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# Meeting Operational Demand

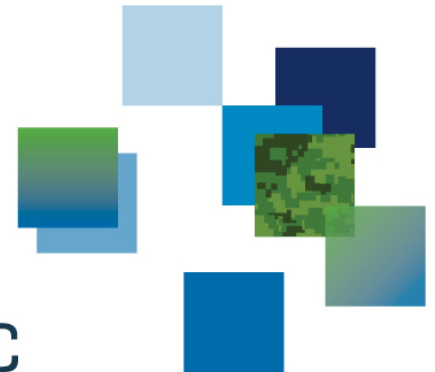
## Determining Output for the Royal Canadian Navy

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NOTICE (U)

(U) This document has been reviewed and DOES NOT CONTAIN  
controlled goods.

## Objective

Provide evidence and insight to the Royal Canadian Navy into fleet size and how it affects the operational output of the fleet and the ability to meet expected demand

# Methodology



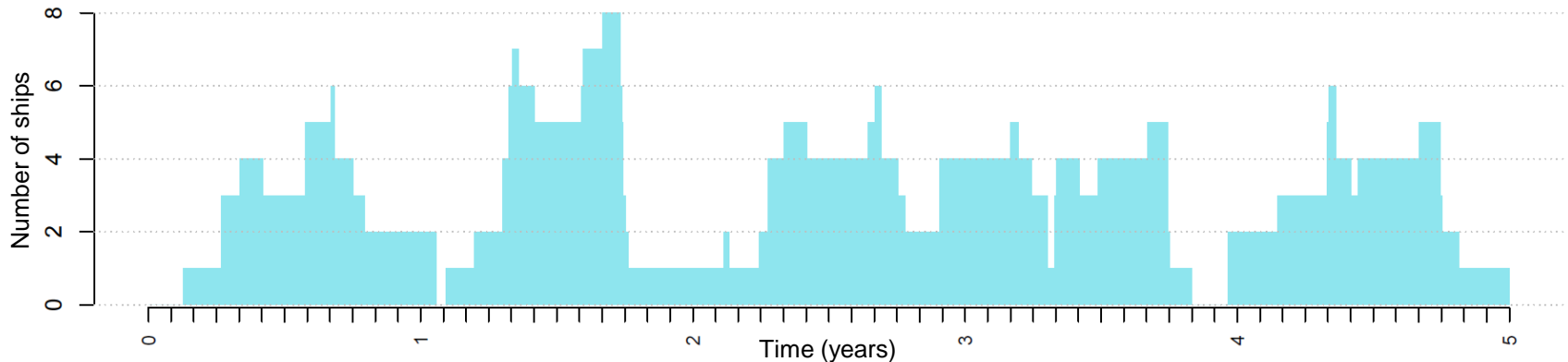
- Vignette-based approach
- Covers full scale of operations
- Frequency of occurrence
- Duration of event
- Expected Response (number of ships)

- Steady-state approach
- Total number of ships in Fleet
- Operational Cycle (OPCYCLE)

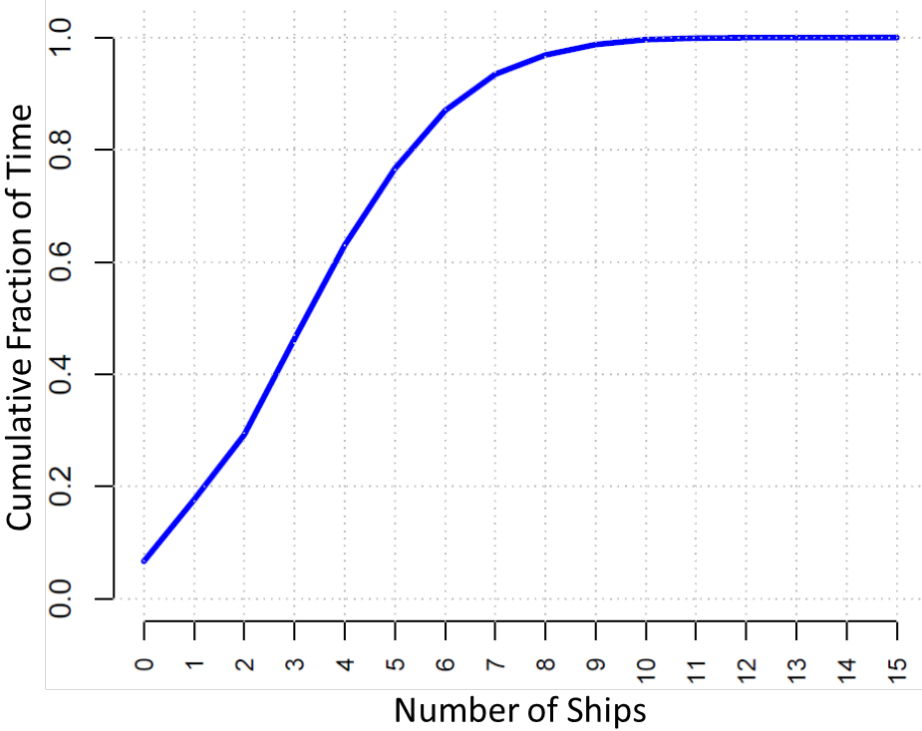
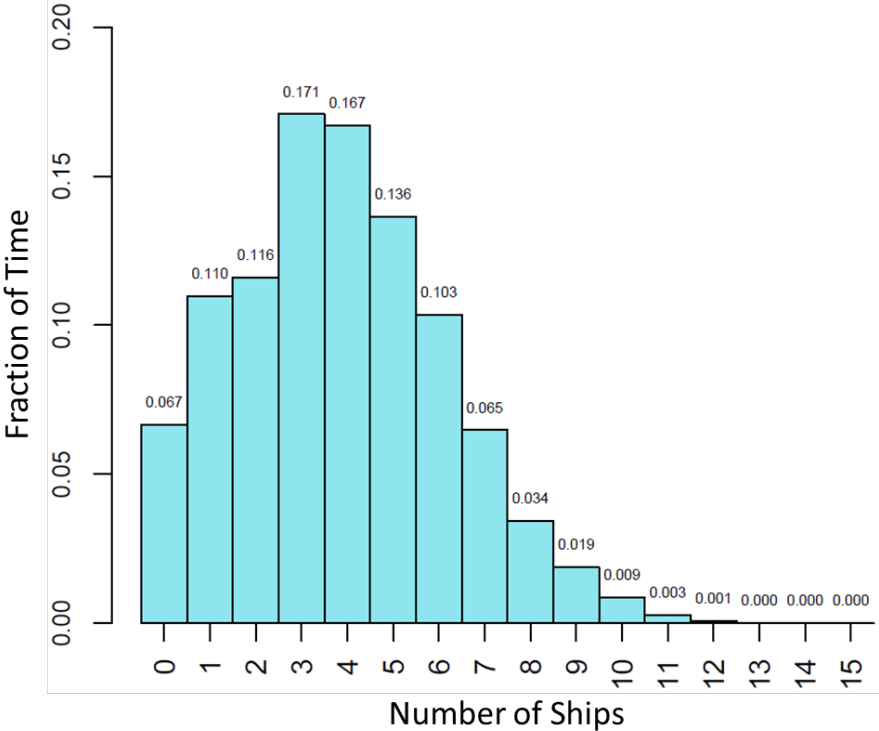
# Operational Demand

- 11 notional vignettes for illustrative purposes

ID	Description	Type	Frequency of Occurrence	Duration	Time of Year	Co-Occur	Expected Response (Number of Ships)
1	Single ship - Short deployment	Random	3 / 2 years	1-4 months	All year	Yes	1
2	Single ship - Medium deployment	Random	2 / 3 years	6-8 months	All year	Yes	1
3	Single ship - Long deployment	Random	1 / 3 years	2 x 6 months	All year	No	1
4	Two ships - Medium Deployment	Random	1 / year	4-6 months	All year	No	2
5	Task Group - Large Scale Commitment	Random	1 / 6 years	3 x 6 months	All year	No	3
6	Standing NATO Maritime Group 1	Scheduled	2 / 3 years	8 months	Feb to Nov	N/A	1
7	Flagship for Standing NATO Maritime Group 1	Scheduled	1 / 3 years	8 months	Feb to Nov	N/A	1
8	Spring / Fall scheduled operations	Scheduled	2 / years	1 month	May and Sep	N/A	1
9	Deployment w/ related exercises	Scheduled	1 year	5 months	Apr to Sep	N/A	2

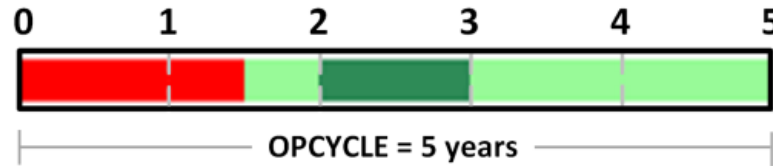


# Operational Demand

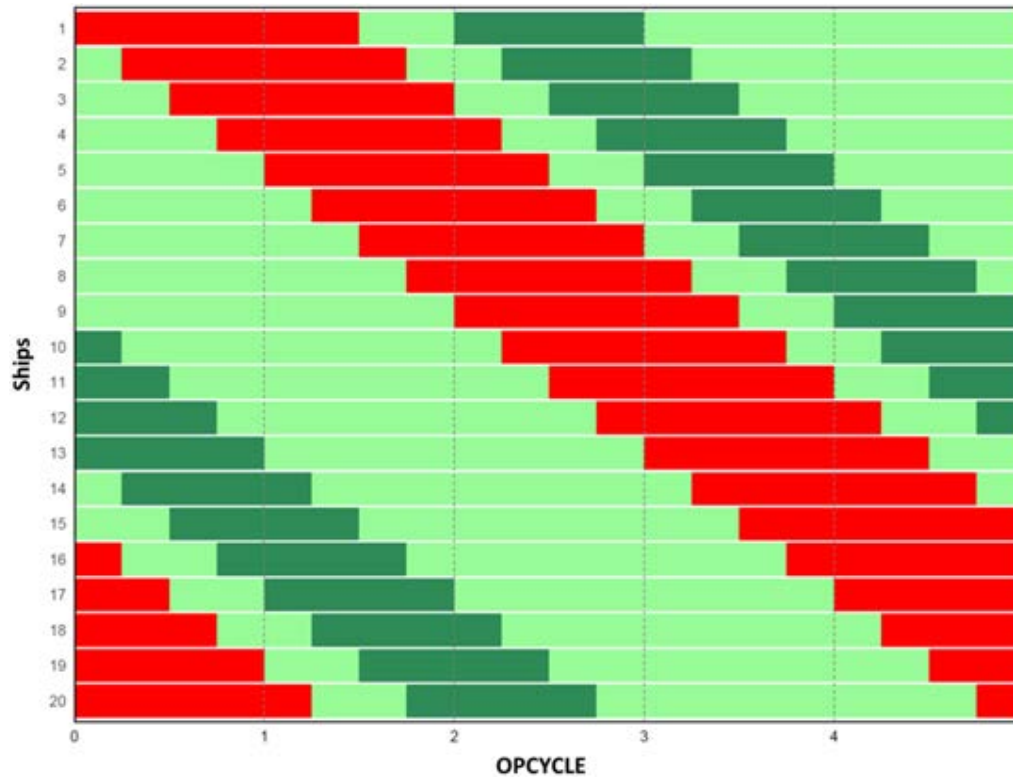


# Operational Supply

- For illustration, we use notional data for a generic ship:



■ Not available    ■ Force Generation    ■ High Readiness (HR)



Example:  
For a 20 ship fleet,  
the idealized fleet  
schedule will always  
achieve 4 HR ships  
for any given point in  
time.

# Operational Supply

		Months at HR / OPCYCLE												
		9	10	11	12	13	14	15	16	17	18	19	20	21
Number of Ships in Fleet	30	4.50	5.00	5.50	6.00	6.50	7.00	7.50	8.00	8.50	9.00	9.50	10.00	10.50
	29	4.35	4.83	5.32	5.80	6.28	6.77	7.25	7.73	8.22	8.70	9.18	9.67	10.15
	28	4.20	4.67	5.13	5.60	6.07	6.53	7.00	7.47	7.93	8.40	8.87	9.33	9.80
	27	4.05	4.50	4.95	5.40	5.85	6.30	6.75	7.20	7.65	8.10	8.55	9.00	9.45
	26	3.90	4.33	4.77	5.20	5.63	6.07	6.50	6.93	7.37	7.80	8.23	8.67	9.10
	25	3.75	4.17	4.58	5.00	5.42	5.83	6.25	6.67	7.08	7.50	7.92	8.33	8.75
	24	3.60	4.00	4.40	4.80	5.20	5.60	6.00	6.40	6.80	7.20	7.60	8.00	8.40
	23	3.45	3.83	4.22	4.60	4.98	5.37	5.75	6.13	6.52	6.90	7.28	7.67	8.05
	22	3.30	3.67	4.03	4.40	4.77	5.13	5.50	5.87	6.23	6.60	6.97	7.33	7.70
	21	3.15	3.50	3.85	4.20	4.55	4.90	5.25	5.60	5.95	6.30	6.65	7.00	7.35
	20	3.00	3.33	3.67	4.00	4.33	4.67	5.00	5.33	5.67	6.00	6.33	6.67	7.00
	19	2.85	3.17	3.48	3.80	4.12	4.43	4.75	5.07	5.38	5.70	6.02	6.33	6.65
18	2.70	3.00	3.30	3.60	3.90	4.20	4.50	4.80	5.10	5.40	5.70	6.00	6.30	

# Assumptions and Limitations

- Steady-state ship supply
  - Does not consider individual ship schedules - no deconfliction
- Ship attrition is not considered
- Coastal disposition
- Only considers a single class fleet of ships





# Matching Supply to Demand

		Months at HR / OPCYCLE												
		9	10	11	12	13	14	15	16	17	18	19	20	21
Number of Ships in Fleet	30	69.8%	76.6%	81.8%	87.0%	90.2%	93.5%	95.2%	96.9%	97.8%	98.8%	99.2%	99.6%	99.8%
	29	67.8%	74.4%	79.9%	84.9%	88.8%	92.0%	94.3%	96.0%	97.3%	98.2%	98.9%	99.3%	99.7%
	28	65.7%	72.1%	78.0%	82.9%	87.4%	90.4%	93.5%	95.1%	96.7%	97.6%	98.5%	99.1%	99.5%
	27	63.7%	69.8%	76.0%	80.8%	85.4%	88.9%	91.8%	94.2%	95.7%	97.1%	97.9%	98.8%	99.2%
	26	61.3%	67.6%	73.5%	78.7%	83.2%	87.4%	90.2%	93.0%	94.7%	96.2%	97.3%	98.1%	98.8%
	25	58.8%	65.3%	71.0%	76.6%	81.0%	85.3%	88.6%	91.3%	93.8%	95.2%	96.6%	97.5%	98.3%
	24	56.3%	63.0%	68.5%	73.9%	78.7%	82.9%	87.0%	89.6%	92.2%	94.2%	95.5%	96.9%	97.6%
	23	53.8%	60.2%	66.0%	71.2%	76.4%	80.4%	84.4%	87.9%	90.3%	92.8%	94.4%	95.7%	97.0%
	22	51.3%	57.4%	63.5%	68.5%	73.5%	78.0%	81.8%	85.6%	88.5%	90.9%	93.3%	94.6%	95.9%
	21	48.8%	54.7%	60.5%	65.7%	70.5%	75.3%	79.2%	82.9%	86.5%	88.9%	91.2%	93.5%	94.7%
	20	46.3%	51.9%	57.4%	63.0%	67.6%	72.1%	76.6%	80.1%	83.5%	87.0%	89.1%	91.3%	93.5%
	19	43.8%	49.1%	54.4%	59.7%	64.6%	68.9%	73.2%	77.3%	80.6%	83.9%	87.1%	89.1%	91.2%
18	41.2%	46.3%	51.3%	56.3%	61.3%	65.7%	69.8%	73.9%	77.7%	80.8%	83.9%	87.0%	88.9%	

# Characterizing Multi-Ship Demand

Single ship Short deployment [1]	Single ship Medium deployment [1]	Single ship Long deployment [1]	Two ships Medium Deployment [2]	Task Group Large Scale Commitment [3]	Standing NATO Maritime Group 1 [1]	Flagship for Standing NATO Maritime Group 1 [1]	Spring / Fall scheduled operations [1]	Deployment w/ related exercises [2]	Percentage of time
					1		1	1	1.68%
	1				1			1	1.61%
		1			1			1	1.36%
1					1			1	1.19%
						1	1	1	0.88%
	1					1		1	0.79%
		1				1		1	0.72%
	1			1					0.66%
				1	1				0.64%
1						1		1	0.62%

Top 10 combinations requiring 4 simultaneous HR ships

# Characterizing Multi-Ship Demand

Single ship Short deployment [1]	Single ship Medium deployment [1]	Single ship Long deployment [1]	Two ships Medium Deployment [2]	Task Group Large Scale Commitment [3]	Standing NATO Maritime Group 1 [1]	Flagship for Standing NATO Maritime Group 1 [1]	Spring / Fall scheduled operations [1]	Deployment w/ related exercises [2]	Percentage of time
			1		1			1	1.84%
			1			1		1	0.90%
			1	1					0.74%
	1				1		1	1	0.64%
		1			1		1	1	0.56%
1					1		1	1	0.52%
	1	1			1			1	0.51%
1	1				1			1	0.45%
1		1			1			1	0.42%
	1					1	1	1	0.34%

Top 10 combinations requiring 5 simultaneous HR ships

# Conclusion and Future Work

- A methodology was developed to provide quick insight into fleet sizing and operational output.
  - Vignette-based Demand Analysis
    - Approach is consistent with DND Force Development process
  - Steady-state ship supply based on two main variables:
    - Number of ships in fleet
    - Number of months at HR / OPCYCLE
- Future work:
  - Expand methodology to consider multiple ship classes
    - Demand model – further define and refine vignettes
    - Supply model – introduce concept of a mixed Task Group



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