheating and undercooling and describe the effects using p-H and T-S diagrams	Keep	100%	None

2.4 COP of actual plant and compare to COP of reversed Carnot cycle	Keep	100%	None
2.5 Use of intermediate cooling and evaluate the application of intermediate cooling by flash chamber	Keep	100%	None
Outcome 3: Determine the efficiency of steam plant and power from a velocity and a pressure compound steam turbine	Keep	100%	None
3.1 Heat energy distribution in a boiler and compile a heat balance account.	Keep	100%	None
3.2 Thermal efficiency	Keep	100%	None
3.3 H-S and T-S charts to evaluate and analyse the basic Carnot and Rankine cycles including improvements from superheating, reheating and feed heating	Keep	100%	None
3.4 Steady flow energy equation to steam nozzles to calculate throat and exit velocities	Keep	100%	None
3.5 Reasons for change of nozzle form and convergent and convergent/divergent sections	Keep	100%	None
3.6 Blade velocity diagrams for impulse and reaction turbines, kinetic and leaving losses	Keep	0%	None
3.7 Stage power, stage efficiency and stage axial thrust for a velocity and pressure compounded turbines and the number of stages from given steam	Keep	0%	None

conditions for a reaction turbine			
Outcome 4: Solve problems involving fluid mechanics in pipes, pumps, meters and jets	Keep	100%	None
4.1 Flow velocities and pressures in parallel and tapering pipe work systems and Bernoulli's equation	Keep	100%	None
4.2 Venturi meters	Keep	100%	None
4.3 Forces on pipe bends	Keep	100%	None
4.4 Motion of hydraulic jets in relation to projectile theory	Keep	100%	None
4.5 Power for centrifugal pumps and evaluate performance	Keep	100%	None
Outcomes for this competency, above and beyond STCW which would be needed due to use of modern technology and impact of future fuels onboard:			
How would you deliver this outcome/ objective?	How would you assess this outcome/ objective?	Action required	Consultation Support %
Ensure all outcomes are contextualised to help Cadets understand what they are learning in relation to what they will experience at sea.	While some outcomes are intrinsically linked to work carried out at sea, some need to be contextualised to show how they apply to work on board. Where this is the case, it is important to make sure Cadets clearly understand how the outcome relates to work at sea and it is essential to make sure that this context is given with reference to current and future seagoing technologies and practices.	Where outcomes do not specifically cover a topic which relates to work carried out at sea, more must be done to contextualise the outcome and make it relevant to the maritime industry, giving specific shipping examples of how the outcome may be applied in a modern shipping context. Not every template has contextualisation recommendations but please do add any you feel may have been missed.	100%

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<p>Include Data Science skills throughout the syllabus</p>	<p>Data Science Skills (Comprehension, Analysis, Presentation, etc...) are already required within much of the syllabus. A further, specific focus on these skills needs to be taught where relevant.</p>	<p>A specific topic will need to be introduced to improve Cadets' Data Science skills. Practical application of data science skills should be highlighted throughout the syllabus. Not every template has Data Science recommendations but please do add any you feel may have been missed.</p>	<p>100%</p>

Deck - Management of Bridge Operations			
Outcome	Sub-Group 1.2 Recommended Action	Consultation Support %	Changes made as a result of industry feedback
Outcome 1: Establish watchkeeping arrangements and operational and safety procedures to comply with statutory and international requirements regarding navigation	Contextualise	75%	None
1.1 Statutory and international regulations regarding watchkeeping arrangements on board ship	Contextualise	75%	None
1.2 Masters standing and night orders and general watchkeeping duties	Include a greater understanding of the human factors impacting this outcome.	100%	None
1.3 Position fixing systems	Keep	100%	None
1.4 Master/pilot relationship	Include a greater understanding of the human factors impacting this outcome.	100%	None
1.5 Bridge procedures prior to arrival, departure, encountering heavy weather/ice, at sea and in port	Keep	100%	None
Outcome 2: Explain how to manoeuvre and handle the ship in all conditions	Contextualise	100%	None
2.1 Propulsion and steering systems	Keep	100%	None

2.2 Factors affecting manoeuvring	Keep	100%	None
2.3 Manoeuvring characteristics	Keep	100%	None
2.4 Berthing and unberthing manoeuvres	Keep	100%	None
2.5 Anchoring	Keep	75%	None
2.6 Routine and emergency manoeuvres	Include a greater understanding of the human factors impacting this outcome.	100%	None
Outcome 3: Analyse the principles of the operation and errors of a marine gyro compass	Keep	100%	None
3.1 The controlled gyroscope	Keep	100%	None
3.2 North settling gyroscope	Keep	100%	None
3.3 Gyrocompass errors	Keep	100%	None
3.4 Gyrocompass interfaces	Keep	100%	None
Outcomes for this competency, above and beyond STCW which would be needed due to use of modern technology and impact of future fuels onboard:			
How would you deliver this outcome/ objective?	How would you assess this outcome/ objective?	Action required	Consultation Support %
Ensure all outcomes are contextualised to help Cadets understand what they are learning in relation to what they will experience at sea.	While some outcomes are intrinsically linked to work carried out at sea, some need to be contextualised to show how they apply to work on board. Where this is the case, it is important to make sure Cadets clearly understand how the outcome relates to work at sea and it is essential to make sure that this context is given with reference to current and future seagoing technologies and practices.	Where outcomes do not specifically cover a topic which relates to work carried out at sea, more must be done to contextualise the outcome and make it relevant to the maritime industry, giving specific shipping examples of how the outcome may be applied in a modern shipping context. Not every template has contextualisation recommendations but please do add any you feel may have been missed.	100%

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