Navy V-22
Concept of Employment
January 2004

Presented to US Naval War College
14 October, 2004
By Arnie Easterly
V22 Business Development
Bell Helicopter Textron

Developed for Bell/Boeing
by
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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
Planned Aircraft Allocation

- Marine Corps: 360 Aircraft
- US Special Operations Command: 50 Aircraft
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.

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System Description
Fleet Logistics Support (COD / VOD) Features:

- Rear Cargo Ramp
- 2,038 gal. Mission Fuel + Air Refueling
- V/STOL Capable
- Dual External Cargo Hooks
- Passenger Door
- 24 Crashworthy Passenger (troop) Seats
- Personnel Hoist
- Multi-function or Weather Radar

- 6’x6’x24’ Cabin
- 739 cu. ft. usable cabin volume
- Flush Roller Rails
- 2,000 lb capacity Cargo Winch
- 5,000 & 10,000 lb Cargo Tiedowns

Navy V-22 Systems Description
Navy V-22 System Description

- 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

- 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

• 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 Conveyor
    ▪ 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 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 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
Navy V-22 COE Naval Expeditionary Forces

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

- Operational Environment 2015 Overview

- Dispersed Theaters of Operations
- Force Rotation Requirements
- Reconstitution
• **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 MPG*.

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

**Vignettes**
– Recovery Tanker
– Search and Rescue

*Marine Exp Group / Exp Strike Group / Maritime Prepo Group
Navy V-22 Recovery Tanker Mission

**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

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

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

Pilot rescued in 65 minutes

Survivability

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Sea Base Enabler
Aircrew Survivability increases as exposure decreases
2015- Reconstitution

• 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

• 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

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

Vignettes
  Reconstitution
  MEDEVAC
• 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**

**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

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**Versatile Sea Basing Enabler**

*Navy V22 Provides a Long Range Option Comparable to C-2A Plus...*
**Navy V-22 COE for 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

• 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

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
Navy V-22 SOF Mission

**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

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

**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
**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 with 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

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

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**Sources:**
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

- 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”

Operational Maneuver From the Sea

- 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

Projecting Decisive Joint Capabilities
Navy V-22 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**
  - 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)

  - Arial Refueling Capability
    - Need more data on pkg. configuration and basket stabilization

  - Rotor Downwash
    - Over water
**Trade Studies**

- **Navy V-22 COE As A Building Block**
  - Requirements Gaps
  - Platform Configuration
  - Flight Deck Operations
  - Force Structure
  - Re-Supply / Re-Constitution

### Recurring Flyaway
- Management
- Hardware
- ECOs

### PLUS
- Non-Recurring
- Ancillary Equip

### Flyaway Cost

### Weapon System Cost

### Procurement Cost

### Acquisition Cost

### Life Cycle Cost

### Total Ownership Cost

- **Common spares/support items**
- **Infrastructure cost for planning, managing, operating and executing**
- **Linked indirect costs**
- **Modification improvements**