

DEFENCE



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**Exploratory Analysis**  
of the  
**Supply Concept**  
for the  
**Standing Contingency Task Force (SCTF)**

Major Bruce Chapman, MSc, CD



Defence Research and  
Development Canada

Recherche et développement  
pour la défense Canada

Canada



## Purpose



- The purpose of this research was to provide insight into the parameters that impact on the ability of a seabase to resupply a landing force.
  - Accomplished by:
    - Investigating the methodologies used by business and military organizations to solve like problems.
    - Discovering and/or developing a tool/tools that would enable the analysis of the deployed support requirements of the SCTF.
    - Using the tool to provide insights into the proposed option.



## Outline



- Concepts of Operation and Sustainment of the SCTF
- Conceptual model
- Data and build the model
- Analysis and Conclusions



# What is the SCTF?



## Naval Task Group



## Amphibious Task Group



The SCTF, a seaborne fully integrated tactical force at high readiness, will conduct sea based full spectrum operations in a littoral in order to provide timely and positive effect on a developing crisis or conflict.

## Landing Force



## Connectors



## Support Group



•Deploy on 10 days notice

•Support the landing force ashore for 30 days



## What is the SCTF Support Concept?



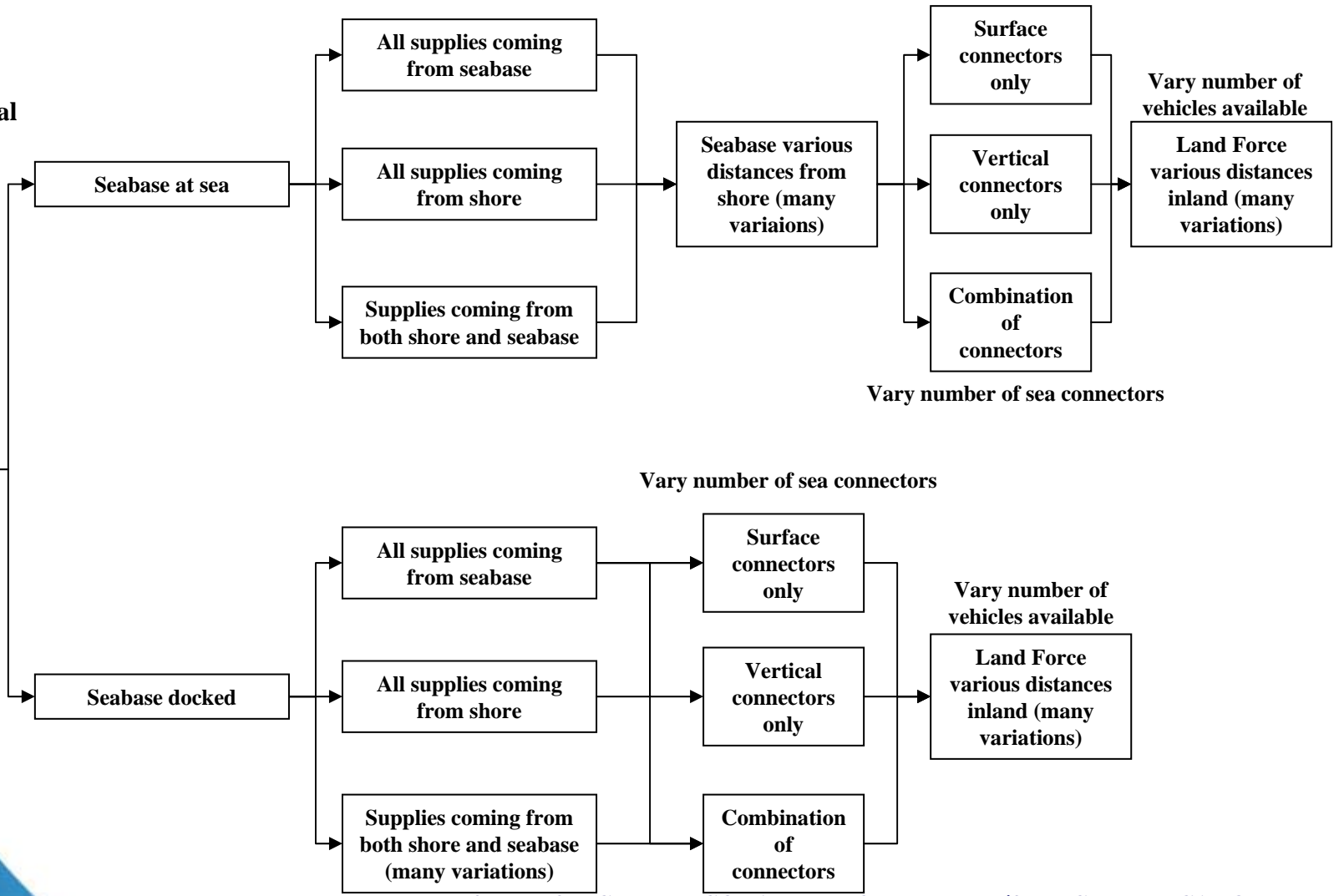
- Integral Support will provide three days of supply (DOS) deployed with the fighting force.
- The SCTF Support Group will maintain the three days of supply at the sub-units
  - These concepts have yet to be developed
  - The Future Employment Concept presents the use of push logistics based upon containerization and the MSVS



**Vary the environmental factors**  
-weather  
-sea state  
-surf State  
**Vary the maintenance factors**  
-mean time between failure  
-repair times

**Sustainment of the land force**

**Vary the crew availability**  
-sleep  
-sickness  
**Vary the losses**  
-accidents  
-enemy activity





## Issues Examined



- How far to sea can the seabase be and still support the landing force?
- How far inland can the landing force be and still be supported?
- Other issues as they come up.
  - Numbers of transport vehicles in the support group
  - Impact of reduced numbers of connectors
  - Impact of speed of convoys on sustainment system





# Initial Conceptual Model

Fat Ship

Flat Ship

- Food
- Water
- Fuel
- Ammo
- Deck Spots

Vertical connectors

Surface connectors

Landing Site

BG units

BG AO

Coy

Coy

Coy

Coy average daily travel = 100 km

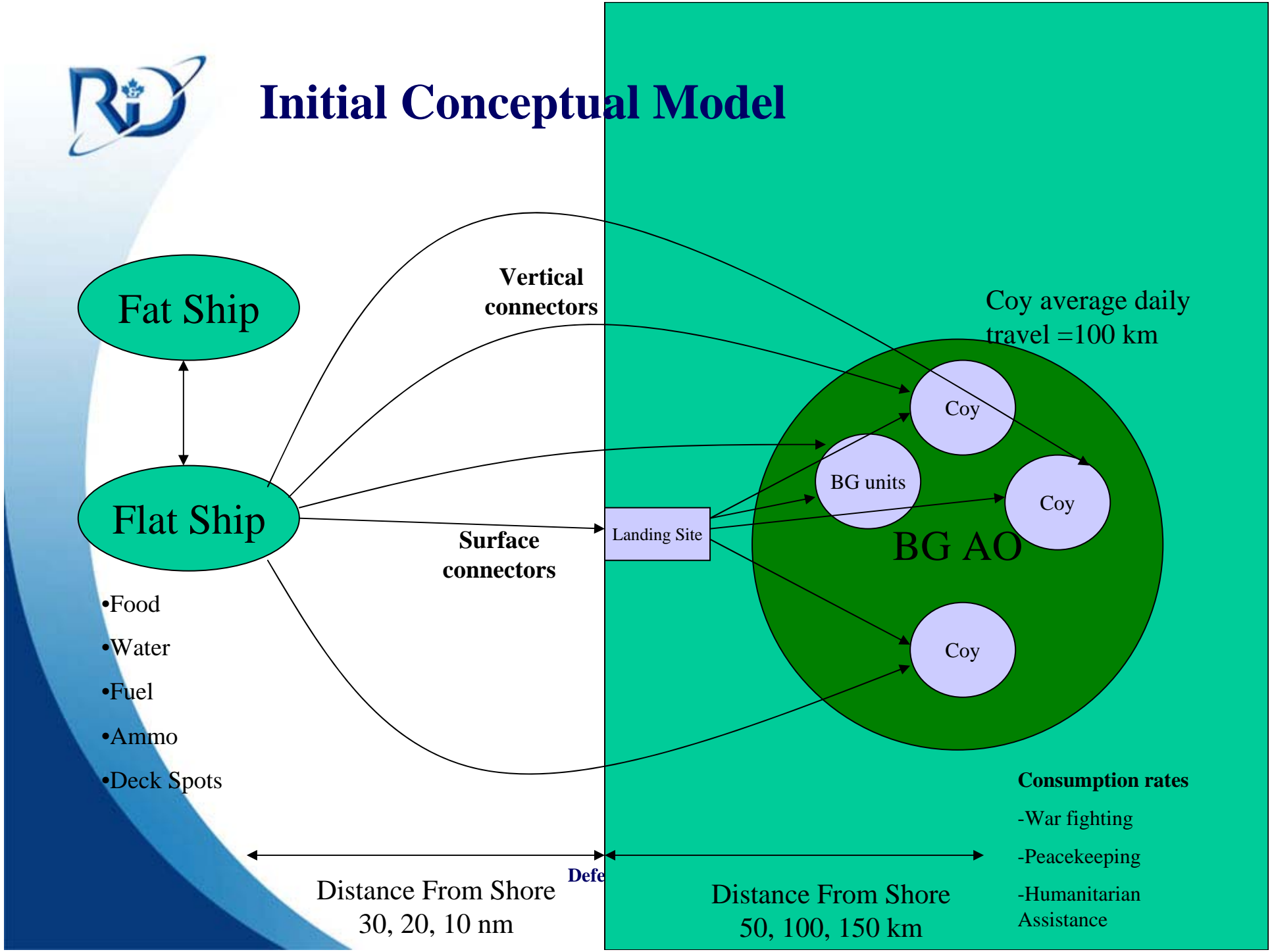
Consumption rates

- War fighting
- Peacekeeping
- Humanitarian Assistance

Distance From Shore  
30, 20, 10 nm

Distance From Shore  
50, 100, 150 km

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## Data Requirements



- The size of the landing force.

Sub-Unit	# Personnel on Shore	# Vehicles on Shore
LAV Company	148	21
LPV Company 1	148	30
LPV Company 2	148	30
Headquarters	64	14
Reconnaissance	42	13
Engineer	61	16
Artillery	79	28



## Data Requirements



- The amount of supplies required ashore.
  - Water
    - 1 DOS Water = # of soldiers × usage per day + # of vehicles × usage per day
  - Food
    - 1 DOS of Rations = # of soldiers × 3 meals per day
  - Fuel
    - 1 DOS Fuel =  $\text{Sum}_{\text{all vehs}} (1/\text{km}_{\text{veh type}} \times \#\text{veh}_{\text{veh type}}) \times 100 \text{ km}$
  - General and Technical
    - Based upon Operation Staff Data Manual
  - Ammunition



# Ammunition



- Current unclassified consumption rates are based upon data for open high intensity war fighting between divisions and corps. In order to take into account Peace Support and Humanitarian assistance the following matrix was developed.

Expenditure of Supplies	Expenditure Factor	Description	% of days at expenditure rate		
			Warfighting	Peace Support	Humanitarian
High	1	High expenditure of Ammunition	0.1	0.05	0.01
Med	0.4	Med expenditurte of Ammunition	0.5	0.3	0.1
Low	0.01	Low expenditure of Ammunition	0.4	0.65	0.899



# Data Requirements



- The capability of the connectors (sea and land).





## Data Requirements



- The number of connectors required to lift a day of supply.

Sub-unit	#MSVS	#Fuel Trailers	#Water Trailers
LAV Coy	3	1	1
LPV Coy 1	2	1	1
LPV Coy 2	2	1	1
Arty	3	1	1
Engr	3	1	1
Misc	2	1	1



## Model Assumptions



- The seabase is considered as one entity as the type and numbers of ships are unknown at this time.
- Vertical connectors (helicopters) are too few in number to be relied upon.
- The Supply Concept
  - Landing force is re-supplied using Medium Support Vehicle System carrying Quadcons and towing fuel and water trailers, on a push concept (exchange 1 Day of Supply worth of vehicles)
  - The Medium Support Vehicle System is loaded at the sea base, transported to shore and travel to the sub-unit to be re-supplied. (no dumping on shore)



# Modified Conceptual Model

Seabase

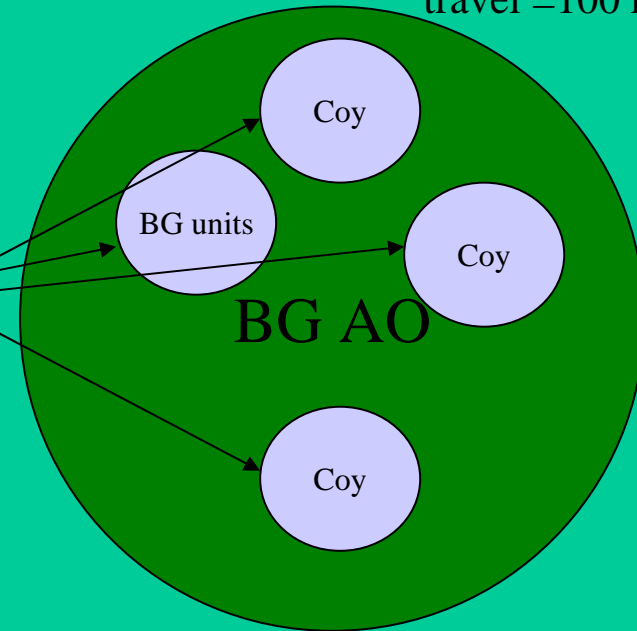
- MSVS
- Fuel Trailer
- Water Trailer
- Load Spots

Surface connectors

- LCU Mk 10
- LCVP Mk 5

Landing Site

•Beach Spots



Coy Average daily travel = 100 km

Distance From Shore  
30, 20, 10 nm

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Distance From Shore  
100, 200, 300, 400, 500, 1000 km





# Extend Model – Level 1



SCTF2\_0.mox

01/01/2006  
Sun 12:00 AM

event  
 count

Database

Resource Pools

Resource Stats  
 Update

ON  
Night

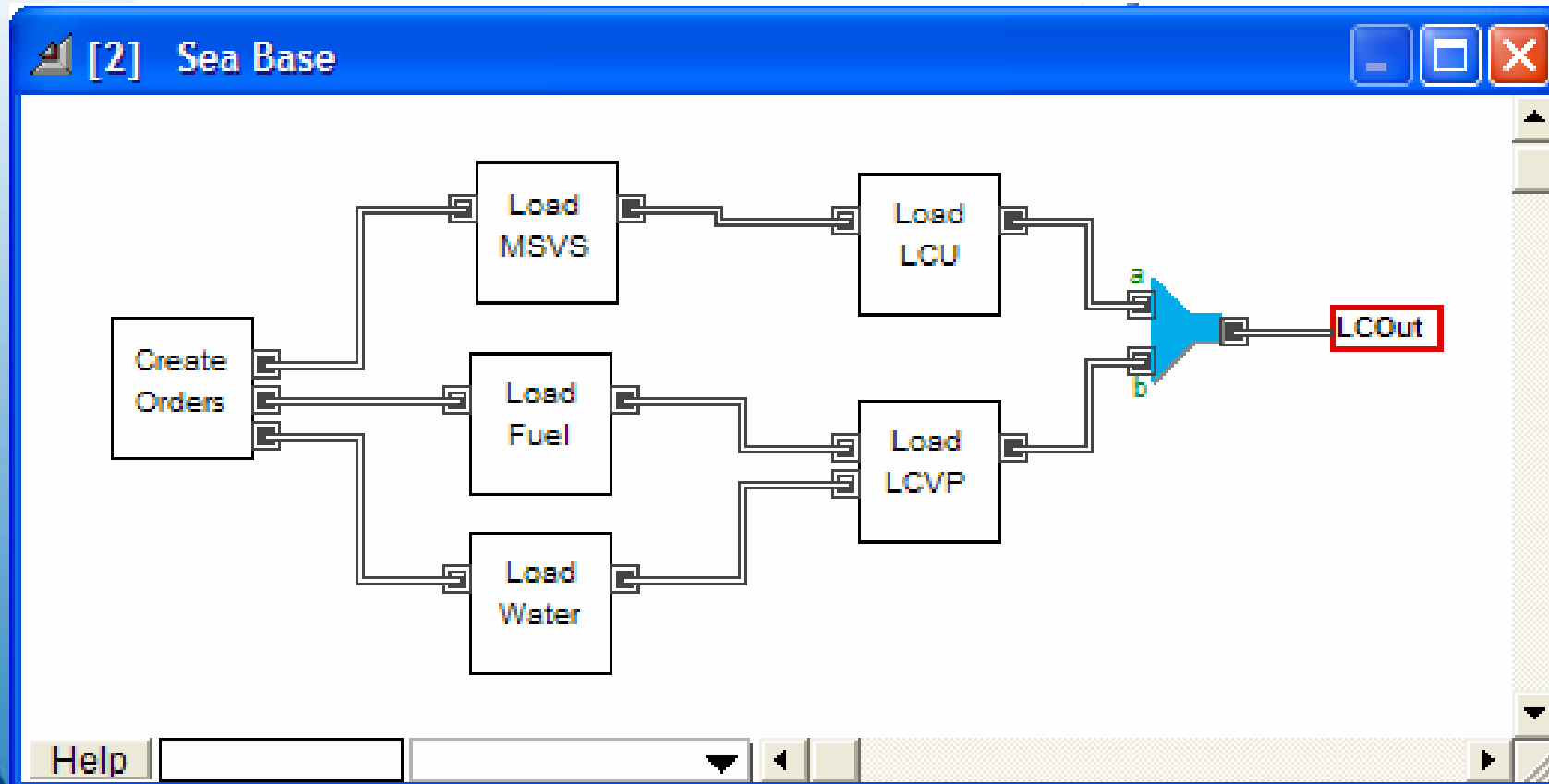
```
graph LR; SB[SEA BASE] --- B[Beach]; SB --- MA[Marshalling Area]; B --- SU[SUB-UNITS]; MA --- SU;
```

	Arrival(hrs)	Priority	Concoy Type	Attribute2	Attribute3	Attribute4
0	9.52692268413	1	1	1		
1	9.73813421887	1		2		
2	10.3518160032	1		3		
3	10.4593607776	1		4		
4	14.8315130229	1		5		
5	33.16757176	1		1		
6	33.2248234634	1		6		
7	33.4781298469	1		2		
8	34.5218969537	1		3		
9	35.6546300736	1		4		
10	38.7794092882	1		5		

Run

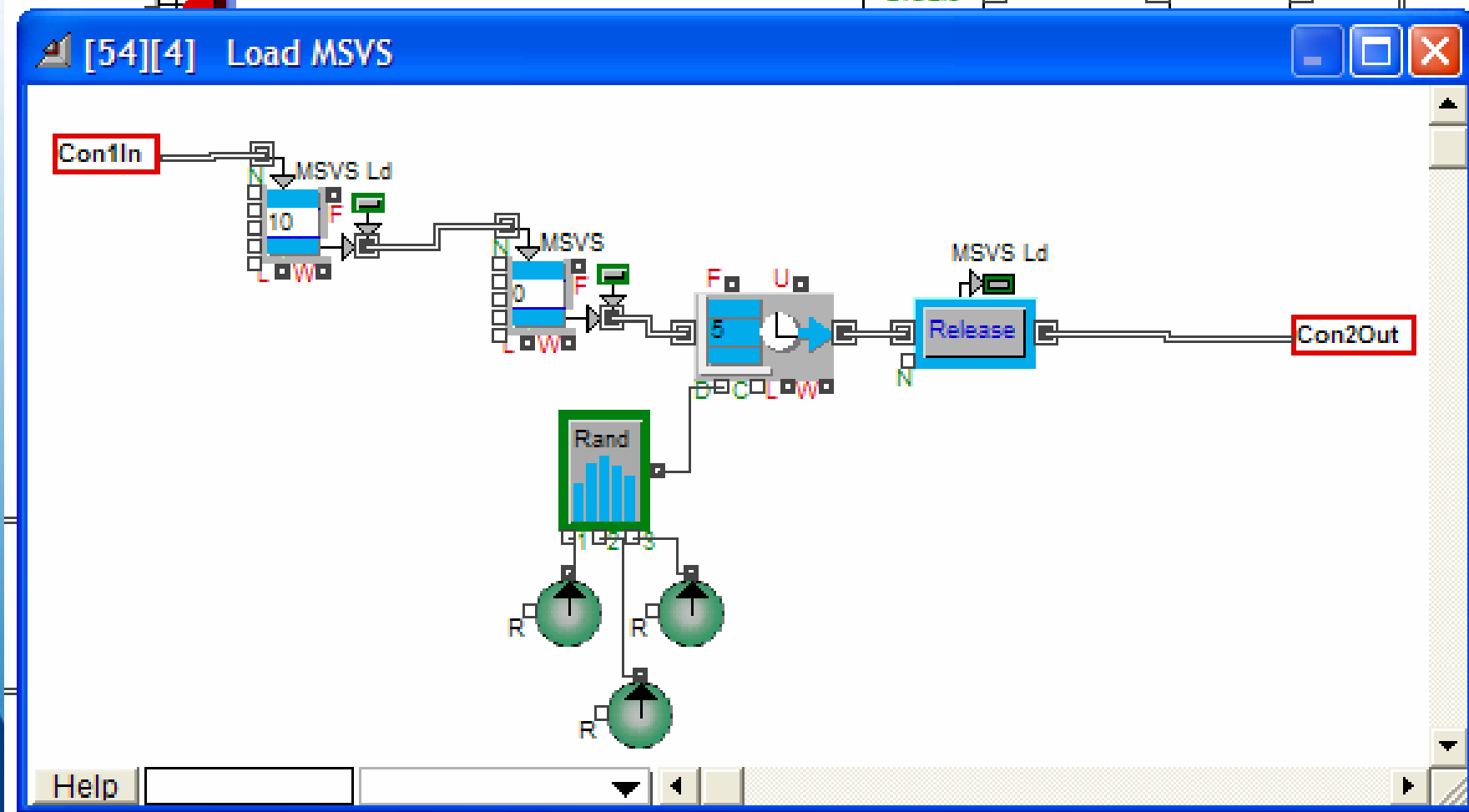


## Extend Model - Level 2





# Extend Model – Level 3





## Sample



- Legend
  - Green = 3 DOS at Sub-unit for 30 days
  - Yellow =  $0 < \text{DOS} < 3$  at Sub-unit for 30 days
  - Red = Sub-units at  $\leq 0$  DOS in 30 days



## Baseline Runs



Ship every	24	hours
MSVS Load Spots	5	spots
Fuel Load Spots	2	spots
Water Load Spots	2	spots
LCU Load Spots	2	spots
LCVP Load Spots	2	spots
Beach Spots	2	spots
Number of MSVS/LCU	3	MSVS
Number of Trailers/LCVP	2	Trailers
LCU Speed	8	knots
LCVP Speed	25	knots
MSVS Speed	30	km/hr



# Baseline Runs



Ship to Shore	Shore to Unit				
	100 km	200 km	300 km	400 km	500 km
40 nm	Green	Green	Yellow	Yellow	Yellow
30 nm	Green	Green	Green	Yellow	Yellow
20 nm	Green	Green	Green	Green	Yellow
10 nm	Green	Green	Green	Green	Yellow

Resource	Utilization with Sea Base at 30 nm				
	100 km	200 km	300 km	400 km	500 km
MSVS Ld Spot	0.04	0.04	0.04	0.15	0.34
Fuel Ld Spot	0.07	0.07	0.07	0.07	0.07
Water Ld Spot	0.07	0.07	0.07	0.07	0.07
LCU Ld Spot	0.14	0.14	0.14	0.14	0.14
Beach Spot	0.37	0.37	0.37	0.36	0.36
LCVP Ld Spot	0.13	0.13	0.13	0.13	0.13
LCU	0.42	0.42	0.42	0.41	0.39
LCVP	0.32	0.32	0.32	0.32	0.30
MSVS	0.53	0.53	0.60	0.81	0.87
Fuel Tlr	0.38	0.38	0.48	0.68	0.67
Water Tlr	0.38	0.38	0.48	0.68	0.67



# Sensitivity to Numbers of Landing Craft



#LCU	Sea Base at 30 nm				
	100 km	200 km	300 km	400 km	500 km
3	Green	Green	Green	Yellow	Yellow
2	Yellow	Yellow	Yellow	Yellow	Yellow
1	Red	Red	Red	Red	Red

#LCVP	Sea Base at 30 nm				
	100 km	200 km	300 km	400 km	500 km
3	Green	Green	Green	Yellow	Yellow
2	Green	Green	Yellow	Yellow	Yellow
1	Yellow	Yellow	Yellow	Yellow	Yellow



# Sensitivity to Numbers of Vehicles



#MSVS	Sea Base at 30 nm				
	100 km	200 km	300 km	400 km	500 km
35	Green	Green	Yellow	Yellow	Red
30	Green	Green	Yellow	Red	Red
25	Green	Green	Yellow	Red	Red
20	Red	Red	Red	Red	Red

#Trailers	Sea Base at 30 nm				
	100 km	200 km	300 km	400 km	500 km
15	Green	Green	Yellow	Yellow	Yellow
12	Green	Green	Yellow	Red	Red
9	Green	Green	Yellow	Red	Red
6	Red	Red	Red	Red	Red





## Sensitivity to Speed of Convoy



km/h	Sea Base at 30 nm				
	100 km	200 km	300 km	400 km	500 km
90	Green	Green	Green	Green	Green
60	Green	Green	Green	Green	Green
10	Yellow	Yellow	Red	Red	Red



## Conclusions and Recommendations



- The system, as modeled, does not provide the robustness required to sustain the landing force
  - at its potential operating distances in all locations of the seabase.
  - within an accepted number of vehicles (MSVS and trailers)
- These results were presented to the SCTF Sustainment Working Group (27 Feb – 3 Mar 06) and influenced the development of a new concept for transportation.



## Future Work



- Consumption Rates
  - The Operational Staff Data manual must be updated to provide a common database of vehicle and weapons performance.
  - The methodology used to calculate consumption rates (especially ammunition) needs to be revisited.
- Modified Supply Concept
  - The model in this thesis should be modified to enable the analysis of future supply concepts.
  - Continued analysis support is required for all concept development activities in the SCTF
- Optimization
  - Use of tools to optimize the final concept of sustainment.

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