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Australian Government
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Science and Technology

An MBSE Methodology to Support Early Stage Australian Naval Vessel Acquisition Projects

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Outline

- Background
- Research Issue
- Focus of Presentation
- Proposed MBSE methodology
- Hydrographic Survey Capability Example Implementation
- Conclusions

Background – Australian Naval Vessel Acquisition

First Principles Review



The ADOD ‘...must deliver a significant capability modernisation program against a backdrop of strategic uncertainty including, but not limited to: rapid technological change; budget uncertainty; substantial economic growth in our region; and increasing demand for military responses...’

→ Reduced guidance with increased oversight

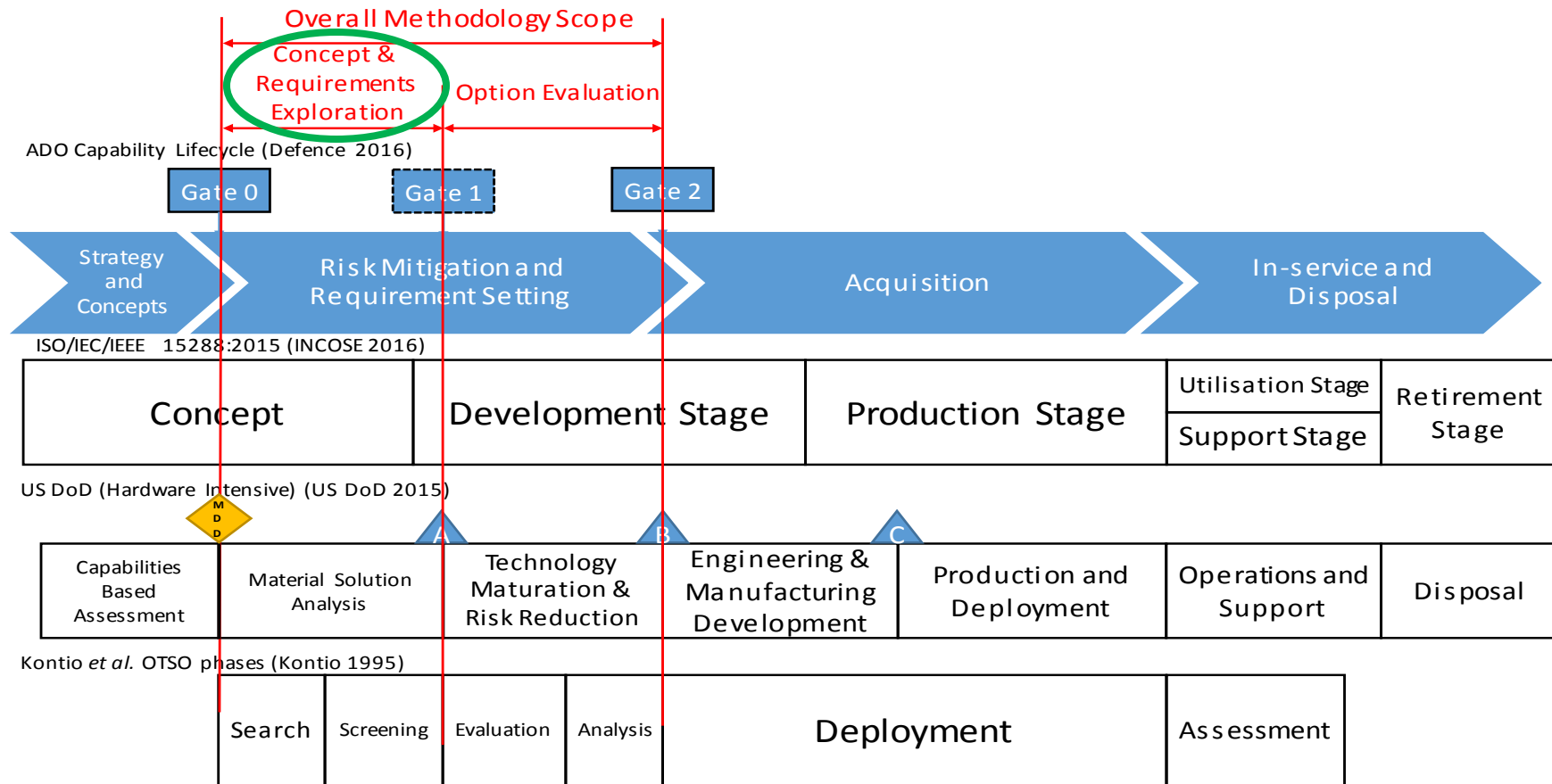
Naval Shipbuilding Plan



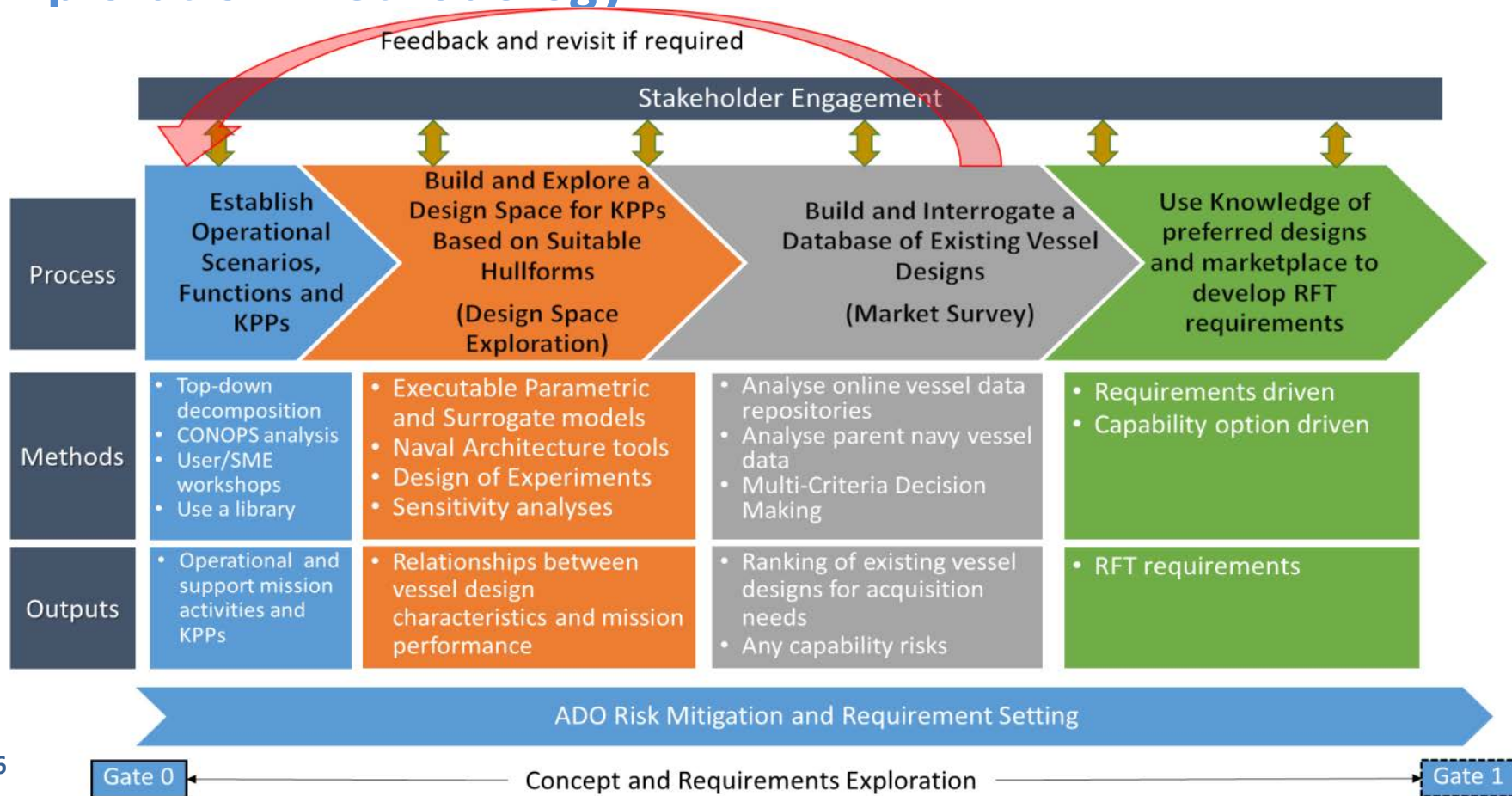
‘Selecting a mature design at the start of the build and limiting the amount of changes once production starts; Limiting the amount of unique Australian design changes.’

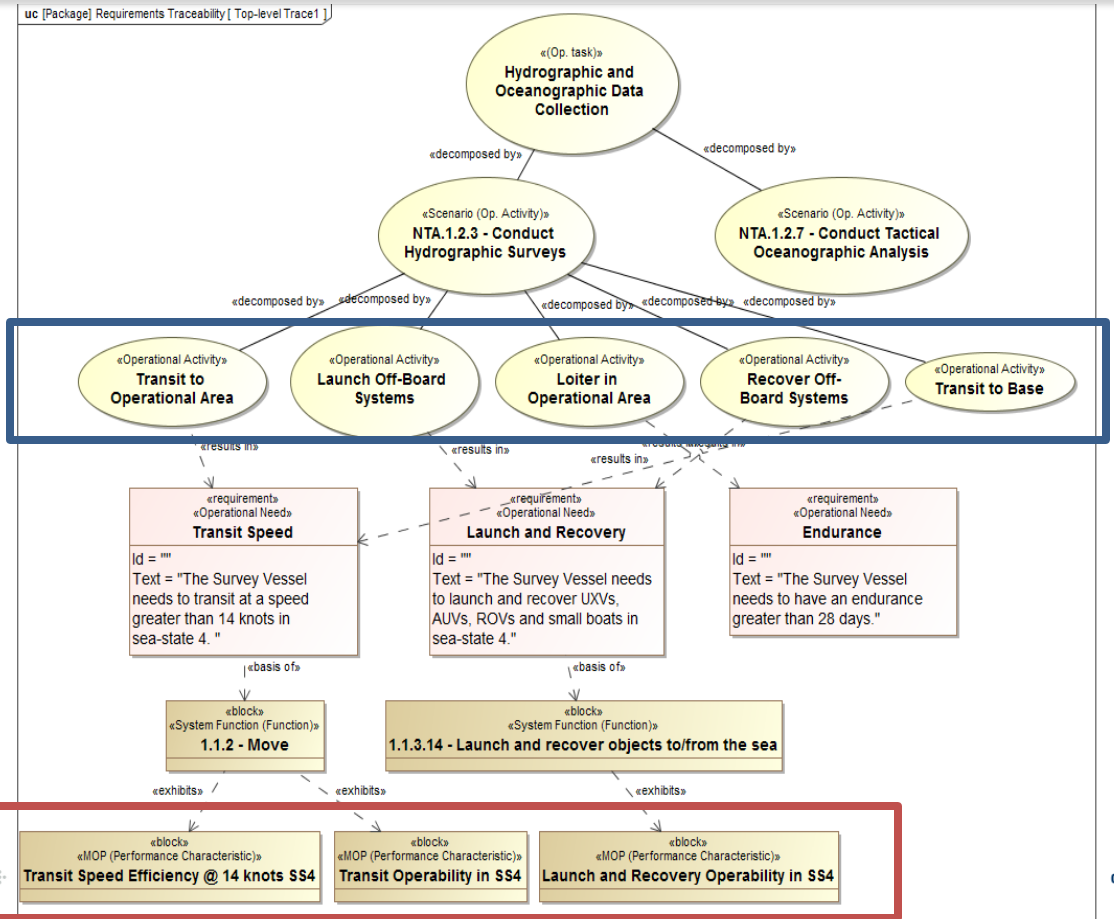
→ Off-the-Shelf (OTS) approach changes nature of acquisitions to ‘middle-out’

Research Focus for this Presentation



Proposed MBSE Off-the-Shelf Concept and Requirements Exploration Methodology



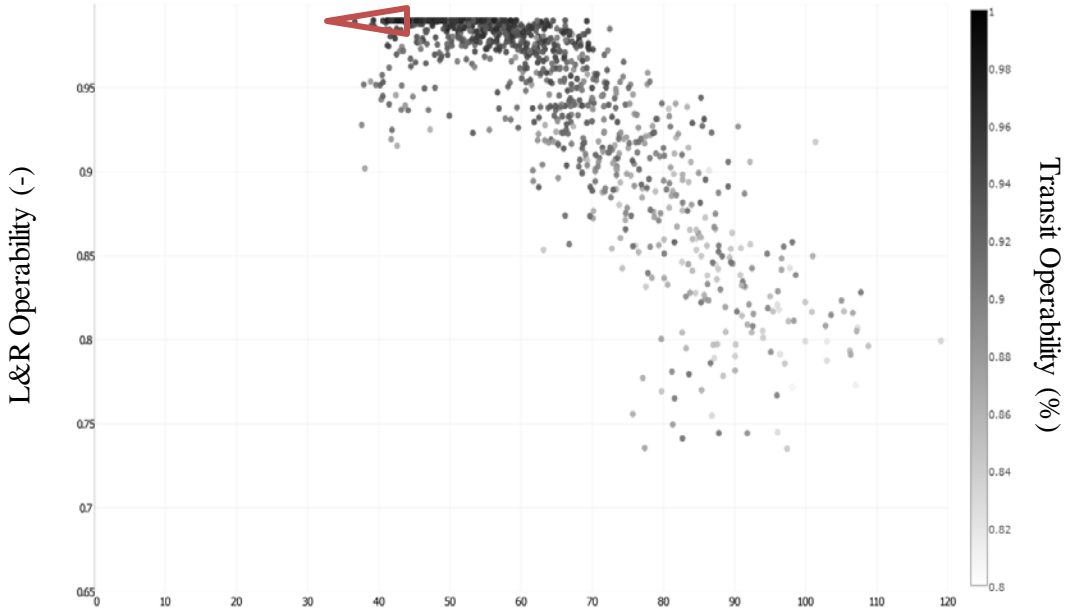


Establish Operational Scenarios, Functions and KPPs

Build and Explore a Design Space for KPPs Based on Existing Hullforms
(Design Space Exploration)

Build and Interrogate a Database of Existing Vessel Designs
(Market Survey)

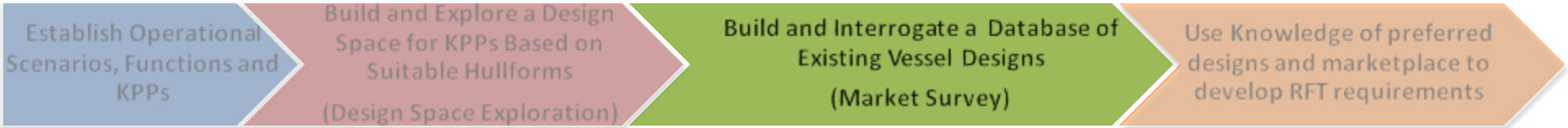
Use Knowledge of preferred designs and marketplace to develop RFT requirements



Generated Design	Length Overall (m)	L/B	B/T	Displacement (tonnes)
775	95	4.12	3.34	9135
337	94.2	4.26	3.47	7871
786	95	4.09	3.97	7850
796	95	4.48	3.50	7301
334	94.2	4.36	3.59	7018
785	95	4.26	3.86	7055
135	93.4	4.12	3.95	7252
482	87.7	4.05	3.56	6443
317	90.2	4.16	3.70	7155

Total Resistance/Displacement @ 14 knots (kN/tonne)





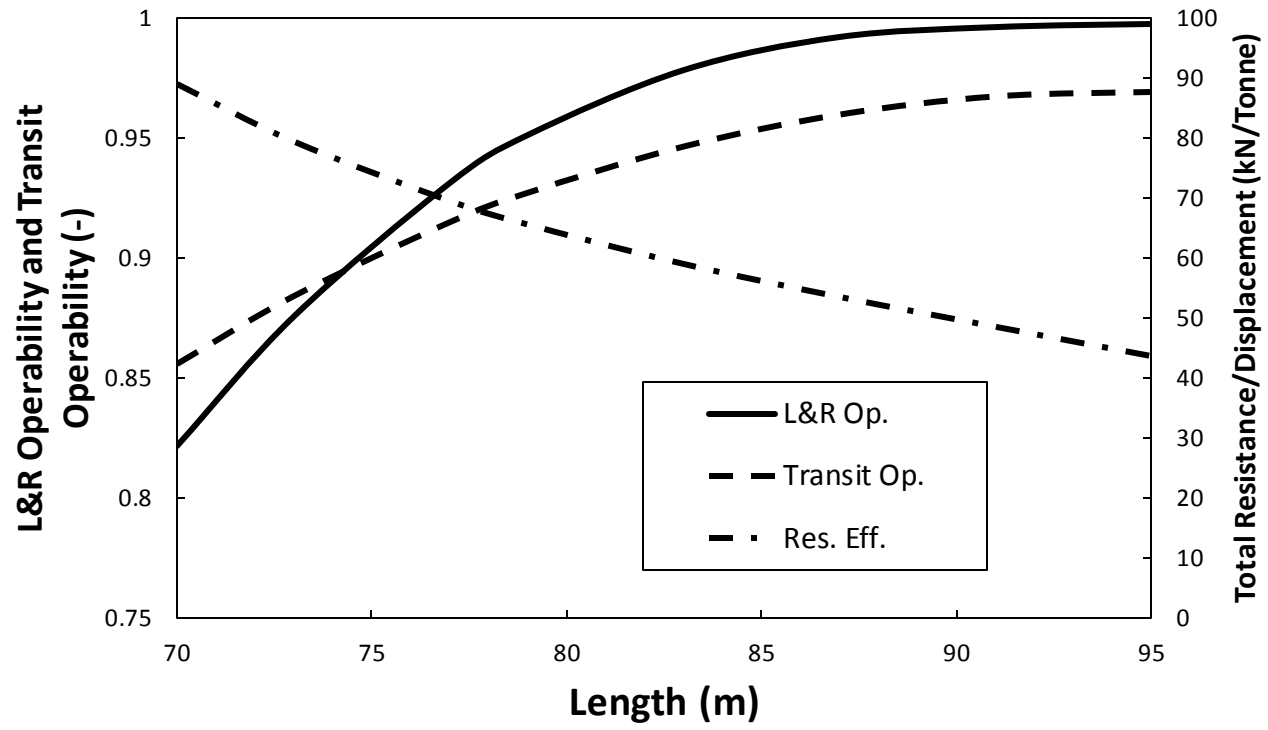
Rank	Displacement (tonnes)	Length (m)	Beam (m)	Length/Beam	Speed (knots)	Range (nm)	Crew
1	6421	89.9	19.1	4.71	15	12000	33
2	2889	87	14.6	5.96	15	12000	31
3	3477	85.7	15	5.71	14	11000	58
4	3455	83.5	16	5.21	15	11300	22
5	2991	85	14.1	6.03	14	10060	23
6	3024	72.5	15.24	4.76	12	10500	20
7	2164	76.8	12.8	6.00	14.5	10000	24
8	2205	71.2	15.2	4.68	14	18000	61
9	2382	67.5	15.3	4.41	16.5	22000	22
10	2298	68.3	13.1	5.21	11	19000	49

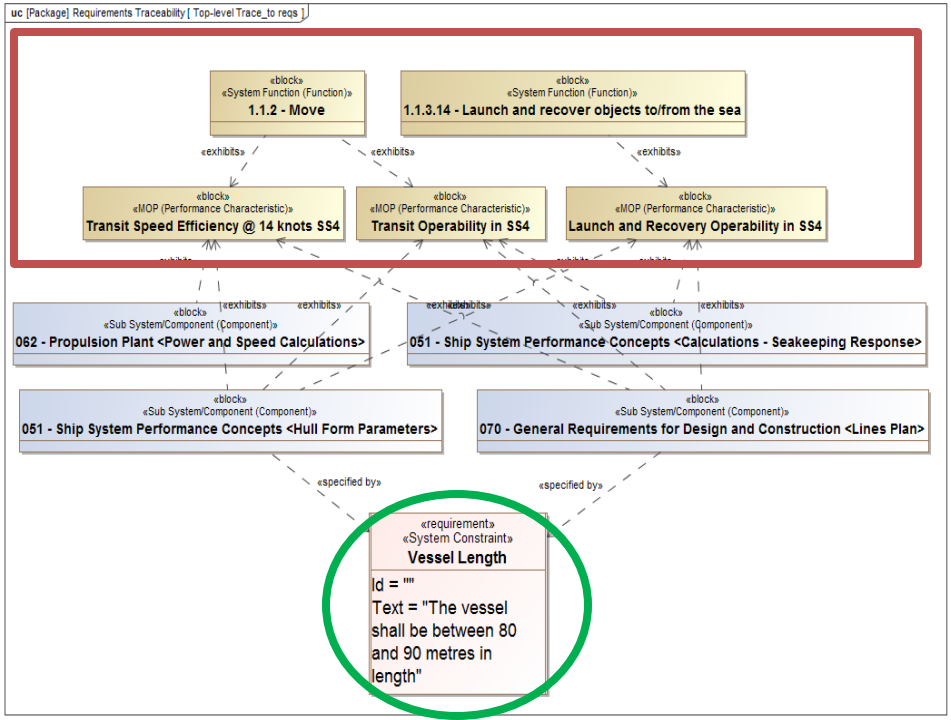
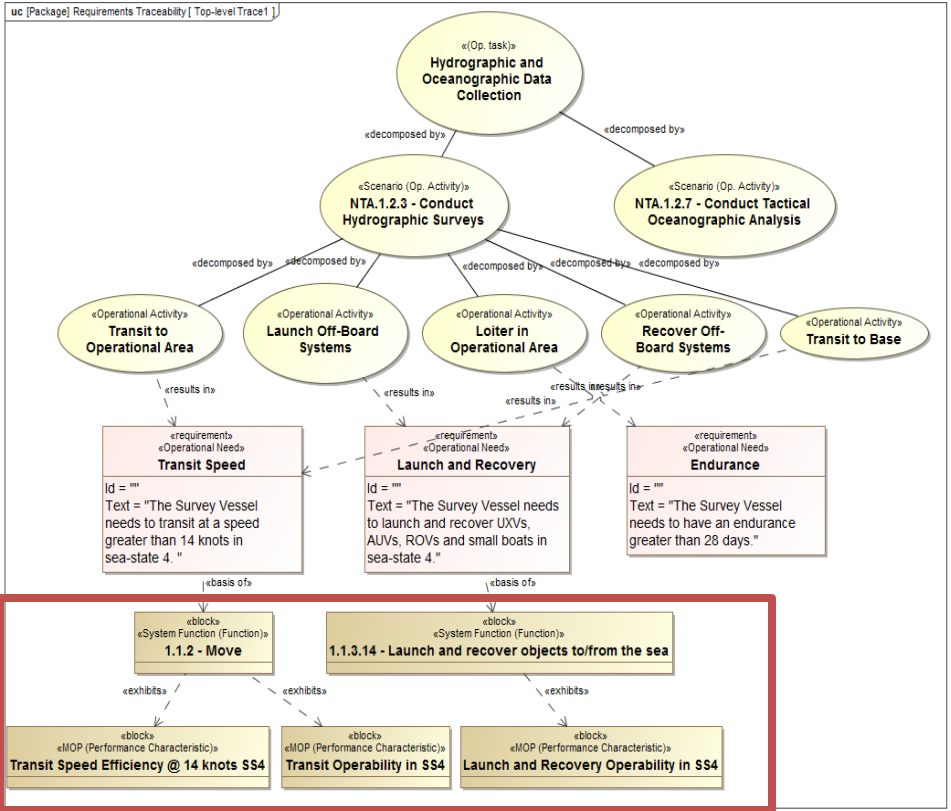
Establish Operational Scenarios, Functions and KPPs

Build and Explore a Design Space for KPPs Based on Suitable Hullforms
(Design Space Exploration)

Build and Interrogate a Database of Existing Vessel Designs
(Market Survey)

Use Knowledge of preferred designs and marketplace to develop RFT requirements





Conclusions

- OTS approach changes the nature of naval vessel acquisitions.
- Proposed an MBSE methodology to support these acquisitions.
- The focus was on the Concept and Requirements Exploration part of the methodology, which includes an explicit market survey.
- The methodology supports defensible decision making through evidence-based analysis and traceability to the strategic capability needs.