



Navy V-22 Concept of Employment January 2004

Presented to US Naval War College
14 October, 2004
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V22 Business Development
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Navy V-22 COE



Purpose

- Depict the enhanced multi-mission capabilities of the Navy V-22 Osprey in support of the Carrier Strike Group (CSG) or Expeditionary Strike Force (ESF) commander operating in the 21st century
- The COE is intended to be used as a baseline document to stimulate discussions regarding the role of the Navy V-22, and its "value-added," during expeditionary operations in the 21st century





Background

System Description

Employment Scenarios

Summary

Background





Planned Aircraft Allocation



- **Marine Corps: 360 Aircraft**

- **US Special Operations Command: 50 Aircraft**





Planned Aircraft Allocation (Navy)



- The table below reflects the planned allocation of Navy V-22 aircraft, as of December, 1995.
- The fielding plan at that time called for basing one squadron of 16 aircraft on each Coast.

Function	No. AC
2 x Operational Squadrons	32
Training Squadron	5
RDT&E	0
Total PAA	37
Maintenance Pipeline	7
Attrition Reserve	4
<i>Total Procurement</i>	<i>48</i>

System Description

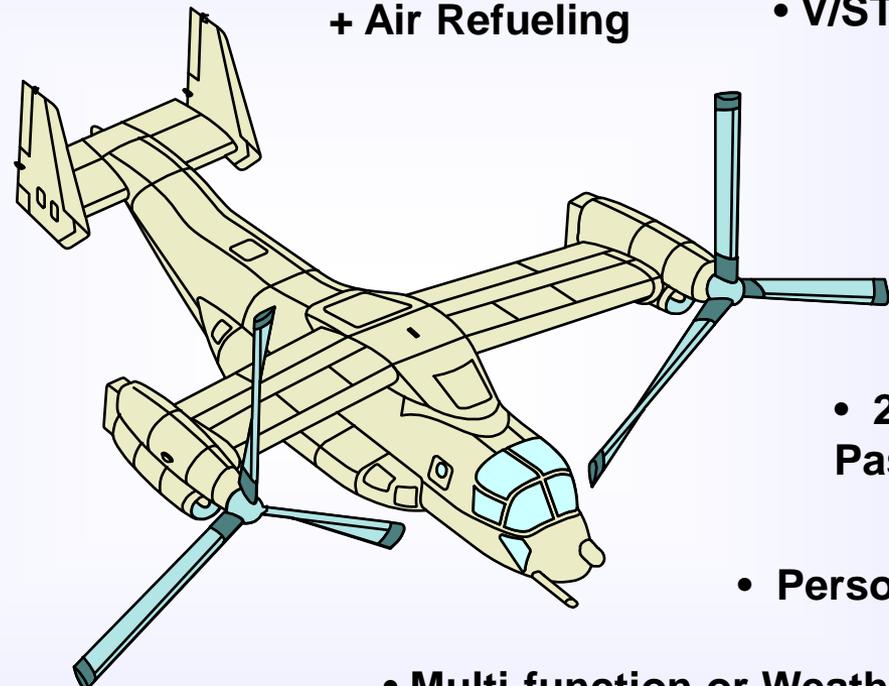




Fleet Logistics Support (COD / VOD) Features:



Navy V-22 Systems Description

- Rear Cargo Ramp
 - 2,038 gal. Mission Fuel + Air Refueling
 - V/STOL Capable
 - 6'x6'x24' Cabin
 - 739 cu. ft. usable cabin volume
 - Dual External Cargo Hooks
 - Passenger Door
 - Flush Roller Rails
 - 24 Crashworthy Passenger (troop) Seats
 - 2,000 lb capacity Cargo Winch
 - Personnel Hoist
 - Multi-function or Weather Radar
 - 5,000 & 10,000 lb Cargo Tiedowns
- 



Navy V-22 System Description

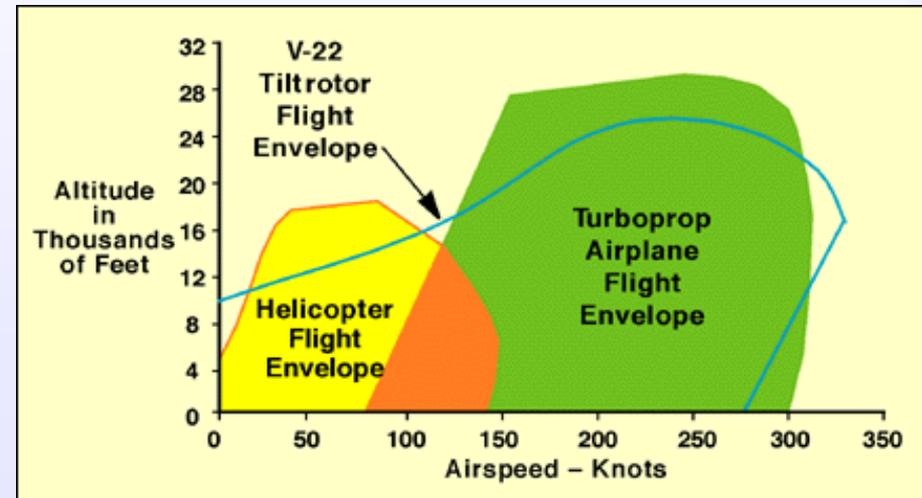


Navy V-22 Systems Description



• Navy V-22 Performance

- Tilt-rotor design
- VTOL
- Speed/Range/Ceiling of Turboprop
- Nominal Cruise 240Kts
- Mission Radius 350nm
- Service Ceiling 25,000ft
- Normal Altitude w/pax 10,000ft
- Ferry Range 2100nm w/ 1 refuel



Versatility of a Helicopter Speed/Range of a Turboprop

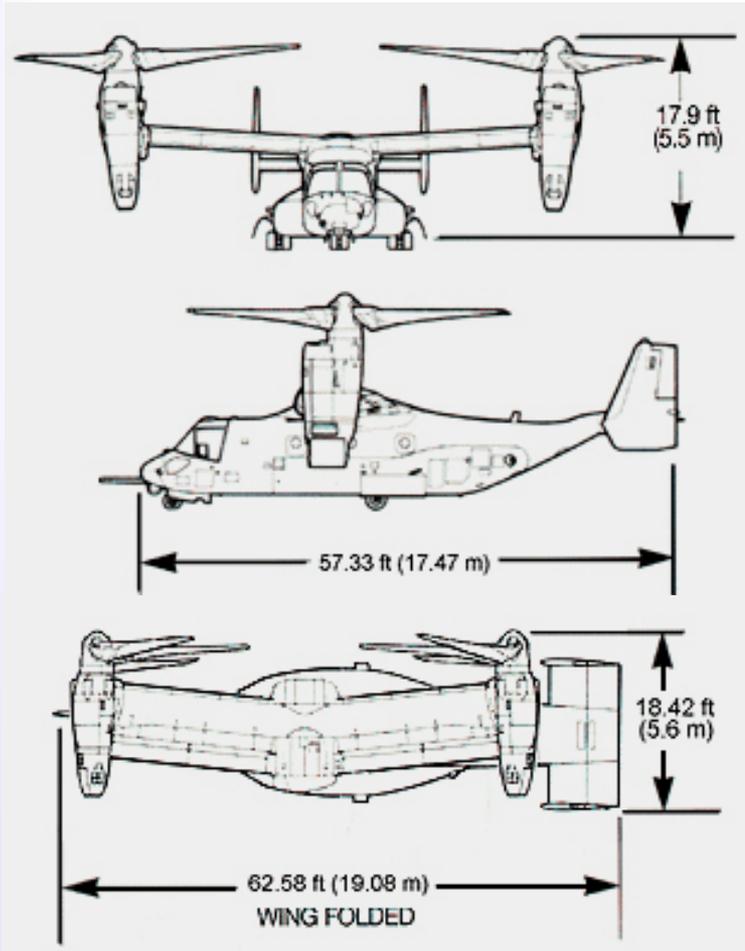


Navy V-22 Shipboard Compatibility

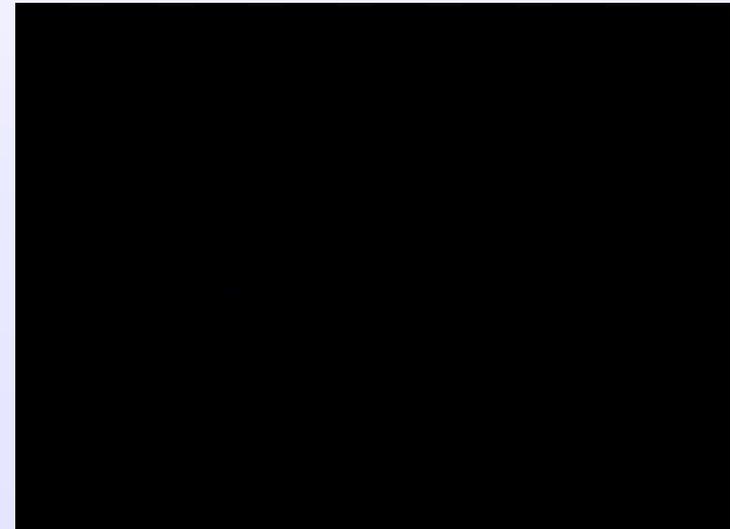


Navy V-22 Systems Description

- Designed for Shipboard Operations
- 90sec Wing and Blade Fold
- Certified for Ops:
 - **All Logistics Ships**
 - **Carriers**
 - **Amphibious Assault**
- To be Certified (current list expanded 2005-2006 by Lakehurst):
 - **Destroyer Class**
 - **Cruiser Class**



Designed for Naval Operations





Navy V-22 System Description



Navy V-22 Systems Description

• Cargo-Lift Capacities

- Internal Cargo Capacity
 - **20,000# Internal**
 - **739ft³ Usable volume**
 - **20.8ft Pallet/Container Length**
 - **24 Combat Troops**
 - **(4) 40x48in Warehouse Pallets**
 - **(2) 463L Half-Pallets**
 - **Roller Conveyer**
 - **Winch**

- External Cargo Capacity
 - **Two retractable external cargo hooks**
 - **10,000# single hook**
 - **15,000# dual hook**
 - **130kts**



Internal capacity of COD with External Lift / VOD Capability



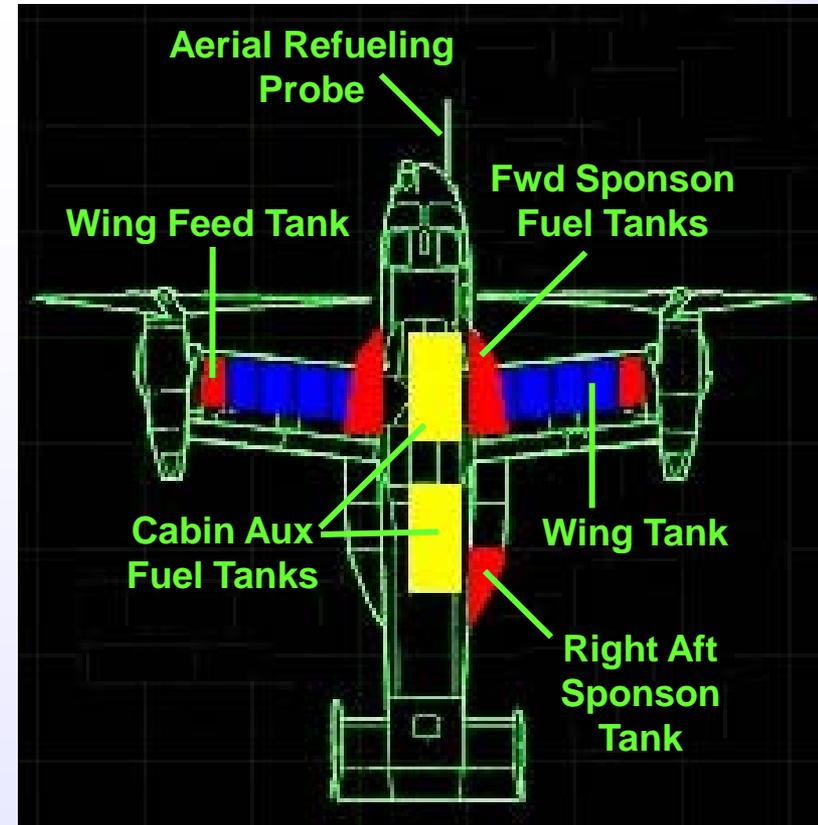
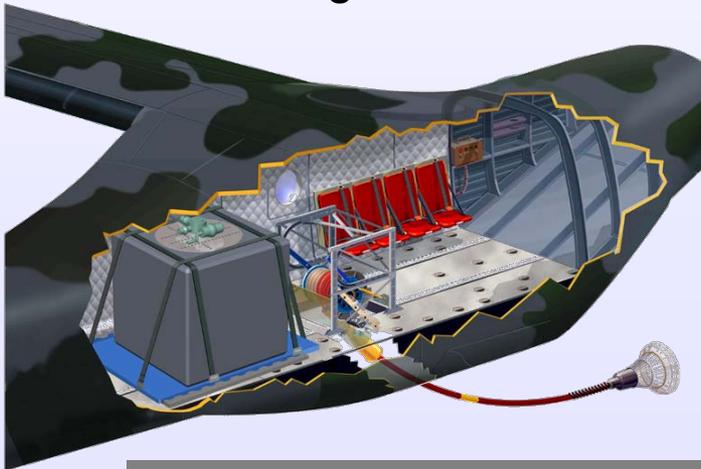
Navy V-22 System Description



Navy V-22 Systems Description

• Navy V-22 Aerial Refueling

- Auxiliary Tanks: 2 x 430 gal (5590 lbs.)
- Internal Fuel: 11,700 lb/1720 gal
- Fuel Giveaway: Auxiliary + Internal (17,290 lbs.)
- Kit Weight: 660 lbs
- Fuel rate: 120gpm
- Reconfigure time: < 1.5 hours
- V-22, CH-53E, AV-8, F/A-18, JSF, etc.
- 230kts
- 80-91 ft hose length



Aerial Refueling provides warfighting flexibility



Navy V-22 System Description

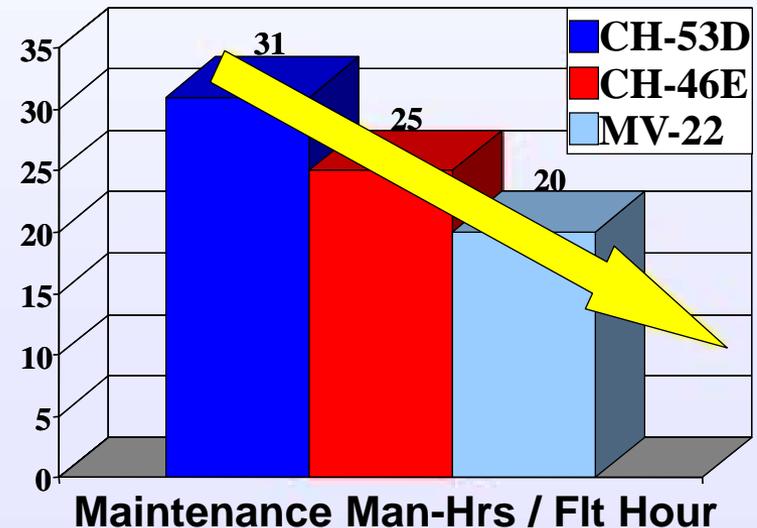


Navy V-22 Systems Description

- **Navy V-22 Supportability**

- **Improved design for maintainability:**

- **Extensive use of composites**
- **Central, Integrated Systems Testability**
- **Improved Maintenance Accessibility**
- **T-406 Engine commonality**
 - C-130J
 - Commercial Aircraft –(Saab 340)



Increased Availability

Employment Scenarios





Navy V-22 COE Assumptions



- Set in the 2015 timeframe
- Services have developed their force structure according to the capabilities based approach articulated in the 2004 Defense Planning Guidance
- Operational adjustments by the Navy to reflect the tenets of Sea Power 21 have been successfully implemented
- The Navy V-22 will be operating with emerging platforms such as the High Speed Vessel, Littoral Combat Ship, and ships in the Maritime Pre-positioning Force (Future)



V-22 Mission Areas-2015



–Sea Strike

Combat Search and Rescue (CSAR)

Aerial Refueling

Special Operations Forces Support

–Sea Shield

Maritime Intercept Operations (MIO)

ASuW, ASW, MIW force multiplier

–Sea Basing

SAR/MEDEVAC

VOD/COD

LCS/SAG Reconstitution



Multi-Mission capabilities across a diverse set of operational tasks



Themes

- Changing threat requires new capabilities
- Multi-mission utility across Sea Power 21 pillars
- Speed, Range, Payload combinations unique
- Flexible Basing Options enable innovative solutions

Navy V-22 is a Transformational Force Multiplier



Navy V-22 COE Naval Expeditionary Forces



Naval Expeditionary Forces

- Operational Environment 2015 Overview



- Dispersed Theaters of Operations
- Force Rotation Requirements
- Reconstitution

MCO-1

MCO-2

ISB



2015- MCO 1



MCO-1

• Situation

- US and coalition forces conducting combat operations for months vs. Orange.
- The aggressor's combat power has been significantly reduced
- The allies have gained the initiative and have forced the aggressor to retreat.

• Threat

- Two armored and three mechanized infantry divisions
- 4th generation fighter-attack aircraft
- fixed / rotary wing transports and attack helicopters.

• Forces

- Three Air Expeditionary Forces
- Four Army divisions organized and equipped per the Future Combat System.
- Four CSGs, 4 MEB* level ESGs*, and two MPGs*.

- * Marine Exp Group / Exp Strike Group / Maritime Prepo Group

• Mission

Continue to assist Orange in ejecting invading forces and be prepared to return to CONUS.



Vignettes

- Recovery Tanker
- Search and Rescue



Navy V-22 Recovery Tanker Mission



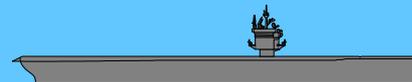
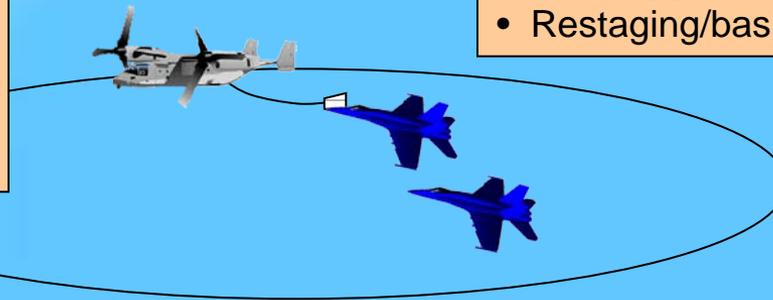
MCO-1

Situation

- Launches last, climbs to 10K
- Consolidates w/ YoYo Tanker
- Meets strike group ovhd “Red Crown” as egress tanker
- Return overhead as Recovery Tanker for 2nd cycle
- Recovers last in second recovery
- Relieves F/A-18E/F for strike/enroute tanking
- 1+30 cycles

Attributes

- 15,000# give
- **120 gal/min**@ 50psi
- Efficient Delivery- economical
- Speed, altitude fit tanking role
- Low O&S cost
- Can support fixed or RW
- Restaging/basing options



**Sea Strike Enabler
Releases Recovery F/A-18E/F Tanker for Strike Missions**



Navy V-22 SAR Mission



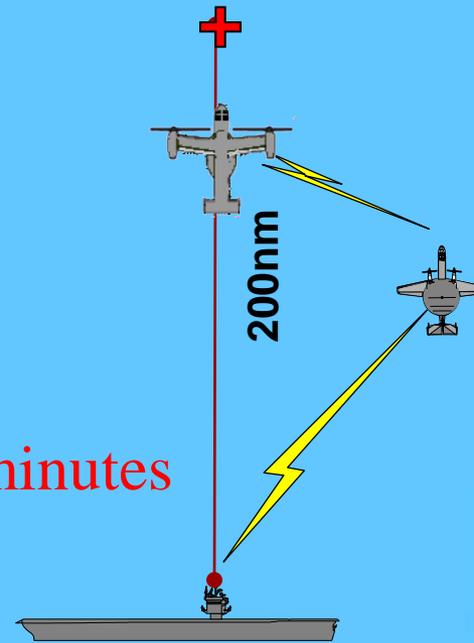
MCO-1

Situation

- F/A-18 suffers engine fire at 200 nm
- Pilot ejects; At “Bingo” state, Wingman returns to CVN
- Environmental
 - Night (2230 Local)
 - Water Temp 46°F
 - Air Temp 38°F
 - Sea State 4
 - Wind: 15-20 knots
- Range exceeds Plane Guard Helo
- Alert 15 Navy V-22 launched for SAR

Attributes

- Speed: 250 kts
- Range: 400+ nm
- Comm suite: Data link, UHF/ VHF voice
- Sensor suite: FLIR, NVD, GPS
- Medical personnel & equipment fit



Pilot rescued in 65 minutes

TIME	15	30	45	60	75	90	105	120	135	150
Survivability	TOC			SURVIVAL DOUBTFUL						
MH60S	2+00 To Survivor With Lily Pad In Place									
Navy V-22	1+05 To Survivor									

Sea Base Enabler
Aircrew Survivability increases as exposure decreases



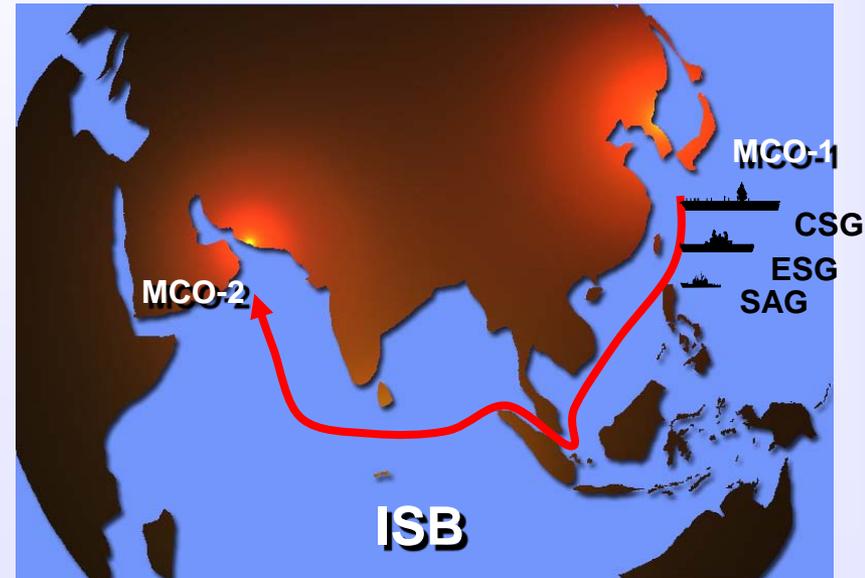
2015- Reconstitution



Reconstitution

• Mission

- Take most direct route to MCO-2
- Resupply from ISB at ranges that optimize reporting to MCO-2 in shortest time
- Move high priority cargo, parts & pax between CSG, SAG & ISB



• Situation

- REAGAN CSG & Bon Homme Richard ESG diverted from homeward transit to MCO-2
- ESG & MPG back load/reconstitution commences in MCO-1
- CSG sprints ahead of ESG
 - MCO 2 Combatant Commander directs ESG to delay at ISB until further notice
- Maintain 15 knot SOA

• Forces

- One CSG , ESG & SAG
- MV-22 not available to CSG

Vignettes

Reconstitution

MEDEVAC

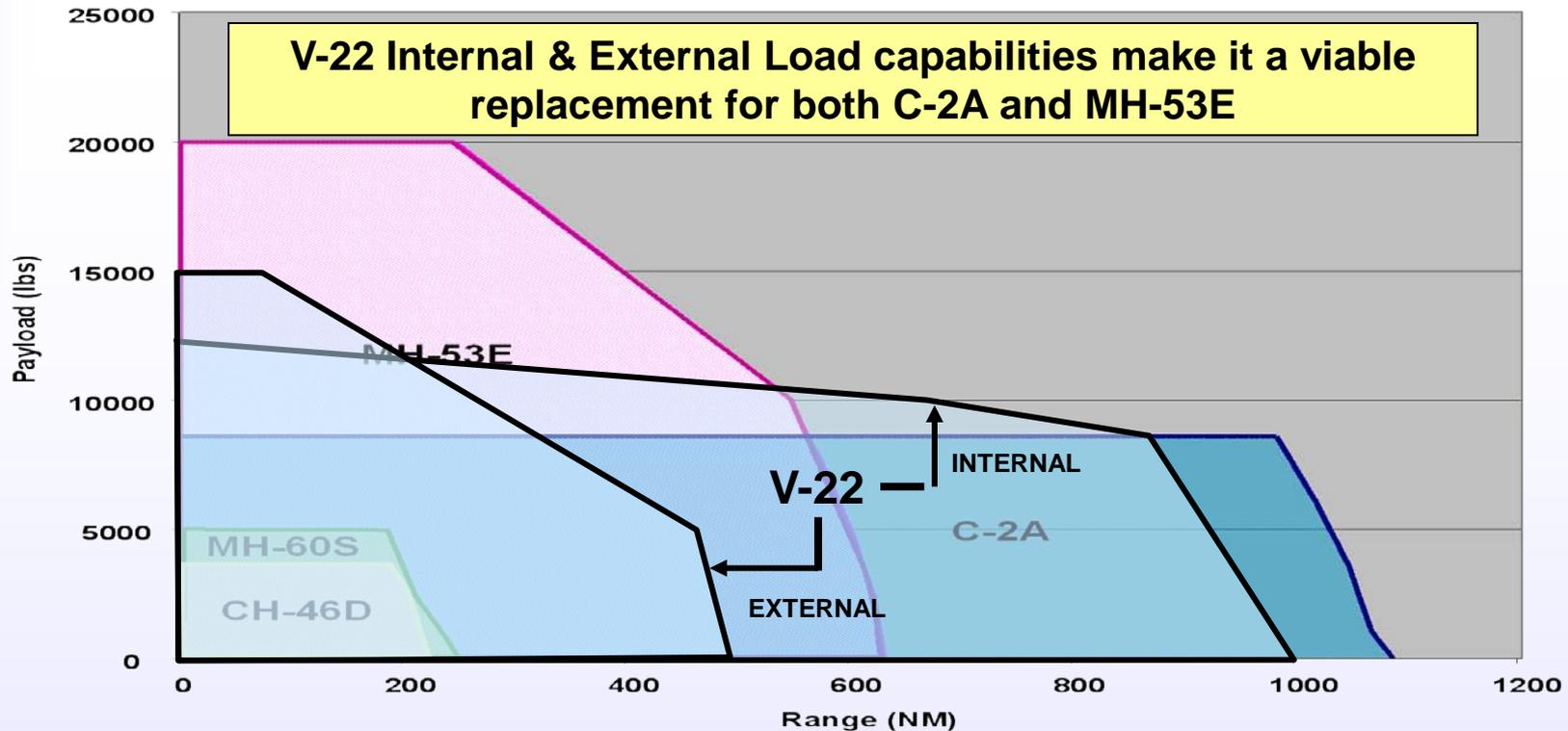


Air Logistics Range vs. Payload Trade-Offs



Utility Role of V-22

Reconstitution



- V-22 enhances the family of small to medium lift capability with greater ranges than helos
- Heavy, over-sized cargo capacity at medium ranges to meet operational readiness needs of aircraft and ships remains H-53 mission (not projected to be in service in 2015)
- Long range cargo and passenger movement necessary to overcome lack of intermediate support base opportunities in several areas of world's oceans
 - V-22 capability comparable to C-2A (projected to leave USN inventory by 2020)
- Short to medium range external lift necessary to meet intra-strike group ship-to-ship logistics
 - MH-60s remain preferred VERTREP platform but Navy V-22 also has that capability



Navy V-22 COE for Reconstitution



Reconstitution

• Situation

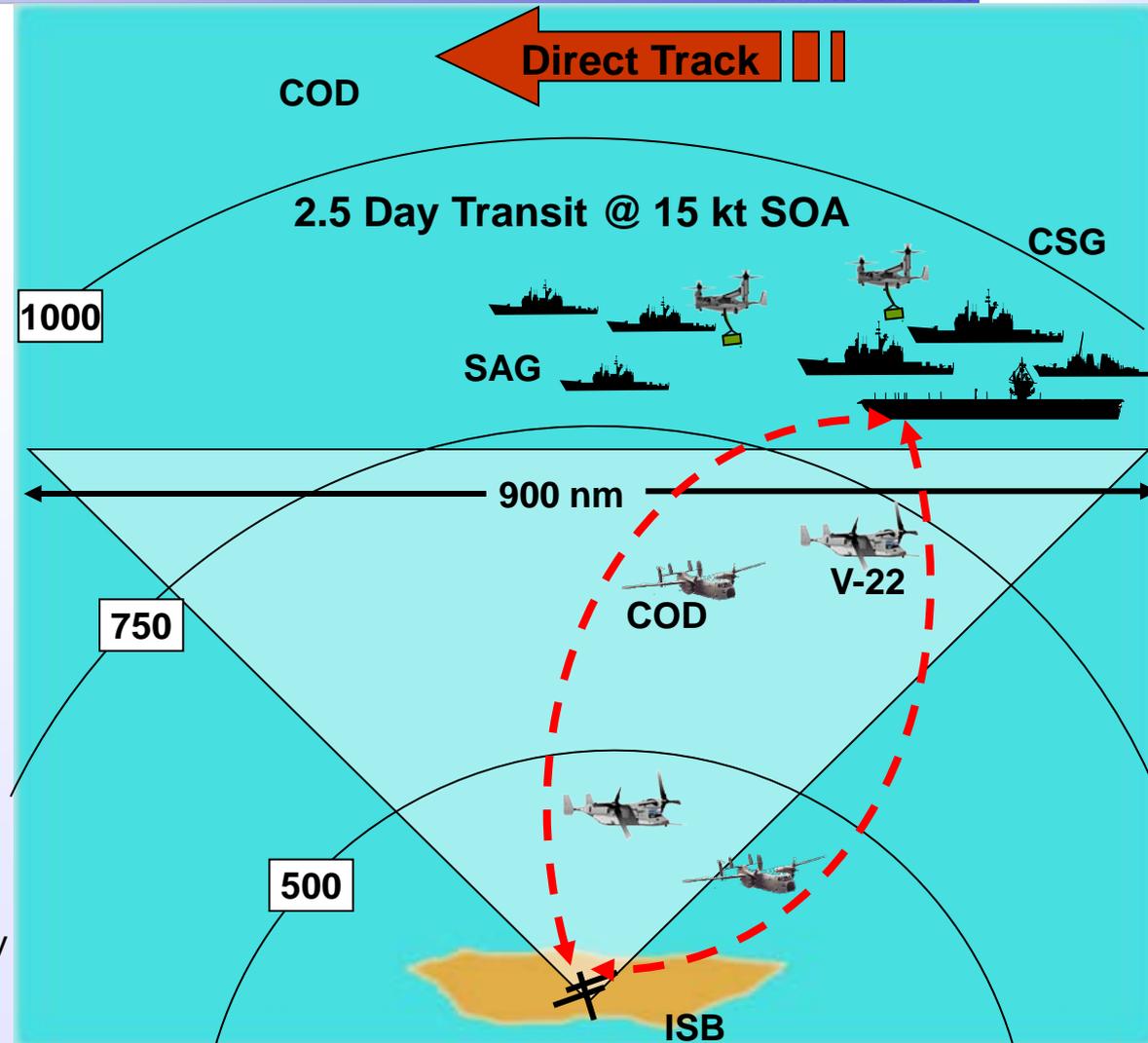
- Navy V-22 (2) and C-2 (2) operate between CVN and ISB
- Re-supply effort via point-to-point mode commences at 750- 850 nm along CSG/SAG track
- Redistribution between CSG & SAG units via V-22 and MH-60S

• Movement Metrics

- Based on equal sorties, V-22 moves comparable payloads to C-2A
 - ~ 7% fewer pax
 - ~ 4% more cargo

• Navy V-22

- Can deliver direct to escorts & CVN
 - Internal & External load options
 - VTOL and STOL capabilities
- Affords greater fixed wing vs non-fixed wing deck configuration flexibility for CVN



Versatile Sea Basing Enabler

Navy V22 Provides a Long Range Option Comparable to C-2A Plus...



Navy V-22 COE for Medevac



Medevac

• Situation

- Collision at sea during underway replenishment results in significant injuries to 12 sailors. All require medevac to shore facility.

- Both CSG and ISB are out of helo range. COD not accessible unless carrier strike group closes SAG to 200 nm

- V-22 launches off carrier with 12 litter configuration and medical team

- 4 litter max for helos will require 3 helos

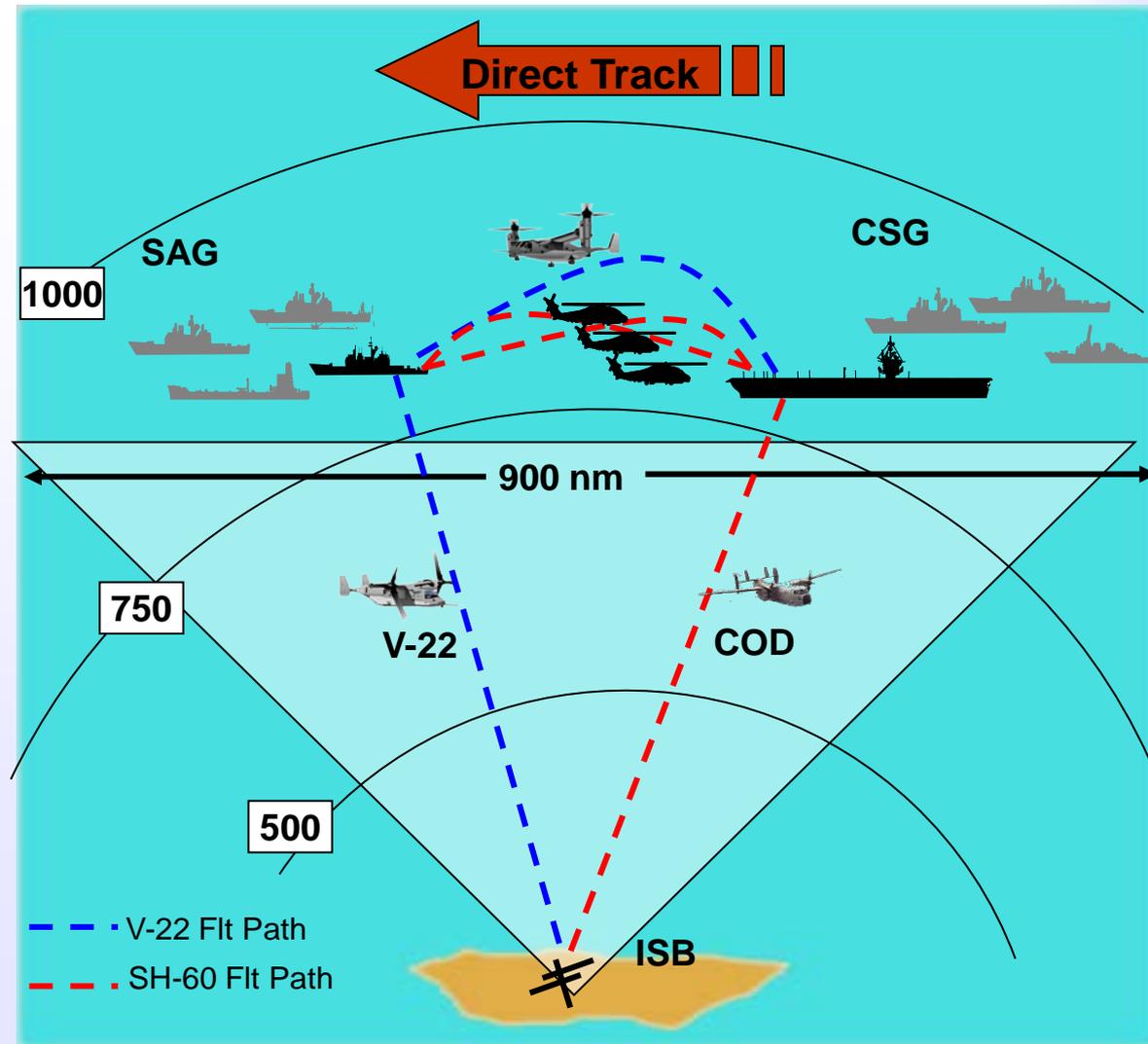
• Movement Metrics

- C-2A + (3)MH-60's

Pax (3 H-60 w/ 4 each)	12
Load Pax (twice)	2 Hrs
Ships close	10 Hrs
4 Sorties (3 Helo, 1 COD)	8 Hrs
Total Time	20 Hrs

- V-22 (1 A/C)

Pax (1 V-22)	12
Load Pax (once) 1 Hr	
2 Sorties	5 Hrs
Total Time	6 Hr





2015- MCO 2



MCO-2

• Situation

- Red has successfully pressured its neighbors to deny the US access to bases
- Red deployed minefields in nearby straits and littoral areas, followed by a similar “seeding” in Green’s major ports.
- Red then attacks on a multi-axis front with the strategic objective of achieving hegemony over Green and compelling the US to substantially reduce its presence in the theater.

• Threat

- Five diesel submarines
- Several flotillas of patrol craft with 70mm cannon and surface to air / surface to surface missiles, as well as a paramilitary organization based aboard numerous, armed, small boats.
- Red's tactical ballistic missiles can be fitted with conventional, chemical, or biological warheads and are protected by a formidable air defense system..

• Forces

- One CSG, SAG and LCS sqd
- Three CSGs and two ESGs enroute
- Two AEFs on standby

• Mission

- Establish Q route through straits
- Establish air supremacy and sea superiority
- Combat air operations ashore



Vignettes

LCS/SAG Sustainment

SOF Support

CAS Tanking

Combat Search and Rescue



Navy V-22 Sustainment –MCO2



MCO-2

SITUATION

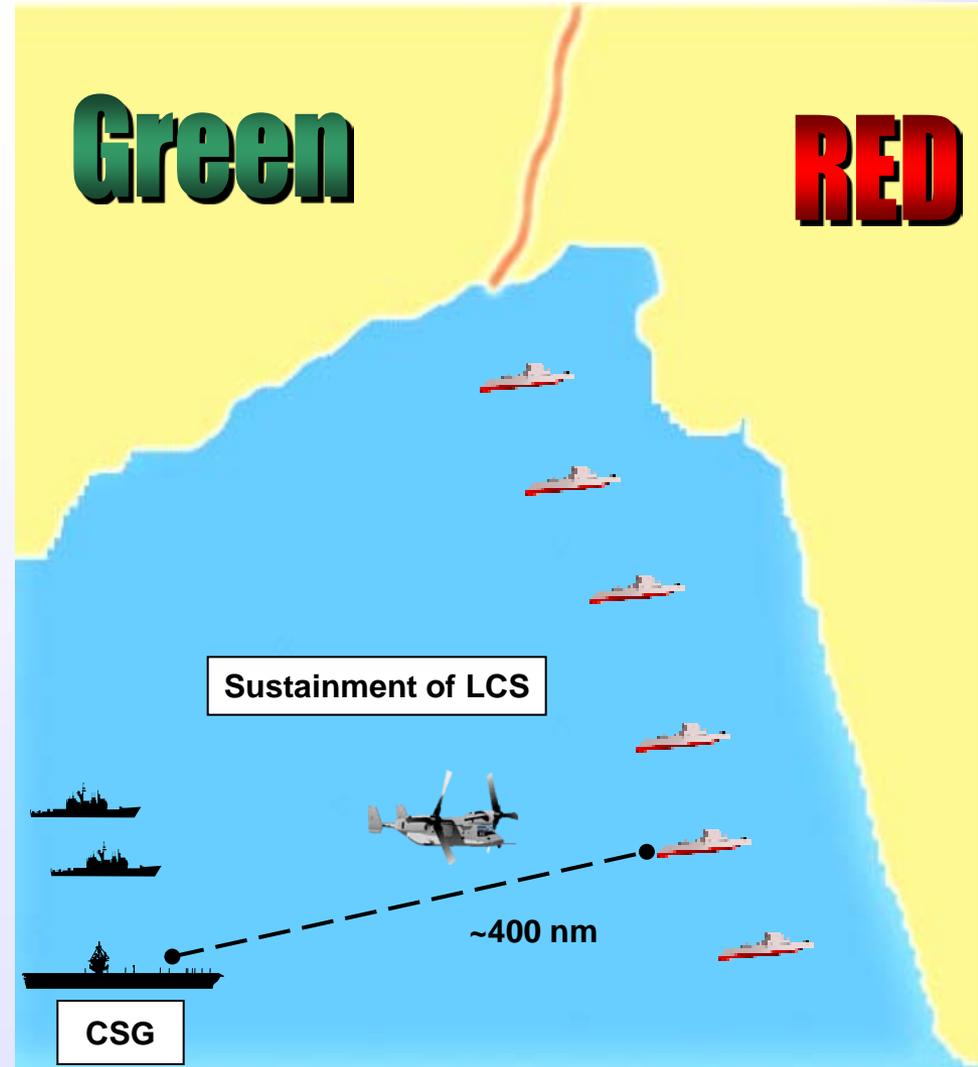
- 2 Divisions of LCS ships patrolling RED littorals
- Intelligence reports RED submarine force unexpectedly sorties
- Replacement part critical to ASW operations
- A replacement part is within the CSG
- CSG lead elements currently 24hrs from op area when one LCS reports Underwater Vehicle (UUV) malfunction

SOLUTION

- Use Navy V-22 to fly the UUV replacement part from the CNV to the LCS

ATTRIBUTES

- Navy V-22 able to make the 400nm delivery within 7hrs from initial distress call
- Internal Carriage of asset
- Hoist used to lower replacement part to LCS



Sea Shield - Maintaining Combat Capability On-station



Navy V-22 SOF Mission



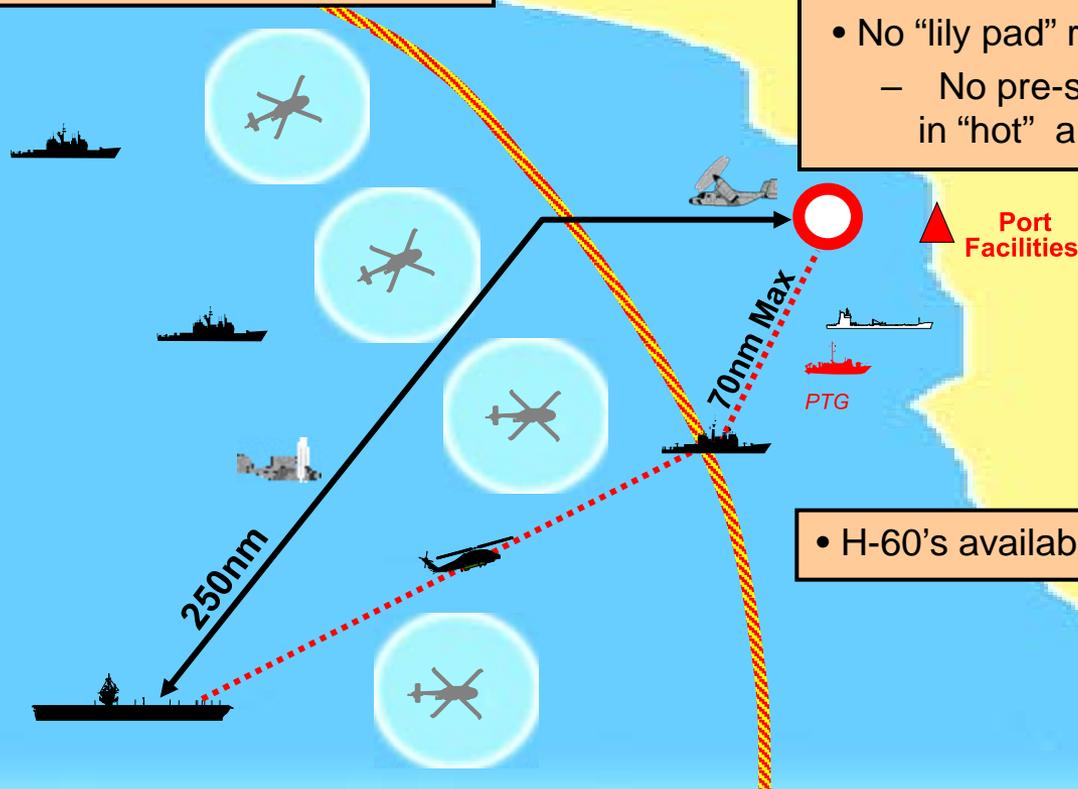
MCO-2

SITUATION

- Insert Seals 5 nm off beach for recon mission
- 500 nm round trip
- Carry 8 Seals + Soft duck (inflatable boat)
- Recover Seals at drop point prior to sunrise

ATTRIBUTES

- V-22 carries Seals directly from CVN
 - Off axis course to avoid PTGs
 - “Soft duck” carried internally
 - Entire mission at night
- No “lily pad” required
 - No pre-staging of a surface ship in “hot” areas



- H-60's available for SUW & USW

Increased mission effectiveness with fewer assets

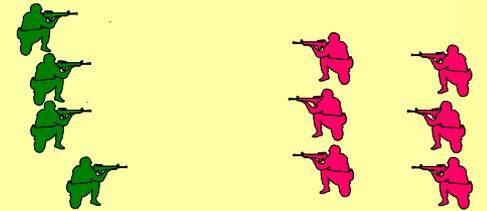


Navy V-22 CAS Tanking Mission



MCO-2

RED

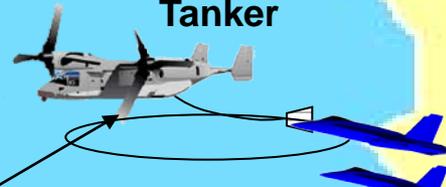


SITUATION

- Support on call CAS
- Increase Time On Station / Responsiveness
- Altitude 10,000 ft; 50nm from CAS orbits

CAS
Tanker

200 nm



Attributes

- Speed: 250 kts
- Range: 200 nm
- 10,000 lbs give
- 120 gal/min
- On Station time 1+00

Provides Division of Hornets with 20-25 minutes additional time on station



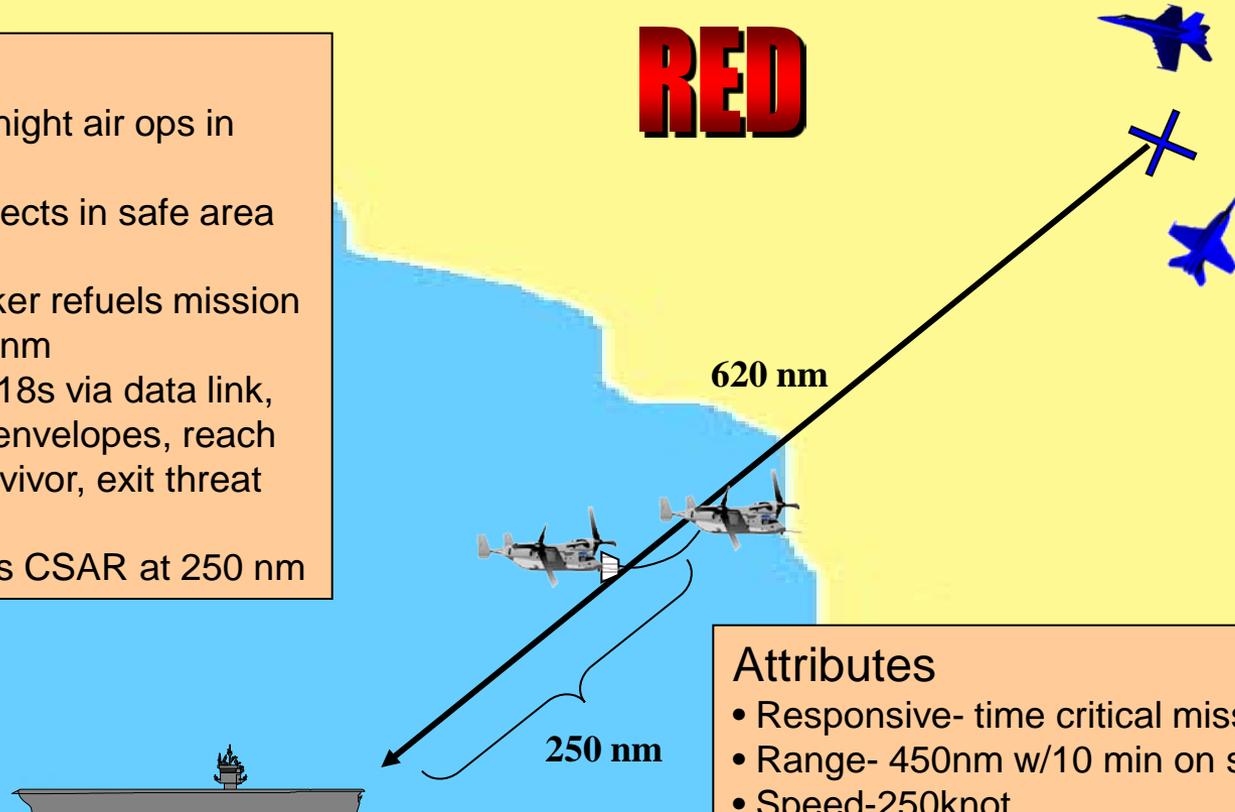
CSAR Mission



MCO-2

Situation

- Regan CSG conducting night air ops in support of SOF in RED
- F/A 18 hit by SAM and ejects in safe area
- CSAR mission tasked
 - V-22 Overhead tanker refuels mission
 - V-22 enroute at 250nm
- Threat updates from F/A-18s via data link, uses GPS to skirt threat envelopes, reach pick-up point, pick up survivor, exit threat environment.
- V-22 airborne tanker joins CSAR at 250 nm



Attributes

- Responsive- time critical mission
- Range- 450nm w/10 min on station
- Speed-250knot
- Survivability
 - Ballistic tolerance
 - Reduced IR signature

**Enhanced CSAR Mission Capability
Provides Force Commander Options not available today**

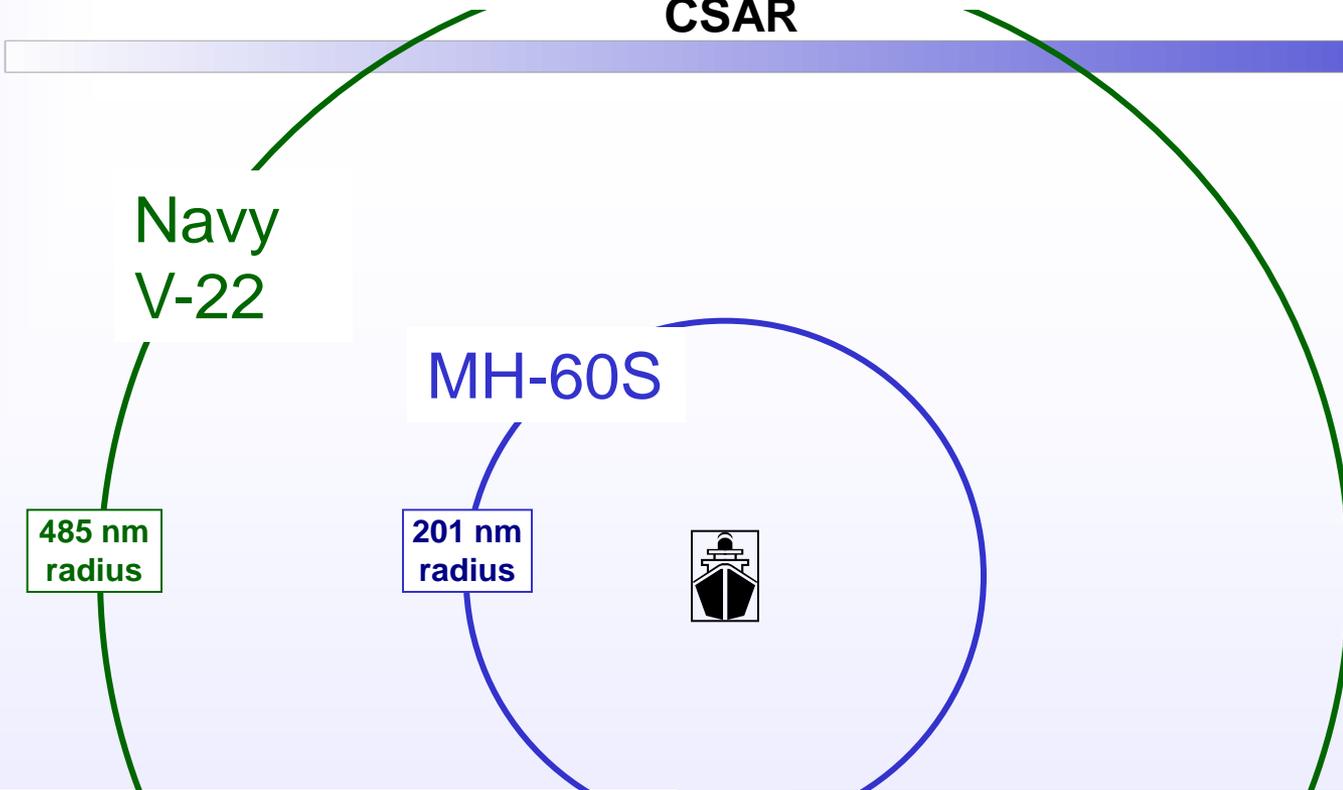


Navy V-22 vs MH-60S

CSAR



MCO-2



Navy V-22

- 485 nm radius w/ 1 add'l 430 gal internal tank
- 261 Kts, 1.9 hrs to 485 nm
- Room for multiple survivors
- Increase range with higher altitude transit
- Max alt 25,000 ft; can fly over high mountains
- Can carry security team
- Loiter in flight near target area for standby
- Second 430 tank or Inflight refuel to extend range

MH-60S

- 201 nm radius with 2 add'l 195 gal aux tanks
- 125 kts, 1.6 hrs to 201 nm
- Max of 2 survivors
- No increase in range with higher alt transit
- Max alt 10,000 ft; cannot fly over high mountains
- Cannot carry security team
- Alert on deck for standby
- Inflight refuel can extend range



Navy V-22 COE



Questions?

Summary





Sea Strike, Sea Shield, Sea Basing Enabler



- Multi-Role Utility
 - V-22 provides 85% mission utility across four other platforms (H-53, C2, H-60, H-46)
- V-22 provides the Navy with across the board mission utility without introducing a new TMS
- Greatly extends operational lift capability and flexibility
 - Pacific theater stressors
- Provides force commander with SAR/CSAR unique capability
- Future Operational Requirements
 - H-53 and COD replacement not currently identified







Backup Slides



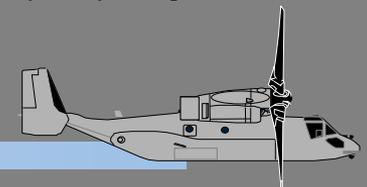
V-22 Ship Compatibility



Ship Class	Number in Class	Obstruction Clearance	Deck Strength		Servicing		Ship Motion & Stability
			Land & Park in SS 5	Land & Storm Park (SS 8)	Fuel	Hangaring	
DD 963	25			Minor Mod		NO	
DDG 51	57	Minor Mod		Minor Mod		NO	
CG 47	27			Minor Mod		NO	
AOE 1	4			Minor Mod		Major Mod	
AOE 6	4					Major Mod	
LPD 4	11					NO	
LPD 17	12						
LSD 41	12					NO	
LHA 1	5						
LHD 1	7						
MCS 8	1						

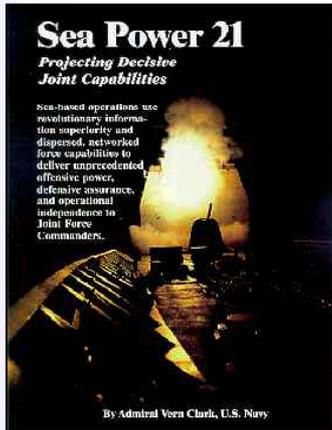
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Sources: 1. Naval Sea Systems Command Ship Design and Engineering Directorate: SV-22 Staging Shipboard Compatibility Study, 9 Sept 1987
 2. NKF Engineering, Inc.: V-22 ASW Variant Shipboard Compatibility Study, 15 August 1986

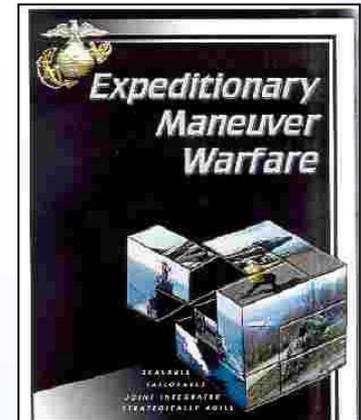




Naval Warfighting Concepts



Naval Operational Concept *Driving closer ties, increased synergies*



The Navy Operational Concept

Operational Maneuver From the Sea

- Continuum of Forward Operations
- Littorals: a starting point – a destination
- Maritime Superiority – defense projected ashore
 - Sea Shield (Joint TAMD)
 - Self sustaining
- Project Power to influence events ashore
 - Sea Strike
 - Sea Basing
- FORCEnet – the “enabler”

- Forward deployed enabling forces
- Sea and land as a maneuver space
- Full spectrum of conflict
- Extended littoral operating area
- Exploit enemy gaps/vulnerabilities
- Operate at night and adverse weather
- Decisive actions with massed fires
- Sea-based C2, Fires and Logistics



Sea Power 21



Strategy

- National Security Strategy
- Defense Planning Guidance
- Joint Vision 2020
- Sea Power 21

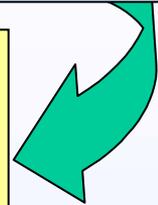


Sea Power 21 Mission

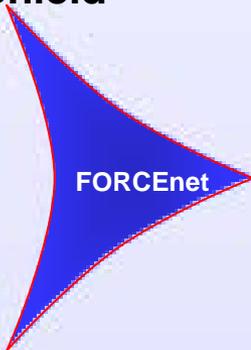
Deliver unprecedented offensive power, defensive assurance, and operational independence to Joint Force Commanders

Sea Power 21 Tasks

- Project layered, defensive power
- Extend homeland security with forward presence
- Sustain access via littoral dominance
- Protect joint forces and allies ashore
 - Extend defensive umbrella deep inland
 - Strengthen strategic stability
 - Provide operational security
- Project Precise and Persistent Offensive Power



Sea Shield



Sea Strike

Sea Basing

Projecting Decisive Joint Capabilities



Navy V-22 Issues



Issues

- **Issues**

- Over Water Night Hover Capability

- GPS/INS system capability vs. Doppler

- Lack Of Pressurization

- Long range passenger carriage

- Force Structure For 48 Aircraft

- Push to decrease manning
- Carrier/Air Wing manning getting close scrutiny

- **Navy V-22 and High Speed Vessel**



Navy V-22 Issues



Issues

- **Issues**

- Platform Configuration Definition

- Navy V-22 needs to be close to MV-22 configuration
- Same TMS
- CV-22 cost
- MV-22 configuration can fill the Navy's needs

- Flight Deck Operations

- Destroyer class / Small decks yet to be validated
- Spotting factor, (larger than H-53, longer than E-2)

- Aerial Refueling Capability

- Need more data on pkg. configuration and basket stabilization

- Rotor Downwash

- Over water



Trade Studies



Issues

•Navy V-22 COE As A Building Block

- Requirements Gaps
- Platform Configuration
- Flight Deck Operations
- Force Structure
- Re-Supply / Re-Constitution

