

73rd MORSS CD Cover Page

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Quick-Look Force Closure Estimates Using the Strategic Mobility Model



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June 21, 2005

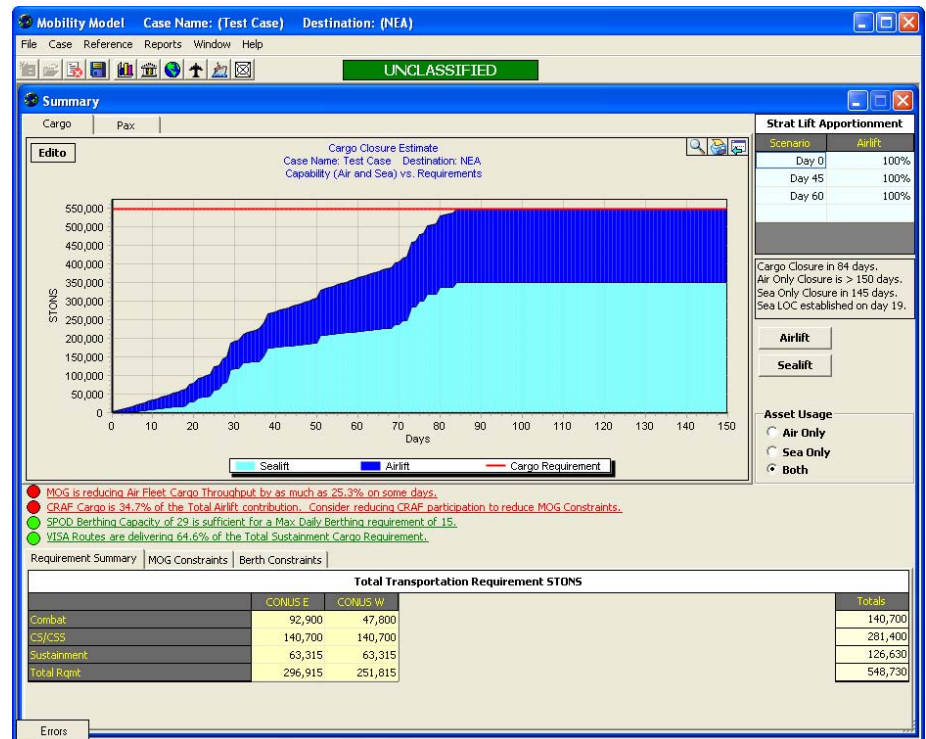
Mobility Model Intro

- Provides intuitive, quick closure estimates for roughly defined scenarios
- Use when higher fidelity models are impractical
 - Lack of data
 - Lack of time
- Evolution of USTRANSCOM “PinCushion” spreadsheet tool
 - Adds Scenario data management
 - More user-friendly
 - Sealift modeled at the Voyage level

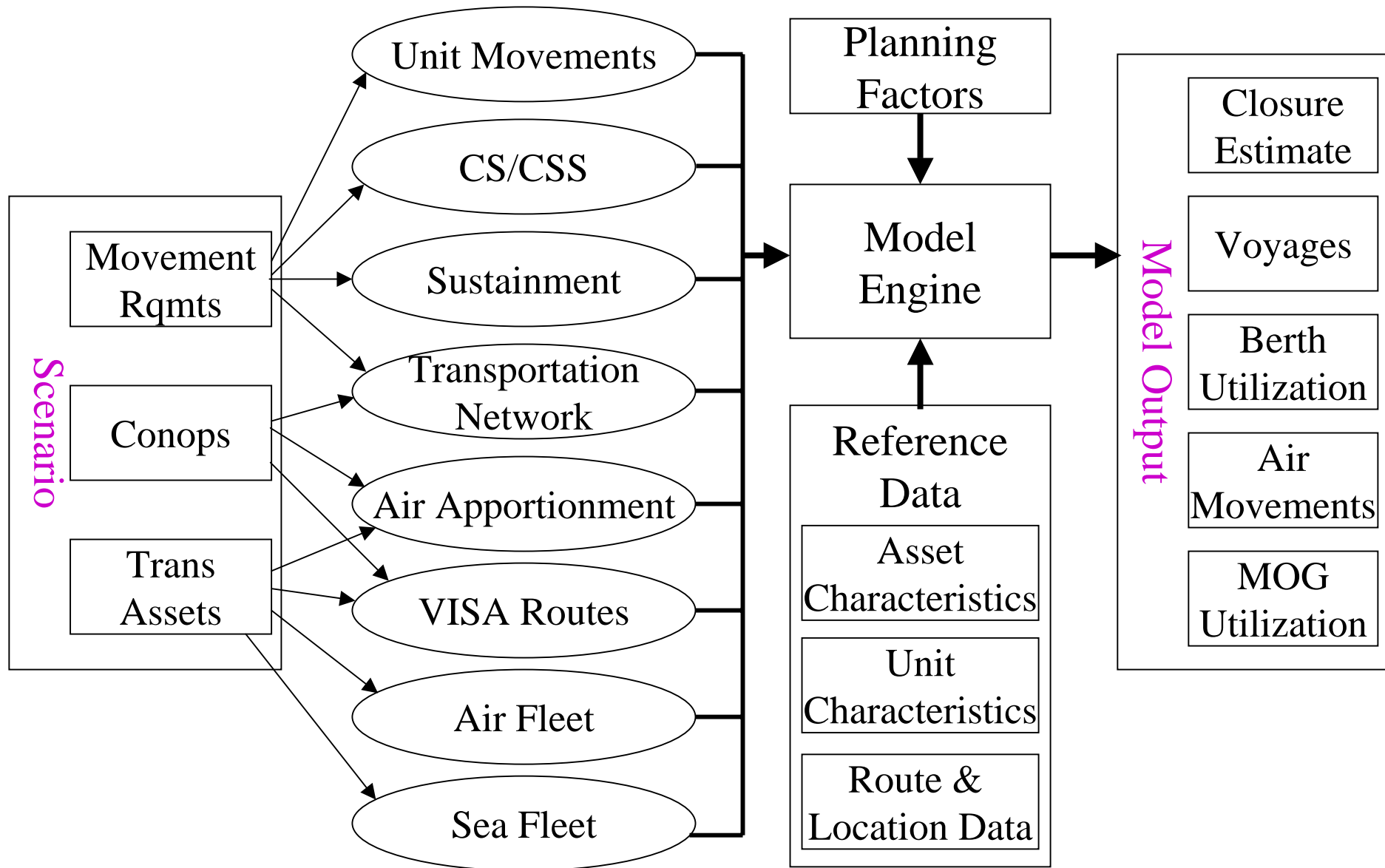
Mobility Model Intro

- Air & Sea Force Closure Estimator
 - Requirements (Combat Units, CS/CSS, Sustainment)
 - Assets (Aircraft, Ships)
 - Transportation Network (Origin-En Route-Destination Links)

- Aggregate Level Tool
 - Gross STons & Pax
 - MOG & Berths
 - Aggregated by Region
 - Destination is a Single APOD/SPOD Region



Mobility Model Architecture



Reference Data

Reference Data: Transportation Network

Available Regions

Regions

| Region | MOG | Berths | RSOI (days) |
|----------|-------|--------|-------------|
| CONUS E | 10.00 | 99 | 4 |
| CONUS G | 99.00 | 9 | 3 |
| CONUS W | 99.00 | 15 | 3 |
| EUROPE S | 99.00 | 1 | 2 |
| EUROPE W | 99.00 | 7 | 2 |
| NEA | 99.00 | 29 | 2 |
| SWA | 99.00 | 5 | 2 |

Routes

Air Distance | **Sea Distance** | **Enroute MOG** | **Canals**

DESTINATIONS

| | CONUS E | CONUS G | CONUS W | EUROPE S | EUROPE W | NEA | SWA |
|------------------------|---------|---------|---------|----------|----------|-------|-------|
| ORIGINS CONUS E | | 486 | 1,170 | 4,567 | 3,960 | 6,475 | 6,779 |
| CONUS G | 486 | | 767 | 5,053 | 4,446 | 6,072 | 7,265 |
| CONUS W | 1,170 | 767 | | 5,737 | 5,130 | 5,305 | 7,949 |
| EUROPE S | 4,567 | 5,053 | 5,737 | | 607 | 9,215 | 2,502 |
| EUROPE W | 3,960 | 4,446 | 5,130 | 607 | | 9,534 | 2,819 |
| NEA | 7,647 | 7,244 | 6,477 | 9,215 | 9,534 | | 7,048 |
| SWA | 6,779 | 7,265 | 7,949 | 2,502 | 2,819 | 7,048 | |

Defaults **OK** **Cancel**

Reference Data: Combat Units



The image shows a software dialog box titled "Combat Units". It contains a table with five columns: "Unit Id", "STons", "Sq Ft.", "PAX", and "Support Ratio". The table lists ten different combat units with their respective values. At the bottom of the dialog, there are three buttons: "Defaults", "OK", and "Cancel".

| Unit Id | STons | Sq Ft. | PAX | Support Ratio |
|-----------------|---------|-----------|--------|---------------|
| IBCT | 14,500 | 290,000 | 5,000 | 2.00 |
| Hvy Bde | 35,000 | 700,000 | 15,000 | 2.00 |
| MEB | 45,667 | 913,340 | 12,000 | 2.00 |
| Fighter Sqdn | 5,000 | 100,000 | 600 | 2.00 |
| BE | 600 | 12,000 | 100 | 2.00 |
| MEF | 137,000 | 2,740,000 | 25,000 | 2.00 |
| PATRIOT | 100,000 | 2,000,000 | 1,200 | 2.00 |
| Air Assault Bde | 17,000 | 340,000 | 14,000 | 2.00 |
| Lt Bde | 7,900 | 158,000 | 10,000 | 2.00 |

Reference Data: Assets

| Aircraft | | | | | | | | | | | | |
|---------------|-------------------------------------|-----------|-------|---------|-----|-------------|-------------|------|---------|-----------|----------|--|
| Aircraft Type | CRAF | UTE Rate | | Payload | | Block Speed | Ground Time | | | MOG Equiv | PM Fleet | |
| | | Sustained | Surge | STON | PAX | | APOE | APOD | Enroute | | | |
| C005 | <input type="checkbox"/> | 8.40 | 11.00 | 61.3 | 102 | 409 | 3.25 | 3.25 | 4.25 | 1.00 | 37 | |
| C017 | <input type="checkbox"/> | 13.90 | 15.20 | 45.0 | 102 | 410 | 2.25 | 2.25 | 2.25 | 1.00 | 45 | |
| C141 | <input type="checkbox"/> | 9.70 | 12.00 | 19.0 | 10 | 394 | 2.25 | 2.25 | 2.25 | 1.00 | 28 | |
| CRAF CARGO | <input checked="" type="checkbox"/> | 10.00 | 10.00 | 55.0 | 0 | 444 | 3.00 | 3.00 | 3.00 | 1.00 | 25 | |
| CRAF PAX | <input checked="" type="checkbox"/> | 10.00 | 10.00 | 0.0 | 280 | 439 | 2.00 | 2.00 | 1.50 | 1.00 | 25 | |
| KC010 | <input type="checkbox"/> | 12.50 | 15.00 | 32.6 | 0 | 434 | 3.25 | 3.25 | 3.25 | 1.00 | 51 | |
| | <input type="checkbox"/> | | | | | | | | | | | |

Defaults OK Cancel

| Ship | | | | | | | | | | | | | | | |
|--------------|-----------|------------|-------|-------------------|--------------|-----------------|----------------|-----------------------|-------|----------|----------------|-------------------------|-----------------------------|--------------|--|
| Ship Id | Ship Type | Ship Class | Speed | Characteristics | | | | | | Defaults | | | | | |
| | | | | Cgo Transfer Time | Capacity TEU | Capacity Sq.FT. | Capacity MTons | Max Cargo Dead Weight | Fleet | Quantity | Activation Day | Initial Region Location | Travel Time To Initial SPOE | Max Sallings | |
| Callaghan | RORO | Callaghan | 21.0 | 2 | 0 | 153,825 | 0 | 10,332 | RRF | 1 | 5 | CONUS W | 1 | 99 | |
| Cape D | RORO | Cape D | 16.0 | 2 | 0 | 167,339 | 0 | 15,692 | RRF | 5 | 5 | CONUS E | 1 | 99 | |
| Cape Edmont | RORO | Cape E | 16.0 | 2 | 0 | 161,372 | 0 | 16,016 | RRF | 1 | 5 | CONUS E | 1 | 99 | |
| Cape F | BARGE | LASH | 19.0 | 7 | 0 | 0 | 40,306 | 31,016 | RRF | 2 | 10 | | 1 | 99 | |
| Cape Fear | BARGE | LASH | 19.0 | 7 | 0 | 0 | 40,306 | 19,658 | RRF | 1 | 10 | CONUS W | 1 | 99 | |
| Cape Florida | BARGE | LASH | 19.0 | 7 | 0 | 0 | 40,306 | 19,658 | RRF | 1 | 5 | | 1 | 99 | |
| Cape G | BREAKBULK | Cape G | 19.0 | 3 | 0 | 0 | 27,583 | 15,740 | RRF | 2 | 5 | CONUS W | 1 | 99 | |
| Cape H | RORO | Cape H | 17.0 | 2 | 0 | 214,365 | 0 | 28,988 | RRF | 3 | 5 | CONUS W | 1 | 99 | |
| Cape I | RORO | Cape I | 19.0 | 2 | 0 | 149,089 | 0 | 14,560 | RRF | 4 | 5 | CONUS W | 1 | 99 | |
| Cape J | BREAKBULK | Cape J | 18.0 | 3 | 0 | 0 | 18,310 | 9,740 | RRF | 2 | 20 | CONUS E | 1 | 99 | |
| Cape John | BREAKBULK | Cape J | 18.0 | 3 | 0 | 0 | 18,310 | 9,740 | RRF | 1 | 20 | | 1 | 99 | |
| Cape K | RORO | Cape K | 17.0 | 2 | 0 | 146,896 | 0 | 24,191 | RRF | 2 | 5 | | 1 | 99 | |
| Cape L | RORO | Cape L | 16.0 | 2 | 0 | 75,644 | 0 | 15,144 | RRF | 2 | 10 | CONUS E | 1 | 99 | |

Defaults OK Cancel

Model Setup

Step 1: Define Transportation Network

| Transportation Network | | | | | | |
|------------------------|-------|--------|-------------|--|--|--|
| Destination Region | MOG | Berths | RSOI (days) | | | |
| ▶ NEA | 99.00 | 29 | 2 | | | |

| Origin Region | MOG | Berths | CSS/CS % | Sustainment % | |
|---------------|-------|--------|----------|---------------|--|
| ▶ CONUS E | 10.00 | 99 | 50% | 50% | |
| CONUS G | 99.00 | 9 | 0% | 0% | |
| CONUS W | 99.00 | 15 | 20% | 50% | |
| NEA | 99.00 | 29 | 30% | 0% | |

| Total | | 100 | 100 |
|-------|--|-----|-----|
|-------|--|-----|-----|

| From Region | To Region | Air Distance | Sea Distance | Enroute MOG | Canals |
|-------------|-----------|--------------|--------------|-------------|-------------------------------------|
| ▶ CONUS E | NEA | 6,475 | 10,388 | 3.00 | <input checked="" type="checkbox"/> |
| NEA | CONUS E | 7,647 | 10,388 | 10.00 | <input checked="" type="checkbox"/> |
| CONUS G | NEA | 6,072 | 0 | 0.00 | <input type="checkbox"/> |
| NEA | CONUS G | 7,244 | 0 | 0.00 | <input type="checkbox"/> |
| CONUS W | NEA | 5,305 | 5,201 | 3.00 | <input type="checkbox"/> |
| NEA | CONUS W | 6,477 | 5,201 | 3.20 | <input type="checkbox"/> |

Step 3: Define Assets

Transportation Assets

Air Fleet

| Aircraft Type | Quantity | CRAF | UTE Rate | | Payload | | Block Speed | Ground Time | | | MOG Equip | PM Fleet |
|---------------|----------|-------------------------------------|-----------|-------|---------|-----|-------------|-------------|------|---------|-----------|----------|
| | | | Sustained | Surge | STON | PAX | | APOE | APOD | Enroute | | |
| C005 | 50 | <input type="checkbox"/> | 8.40 | 11.00 | 61.3 | 102 | 409 | 3.25 | 3.25 | 4.25 | 1.00 | 37 |
| C017 | 46 | <input type="checkbox"/> | 13.90 | 15.20 | 45.0 | 102 | 410 | 2.25 | 2.25 | 2.25 | 1.00 | 45 |
| C141 | 12 | <input type="checkbox"/> | 9.70 | 12.00 | 19.0 | 10 | 394 | 2.25 | 2.25 | 2.25 | 1.00 | 28 |
| CRAF CARGO | 60 | <input checked="" type="checkbox"/> | 10.00 | 10.00 | 55.0 | 0 | 444 | 3.00 | 3.00 | 3.00 | 1.00 | 25 |
| CRAF PAX | 20 | <input checked="" type="checkbox"/> | 10.00 | 10.00 | 0.0 | 280 | 439 | 2.00 | 2.00 | 1.50 | 1.00 | 25 |
| KC010 | 15 | <input type="checkbox"/> | 12.50 | 15.00 | 32.6 | 0 | 434 | 3.25 | 3.25 | 3.25 | 1.00 | 51 |

Sea Fleet

| Ship Id | Fleet | Quantity | Activation Day | Initial Region Location | Travel Time To Initial SPOE | Max Sailings |
|--------------|-------|----------|----------------|-------------------------|-----------------------------|--------------|
| F55(E) | MSC | 4 | 4 | CONUS E | 1 | 99 |
| F55(G) | MSC | 4 | 4 | CONUS G | 1 | 99 |
| Shughart | MSC | 1 | 4 | CONUS E | 1 | 99 |
| Yano | MSC | 1 | 4 | CONUS E | 1 | 99 |
| Gilliland | MSC | 1 | 4 | CONUS E | 1 | 99 |
| Gordon | MSC | 1 | 4 | CONUS E | 1 | 99 |
| LMSR(E) | MSC | 2 | 4 | CONUS E | 1 | 99 |
| LMSR(G) | MSC | 5 | 4 | CONUS G | 1 | 99 |
| Cape T | RRF | 3 | 5 | CONUS G | 1 | 99 |
| Cape V | RRF | 2 | 5 | CONUS G | 1 | 99 |
| Cape Orlando | RRF | 1 | 5 | NEA | 1 | 99 |
| Cape K | RRF | 2 | 5 | CONUS G | 1 | 99 |
| Cape Edmont | RRF | 1 | 5 | CONUS E | 1 | 99 |
| Cape D | RRF | 5 | 5 | CONUS E | 1 | 99 |

VISA Routes

Clear

Append

Step 3: Define Assets (con't)

Transportation Assets

Air Fleet

| Aircraft Type | Quantity | CRAF | UTE Rate | | Payload | | Block Speed | Ground Time | | | MOG Equip | PM Fleet |
|---------------|----------|-------------------------------------|-----------|-------|---------|-----|-------------|-------------|------|---------|-----------|----------|
| | | | Sustained | Surge | STON | PAX | | APOE | APOD | Enroute | | |
| ▶ C005 | 50 | <input type="checkbox"/> | 8.40 | 11.00 | 61.3 | 102 | 409 | 3.25 | 3.25 | 4.25 | 1.00 | 37 |
| C017 | 46 | <input type="checkbox"/> | 13.90 | 15.20 | 45.0 | 102 | 410 | 2.25 | 2.25 | 2.25 | 1.00 | 45 |
| C141 | 12 | <input type="checkbox"/> | 9.70 | 12.00 | 19.0 | 10 | 394 | 2.25 | 2.25 | 2.25 | 1.00 | 28 |
| CRAF CARGO | 60 | <input checked="" type="checkbox"/> | 10.00 | 10.00 | 55.0 | 0 | 444 | 3.00 | 3.00 | 3.00 | 1.00 | 25 |
| CRAF PAX | 20 | <input checked="" type="checkbox"/> | 10.00 | 10.00 | 0.0 | 280 | 439 | 2.00 | 2.00 | 1.50 | 1.00 | 25 |
| KC010 | 15 | <input type="checkbox"/> | 12.50 | 15.00 | 32.6 | 0 | 434 | 3.25 | 3.25 | 3.25 | 1.00 | 51 |

Sea Fleet

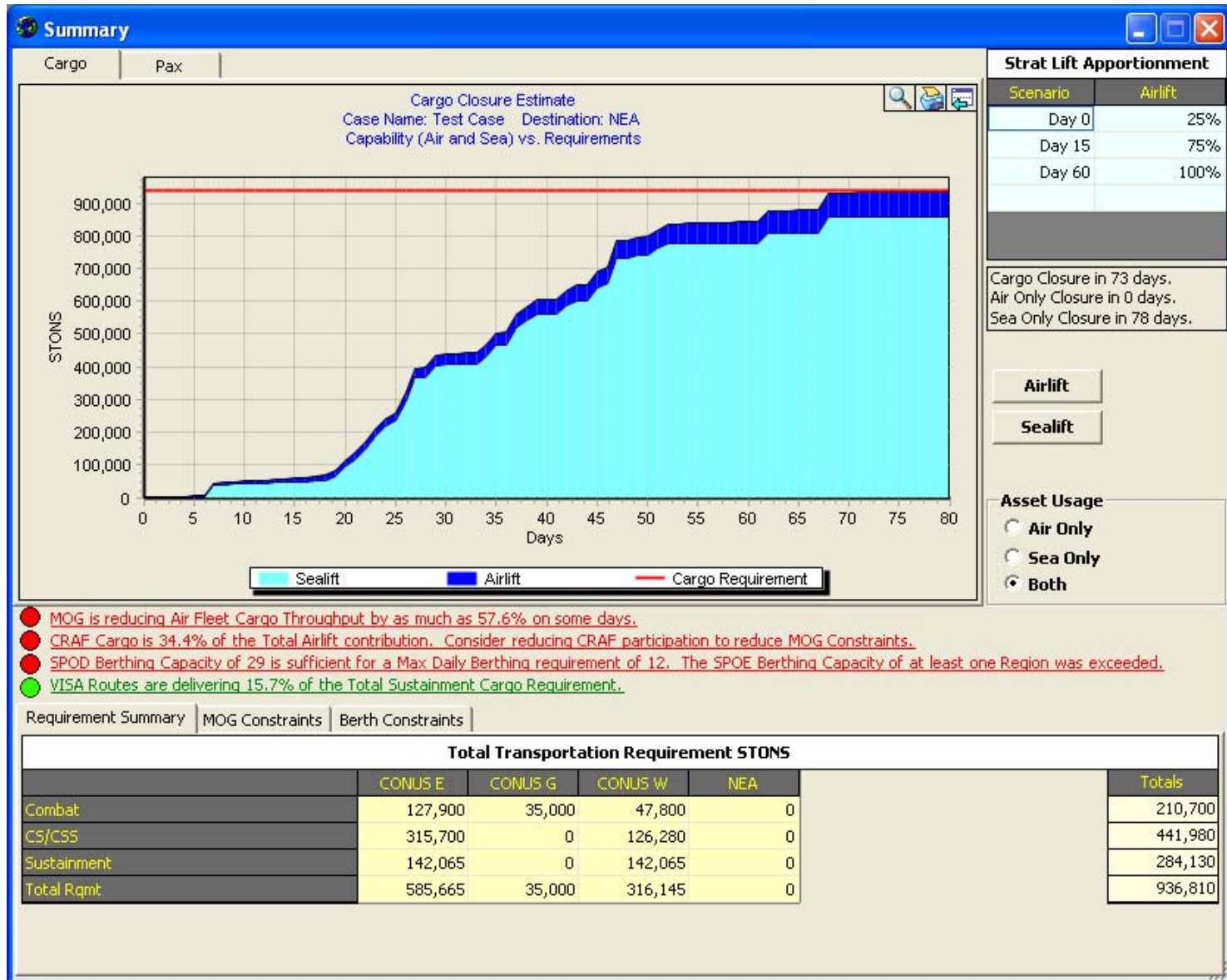
| Ship Id | Fleet | Quantity | Activation Day | Initial Region Location | Travel Time To Initial SPOE | Max Sailings |
|--------------|-------|----------|----------------|-------------------------|-----------------------------|--------------|
| F55(E) | MSC | 4 | 4 | CONUS E | 1 | 99 |
| F55(G) | MSC | 4 | 4 | CONUS G | 1 | 99 |
| Shughart | MSC | 1 | 4 | CONUS E | 1 | 99 |
| Yano | MSC | 1 | 4 | CONUS E | 1 | 99 |
| Gilliland | MSC | 1 | 4 | CONUS E | 1 | 99 |
| Gordon | MSC | 1 | 4 | CONUS E | 1 | 99 |
| LMSR(E) | MSC | 2 | | | | |
| LMSR(G) | MSC | 5 | | | | |
| Cape T | RRF | 3 | | | | |
| Cape V | RRF | 2 | | | | |
| Cape Orlando | RRF | 1 | | | | |
| Cape K | RRF | 2 | | | | |
| Cape Edmont | RRF | 1 | | | | |
| Cape D | RRF | 5 | | | | |

VISA Routes

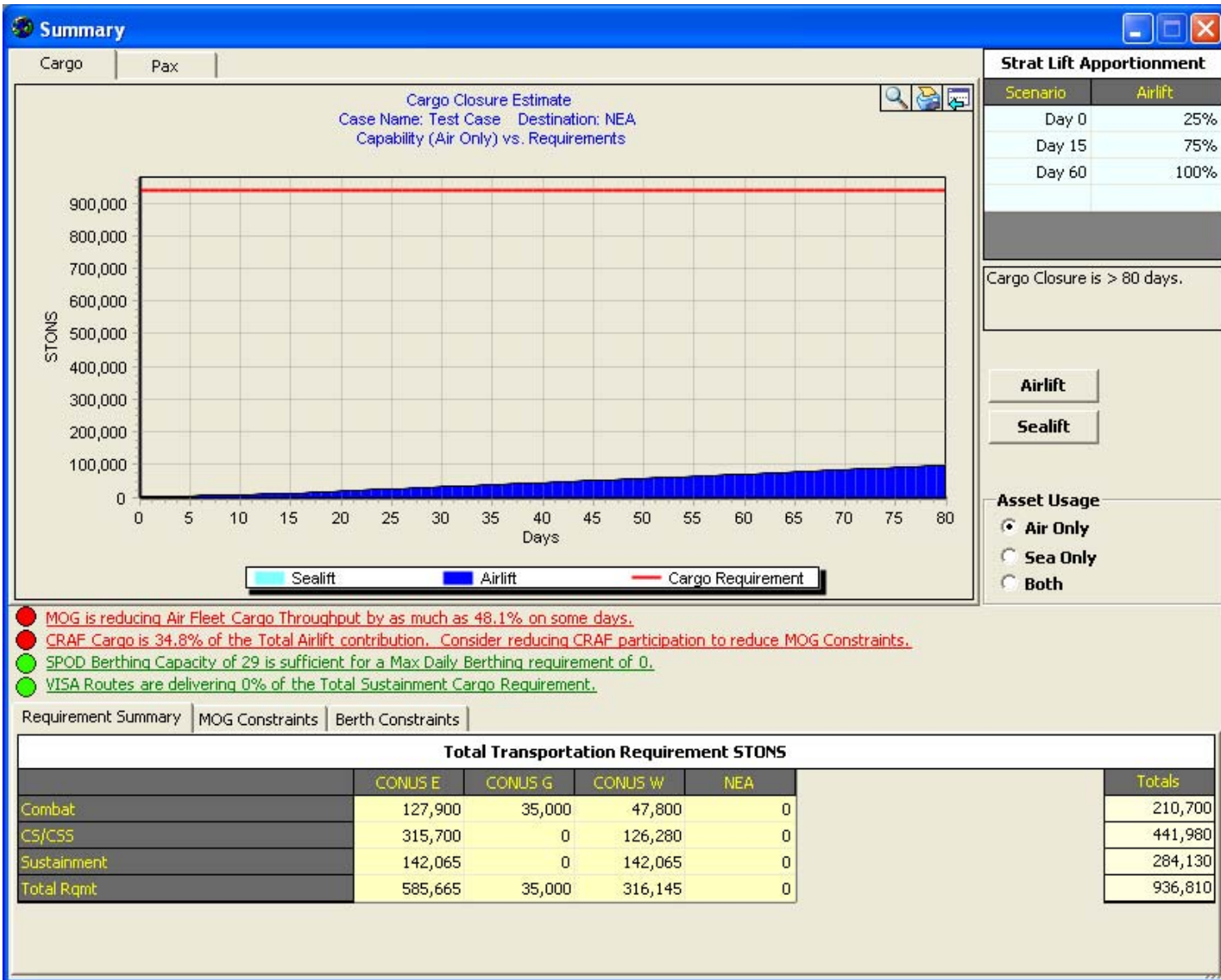
| Origin | Start Day | Capacity On Route (STons) | Cycle Time (Days) | Daily Capacity (STons/Day) |
|-----------|-----------|---------------------------|-------------------|----------------------------|
| ▶ CONUS E | 5 | 15,000 | 25 | 600 |
| CONUS W | 5 | 15,000 | 25 | 600 |

Results

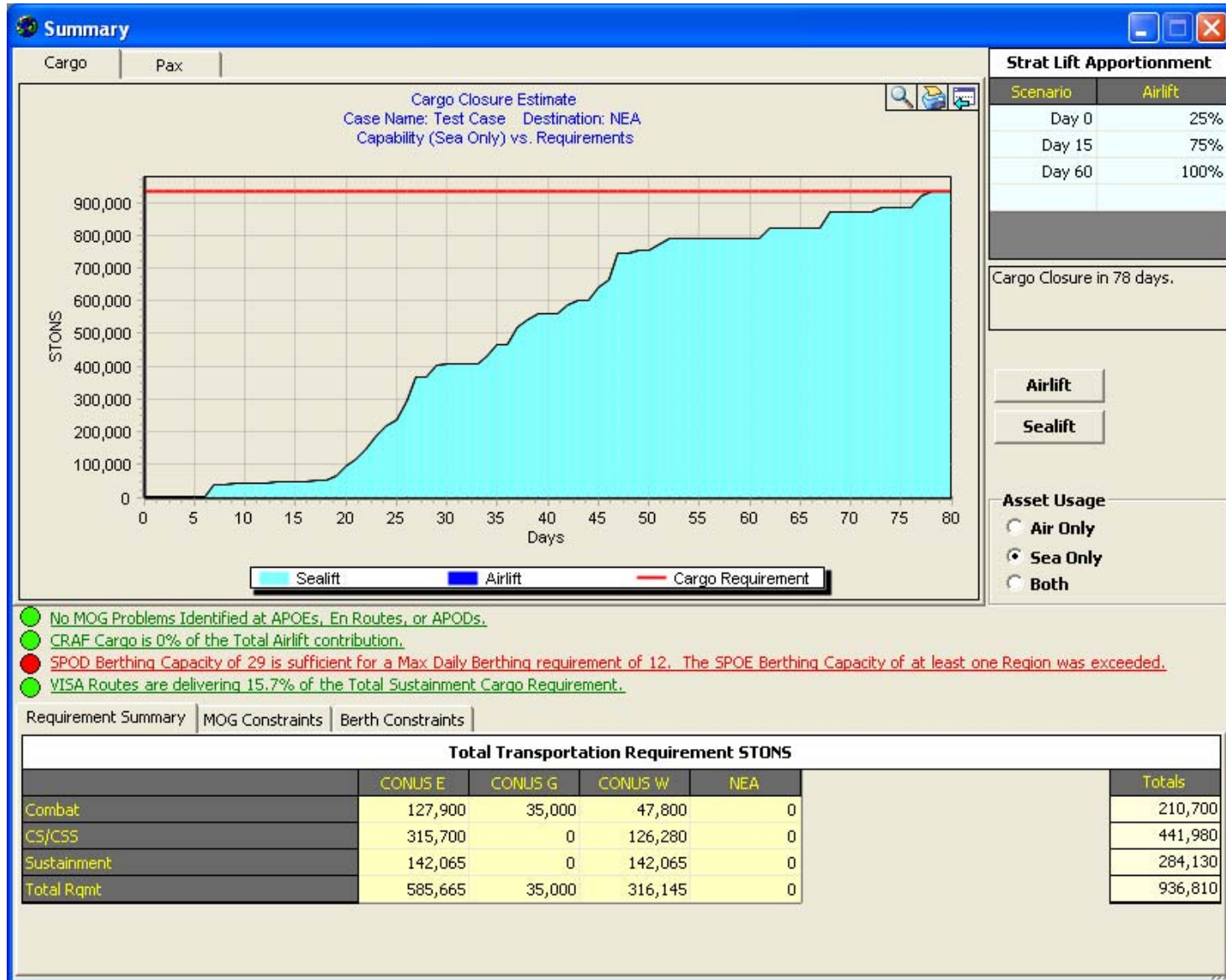
Results: Closure Estimate



Results: Closure Estimate (Air Only)



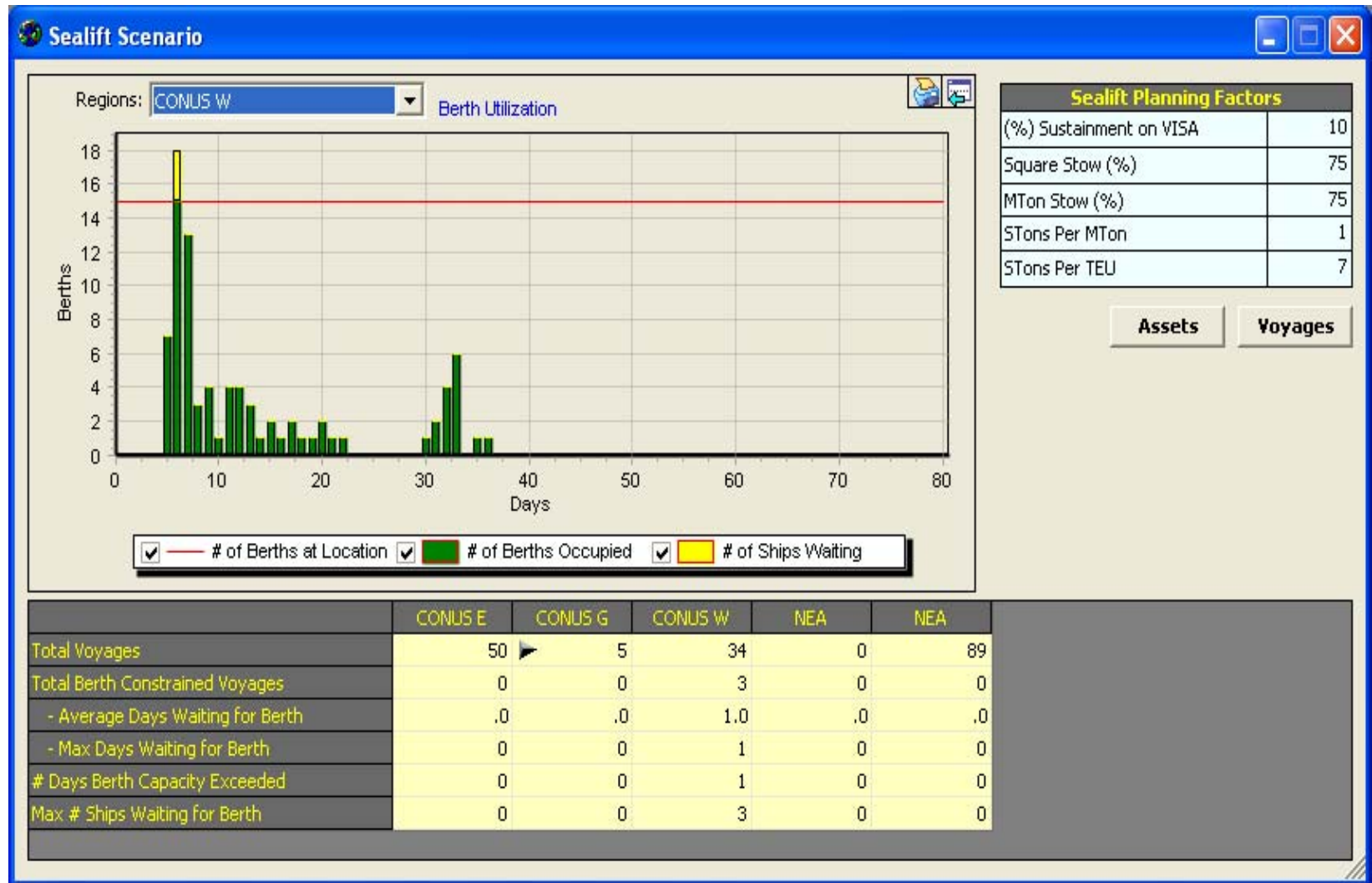
Results: Closure Estimate (Sea Only)



Results: Voyages

| Voyage Id | Ship Id | Voyage Number | SPOE | Origin Arrival | Origin Departure | Destination Arrival | Destination Departure | Cargo Load | % Net Capacity | Sustainment Load | SPOE Wait Time | SPOD Wait Time |
|-----------|-----------------|---------------|---------|----------------|------------------|---------------------|-----------------------|------------|----------------|------------------|----------------|----------------|
| 21 | Cape T #2 | 1 | CONUS W | 5 | 7 | 21 | 23 | 3,358 | 100% | 1,505 | 0 | 0 |
| 22 | Cape T #3 | 1 | CONUS W | 5 | 7 | 21 | 23 | 3,358 | 100% | 1,505 | 0 | 0 |
| 23 | Cape V #1 | 1 | CONUS W | 5 | 7 | 22 | 24 | 3,801 | 100% | 1,704 | 0 | 0 |
| 24 | Cape V #2 | 1 | CONUS W | 5 | 7 | 22 | 24 | 3,801 | 100% | 1,704 | 0 | 0 |
| 25 | Cape Orlando #1 | 1 | CONUS W | 19 | 21 | 35 | 37 | 3,398 | 100% | 1,469 | 0 | 0 |
| 26 | Cape K #1 | 1 | CONUS W | 5 | 7 | 20 | 22 | 4,186 | 100% | 1,876 | 0 | 0 |
| 27 | Cape K #2 | 1 | CONUS W | 5 | 7 | 20 | 22 | 4,186 | 100% | 1,876 | 0 | 0 |
| 28 | Cape Edmont #1 | 1 | CONUS E | 6 | 8 | 36 | 38 | 4,853 | 100% | 1,168 | 0 | 0 |
| 29 | Cape D #1 | 1 | CONUS E | 6 | 8 | 36 | 38 | 5,033 | 100% | 1,211 | 0 | 0 |
| 30 | Cape D #2 | 1 | CONUS E | 6 | 8 | 36 | 38 | 5,033 | 100% | 1,211 | 0 | 0 |
| 31 | Cape D #3 | 1 | CONUS E | 6 | 8 | 36 | 38 | 5,033 | 100% | 1,211 | 0 | 0 |
| 32 | Cape D #4 | 1 | CONUS E | 6 | 8 | 36 | 38 | 5,033 | 100% | 1,211 | 0 | 0 |
| 33 | Cape D #5 | 1 | CONUS E | 6 | 8 | 36 | 38 | 5,033 | 100% | 1,211 | 0 | 0 |
| 34 | Cape I #1 | 1 | CONUS W | 6 | 8 | 19 | 21 | 4,249 | 100% | 1,900 | 0 | 0 |
| 35 | Cape I #2 | 1 | CONUS W | 6 | 8 | 19 | 21 | 4,249 | 100% | 1,900 | 0 | 0 |
| 36 | Cape I #3 | 1 | CONUS W | 6 | 8 | 19 | 21 | 4,249 | 100% | 1,900 | 0 | 0 |
| 37 | Cape I #4 | 1 | CONUS W | 6 | 8 | 19 | 21 | 4,249 | 100% | 1,900 | 0 | 0 |
| 38 | Cape R #1 | 1 | CONUS E | 6 | 8 | 34 | 36 | 5,303 | 100% | 1,276 | 0 | 0 |
| 39 | Cape R #2 | 1 | CONUS E | 6 | 8 | 34 | 36 | 5,303 | 100% | 1,276 | 0 | 0 |
| 40 | Cape R #3 | 1 | CONUS E | 6 | 8 | 34 | 36 | 5,303 | 100% | 1,276 | 0 | 0 |
| 41 | Callaghan #1 | 1 | CONUS W | 6 | 8 | 18 | 20 | 4,384 | 100% | 1,961 | 0 | 0 |
| 42 | Cape H #1 | 1 | CONUS W | 6 | 8 | 21 | 23 | 6,110 | 100% | 2,732 | 0 | 0 |
| 43 | Cape H #2 | 1 | CONUS W | 6 | 8 | 21 | 23 | 6,110 | 100% | 2,732 | 0 | 0 |
| 44 | Cape H #3 | 1 | CONUS W | 6 | 8 | 21 | 23 | 6,110 | 100% | 2,732 | 0 | 0 |
| 45 | Cape W #1 | 1 | CONUS E | 6 | 8 | 38 | 40 | 8,901 | 100% | 2,142 | 0 | 0 |
| 46 | Cape W #2 | 1 | CONUS E | 6 | 8 | 38 | 40 | 8,901 | 100% | 2,142 | 0 | 0 |
| 47 | Cape May #1 | 1 | CONUS E | 6 | 13 | 41 | 48 | 17,270 | 100% | 4,156 | 0 | 0 |
| 48 | Cape Mohican #1 | 1 | CONUS W | 6 | 14 | 28 | 35 | 17,270 | 100% | 7,700 | 1 | 0 |
| 49 | Cape G #1 | 1 | CONUS W | 6 | 10 | 21 | 24 | 15,740 | 100% | 7,018 | 1 | 0 |
| 50 | Cape G #2 | 1 | CONUS W | 6 | 10 | 21 | 24 | 15,740 | 100% | 7,018 | 1 | 0 |
| 51 | Cape Florida #1 | 1 | CONUS F | 5 | 12 | 36 | 43 | 19,658 | 100% | 4,750 | 0 | 0 |

Results: Berth Utilization



Results: Air Movements & MOG Ute

| Aircraft Planning Factors | | | | | | |
|---------------------------------|-------------------------------------|--|--|--|--|--|
| Airlift Productivity Factor (%) | 93 | | | | | |
| CRAF Warning (%) | 10 | | | | | |
| MOG Efficiency (%) | 85 | | | | | |
| Surge Start | 5 | | | | | |
| Surge Duration (Days) | 30 | | | | | |
| CRAF Utilizes Enroute MOG | <input checked="" type="checkbox"/> | | | | | |

| Airlift Summary By Day | | | | | | |
|---|---------|---------|---------|--------|--------|-----------------------------|
| | CONUS E | CONUS G | CONUS W | NEA | Total | % Airlift Acft Contribution |
| APOE Rqmt Distribution (%) | 62.52 % | 3.74 % | 33.75 % | 0.00 % | | |
| Air Capacity Distribution (%) | 83.71 % | 2.43 % | 13.86 % | 0.00 % | | |
| Day 0 (Apportionment = 25%, Ops Tempo = SUSTAINED) | | | | | | |
| MOG Lift Capacity Reduction (%) | 0.00 % | 0.00 % | 0.00 % | 0.00 % | 0.00% | |
| Constraint ID | NONE | NONE | NONE | NONE | | |
| Total Actual Cargo Fleet | 558 | 0 | 111 | 0 | 669 | |
| Total Actual Pax Fleet | 955 | 0 | 190 | 0 | 1,145 | |
| Day 5 (Apportionment = 25%, Ops Tempo = SURGE) | | | | | | |
| MOG Lift Capacity Reduction (%) | 0.00 % | 0.00 % | 0.00 % | 0.00 % | 0.00% | |
| Constraint ID | NONE | NONE | NONE | NONE | | |
| Total Actual Cargo Fleet | 628 | 0 | 125 | 0 | 753 | |
| C005 | 190 | 0 | 38 | 0 | 228 | 30.24 % |
| KC010 | 44 | 0 | 9 | 0 | 53 | 6.98 % |
| CRAF PAX | 0 | 0 | 0 | 0 | 0 | 0.00 % |
| C017 | 178 | 0 | 35 | 0 | 213 | 28.29 % |
| CRAF CARGO | 202 | 0 | 40 | 0 | 242 | 32.13 % |
| C141 | 15 | 0 | 3 | 0 | 18 | 2.36 % |
| Total Actual Pax Fleet | 1,066 | 0 | 212 | 0 | 1,277 | |
| Day 15 (Apportionment = 75%, Ops Tempo = SURGE) | | | | | | |
| MOG Lift Capacity Reduction (%) | 50.28 % | 0.00 % | 0.00 % | 0.00 % | 41.95% | |
| Constraint ID | ENROUTE | NONE | NONE | NONE | | |

Coming Soon ...

- Multiple Theaters
- Sealift Apportionment
- Multiple Destinations
- Cargo Stratification