



Fleet Maintenance Policy and Implementation



TOPIC LEARNING OBJECTIVES

Upon successful completion of this topic, the student will be able to:

- 1. Identify the Navy’s ship maintenance policy.
- 2. Identify the relationships between Condition Based Maintenance (CBM), Time Directed Maintenance (TDM), and Reliability Centered Maintenance (RCM).
- 3. Identify the content, and uses of the following documents: OPNAVINST 4700.7M, OPNAVNOTE 4700, Navy Data Environment – Navy Modernization (NDE-NM), the Class Maintenance Plan (CMP), and the Integrated Class Maintenance Plan (ICMP).
- 4. Identify roles, responsibilities, considerations, and requirements involved with the CNO availability scheduling and approval process.
- 5. Identify the Navy’s current maintenance strategies and their key attributes.

STUDENT PREPARATION

Student Support Material

- 1. None

Primary References

- 1. OPNAVINST 4700.7 (series) Maintenance Policy for Navy Ships
- 2. OPNAVNOTE 4700 (series) Notional Intervals, Durations, Maintenance Cycle, and Repair Man-Days for Depot Level Maintenance Availabilities of U.S. Navy Ships
- 3. OPNAVINST 4790.16 (series) Condition-Based Maintenance and Condition-Based Maintenance Plus Policy

Additional References

- 1. OPNAVINST 3000.15 (series) Optimized Fleet Response Plan
- 2. CNSP/CNSL 3502.7 (series) Surface Force Training and Readiness Manual

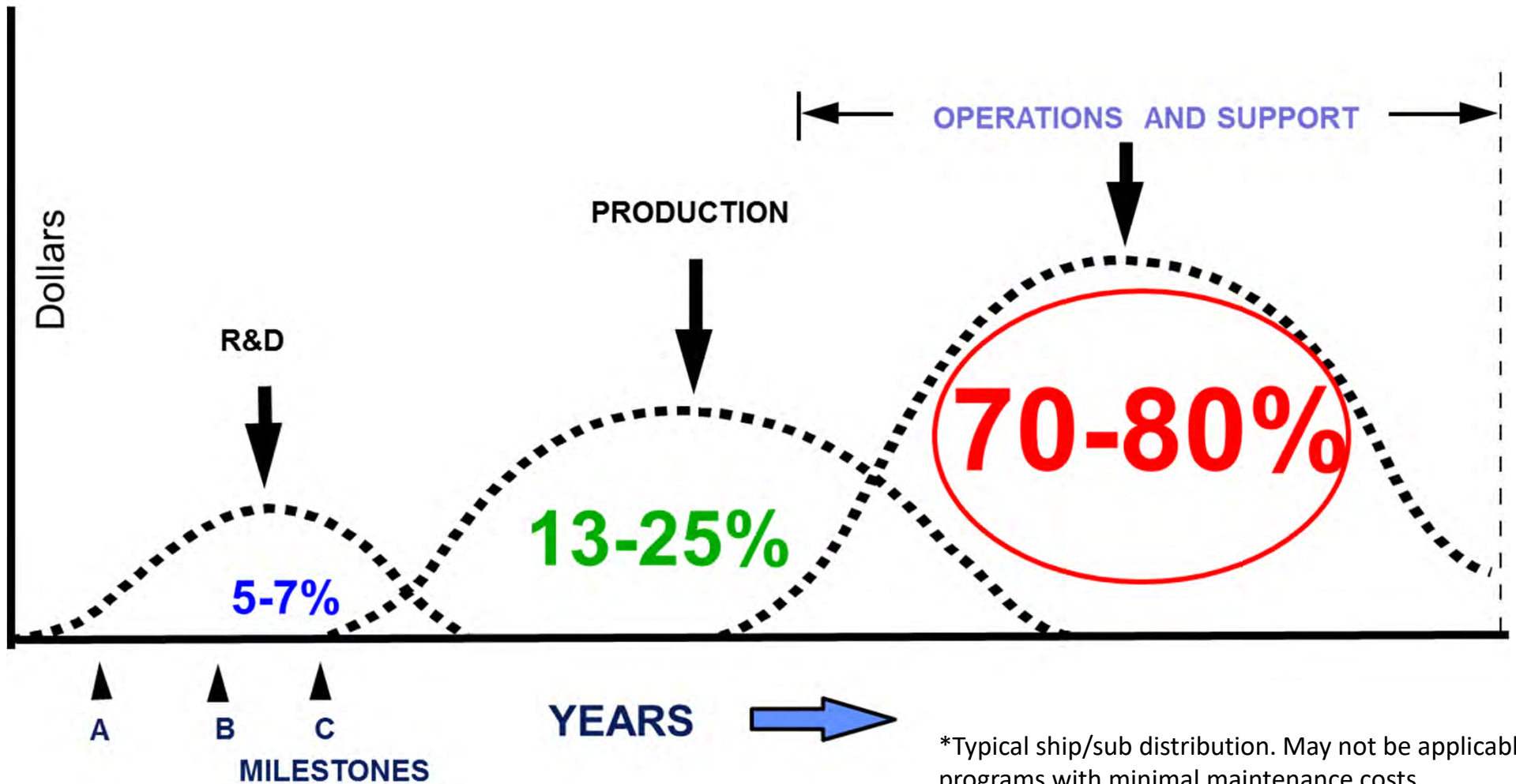


Overview

- Fleet Maintenance
- Maintenance Process
- Class Maintenance



Maintenance Costs

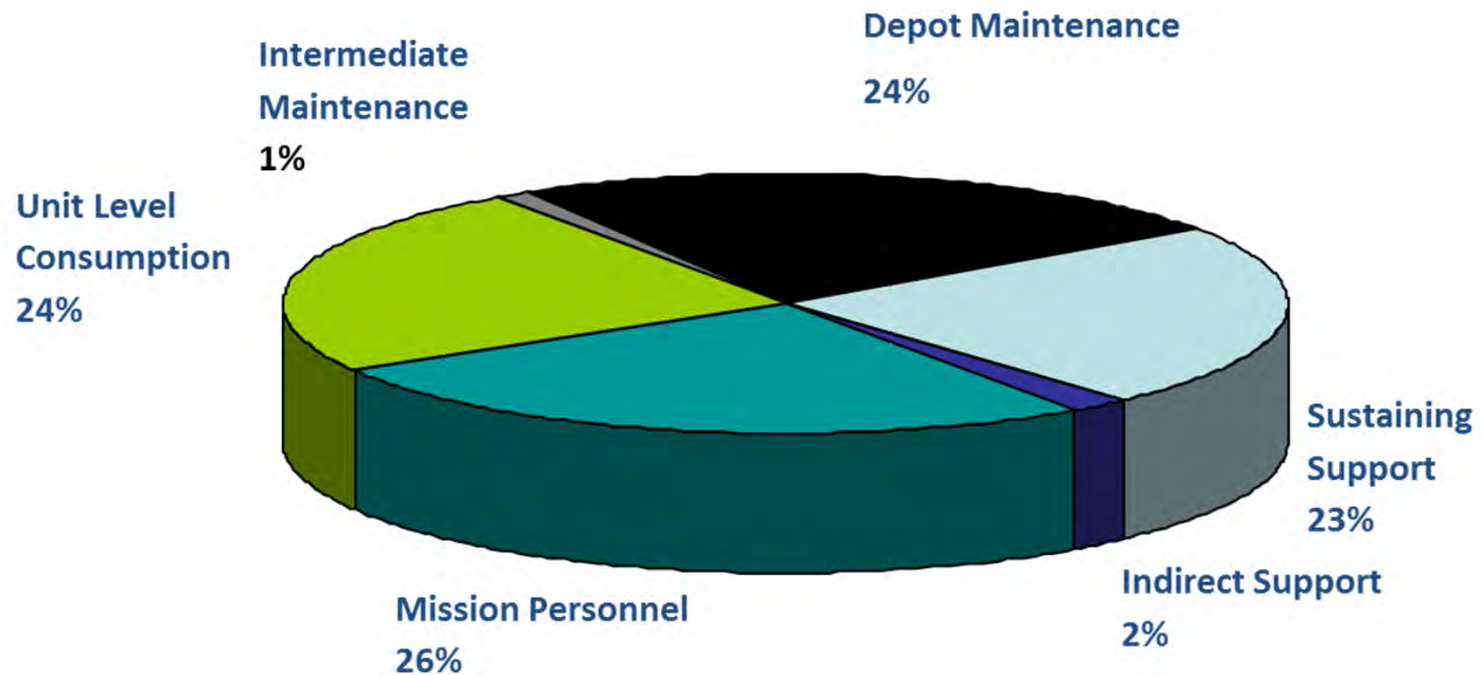


*Typical ship/sub distribution. May not be applicable to programs with minimal maintenance costs

Maintenance costs account for a large portion of total Life-Cycle Cost (LCC)



Typical Combatant O&S Costs





Fleet Maintenance Policy

- OPNAVINST 4700.7 (series)
- Ships shall be maintained...
 - in the highest practical level of readiness
 - to meet required operational availability (A_o) needs
 - while minimizing total LCC over the design life of the ship
 - in a safe material condition
 - to meet the shipboard habitability standards of OPNAVINST 9640.1 (series)
 - to meet expected service life
- Maintenance shall be performed by the maintenance level that can best ensure proper accomplishment (weighing laws, urgency, priority, crew impact, capability, capacity, and total cost)
- Maintenance for new ships, systems, and equipment shall be based on Reliability Centered Maintenance (RCM) methodology



Fleet Maintenance Policy

- Influences on maintenance policy:
 - Force Structure
 - Size of fleet
 - Mix of ships
 - Operational Transformation
 - Surge & pulse
 - NAVPLAN 2024 Goal - Achieve and sustain 80% combat surge ready ships, aircraft, and submarines
 - Minimal manning and maintenance strategy
 - Increased forward presence
 - Optimized Fleet Response Plan (O-FRP)
 - Industrial Capacity
 - Private and public sectors
 - Proprietary and Original Equipment Manufacturer (OEM) information
 - Funding
 - Maintenance activities are mostly general (mission) funded, and some reimbursable
 - Readiness
 - Labor and skill intensive avails
 - Continuous Maintenance
 - Condition Based Maintenance



Maintenance Principles

- **Reliability Centered Maintenance (RCM)**
 - *A method for determining maintenance requirements* based on analysis of the likely functional failures of components, equipment, subsystems, or systems having a significant impact on safety, operations and life-cycle cost
- It is an engineering discipline that allows for evaluation of evidence for the purpose of scheduling and executing maintenance tasks and intervals:
 - Condition Based Maintenance (CBM) tasks identify signs of impending failure (e.g., visual inspection or non-destructive inspection, vibration monitoring and analysis, oil samples)
 - Time Directed Maintenance (TDM) tasks restore acceptable resistance to failure and are performed regardless of item's condition
 - Failure finding tasks identify if a protective device is in a failed state (e.g., testing a smoke detector)
 - Tasks must be considered applicable and effective, and are needed to maintain the inherent reliability of equipment at minimum cost



Maintenance Principles

- **Condition Based Maintenance (CBM)**
 - A maintenance strategy derived from analysis, using DoD approved RCM principles, that *stipulates the performance of maintenance when there is objective evidence of need* in order to ensure safety, reliability, availability, and acceptable total ownership cost
- Includes maintenance processes and capabilities derived from real-time or near real-time assessments obtained from embedded sensors, external tests and measurements, using either portable equipment or actual inspection
- Limited by ability to conduct timely assessments in a manpower and resource constrained environment



damenshiprepair.com



Maintenance Principles

- **Time Directed Maintenance (TDM)**
 - A maintenance strategy derived from analysis, using DoD approved RCM principles, *that requires maintenance to be performed regardless of equipment condition* to ensure safety, reliability, availability, and acceptable total ownership cost
 - A task performed at some interval to renew life based on statistical analysis of wear-out regardless of condition, maybe based on calendar time or recurring events, e.g., critical hose replacement. Time-directed tasks are authorized when RCM analysis shows there is no applicable and effective condition-directed task.

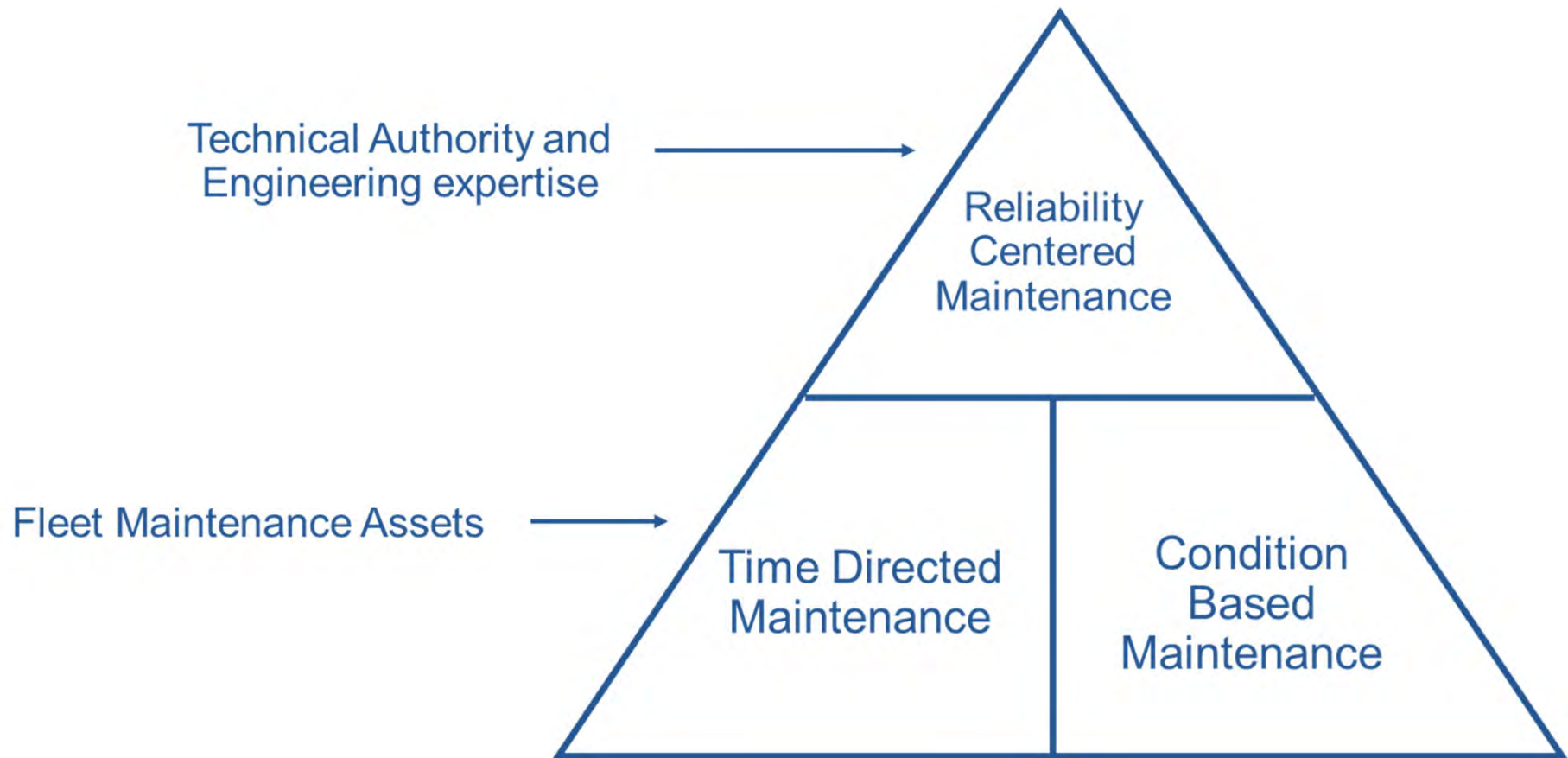


<https://www.dvidshub.net/image/8166342/diesel-engines-overhauled-aboard-uss-gunston-hall>

4.1.3 Fleet Maintenance Policy and Implementation



Maintenance Philosophy



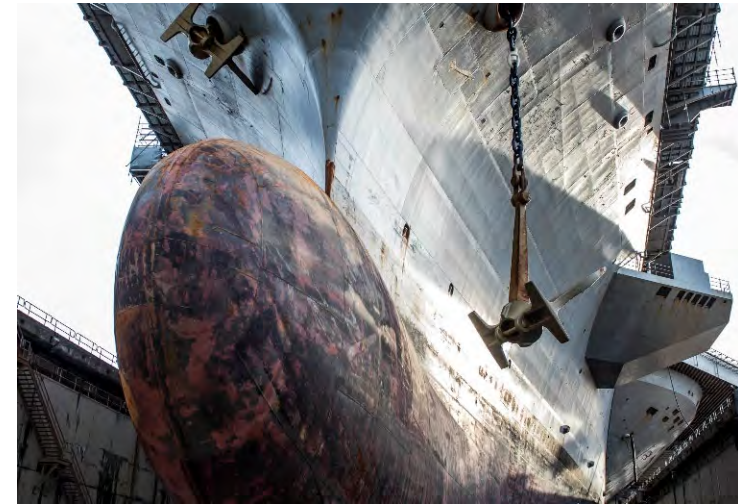
- RCM is the maintenance philosophy with TDM & CBM as two primary maintenance strategies derived from its analysis

Navy maintenance policy uses CBM to the maximum extent available using RCM rules



Depot Maintenance

- OPNAVINST 4700.7 (series)
 - *Overall ship maintenance policy*
 - Provides broad concepts for O/I/D maintenance
 - Requires development of Class Maintenance Plan
 - Assigns organizational responsibilities
- Class Maintenance Plan (CMP)
 - Defines maintenance strategy and availability cycle (i.e., requirements)
 - Defines maintenance tasks (scope, level of accomplishment, periodicity)
 - Developed by the Ship Program Manager (SPM) and technical support community
 - Based on Technical Foundation Papers (TFP)
 - Planning and programming document



O – Organizational, I – Intermediate, D – Depot



Depot Maintenance

- Technical Foundation Paper (TFP)
 - Notional maintenance requirement by ship class across Expected Service Life (ESL)
 - Used to identify and capture technical requirements
 - Primarily a budget requirements document. Submitted to OPNAV for inclusion in budget process
 - Programming and budgeting document
- Ship Sheets
 - Lays out the maintenance requirement in resource-days by hull across the FYDP (Future Year Defense Plan – 5 years)
 - Supports yearly Program Objective Memorandum (POM) process
 - Captures requirements from TFP, previously deferred maintenance, and known modernization requirements for each individual ship
 - Programming and budgeting document



Depot Maintenance

- Integrated Class Maintenance Plan (ICMP)
 - Transitioned CMPs from a class-oriented, time-directed methodology to an integrated equipment-oriented CBM approach
 - Uses standard maintenance tasks. Provides consistent and re-usable maintenance planning information
 - Jointly developed by Surface Type Commanders (TYCOMs), Supervisors of Shipbuilding (SUPSHIPs), NAVSEA, and Ship Program Managers (SPMs)
 - Provides maintenance requirements for OPNAVNOTE 4700
 - Planning and programming document



Depot Maintenance

- OPNAVNOTE 4700 (series)
 - Consolidation of class maintenance plan schedules
 - Provides notional depot availability intervals, durations, and mandays by ship class
 - Published annually by OPNAV (N43)
 - **Programming, budgeting, and scheduling document**
- NDE - NM (Navy Data Environment – Navy Modernization)
 - Current and future schedule of all ship depot maintenance by hull number
 - Balances operational schedules with industrial base workload
 - Living document altered by TYCOM based on notional times in OPNAVNOTE 4700
 - Execution document

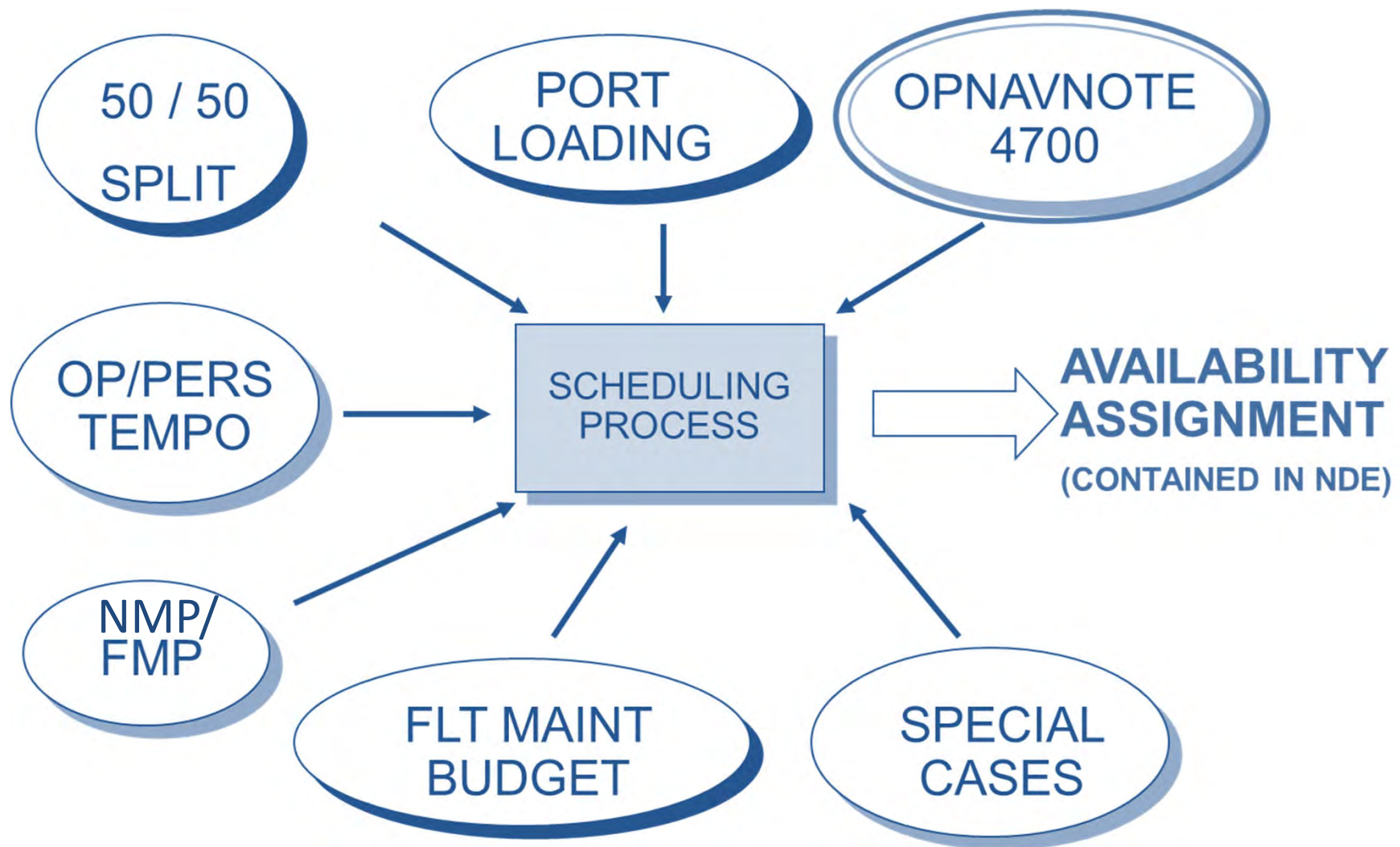


Overview

- Fleet Maintenance
- Maintenance Process
- Class Maintenance



Scheduling Process for CNO Availabilities





OPNAVNOTE 4700 Contents

SHIP CLASS	MAINT STRATEGY	TYPE AVAIL	REP. DURATION (MOS)	REP. INTERVAL (MOS)	MAINT CYCLE (MOS)	REP. MANDAYS (000)	TIME LINE (NUMBERS INDICATE MONTHS)
SSN 21 CL	EOC	INAC/IRR DMP EOH DSRA	NOTE 9 13 16 5	120 120 120 48	133 136	NOTE 9 123 200 45	EDSRA1 ---- DMP ---- EDSRA2 ---- EOH 0 48 0 48 60 108 0 ---- EDSRA3 ---- INAC 48 60 108
LPD 17 CL	PM	DPMA PMA CM	4 2	116 22	120	29 13.6 1.1	DPMA ----- PMA ----- PMA ----- PMA ---- 0 22 24 46 48 70 72 ---- PMA ----- DPMA 92 94 116 120
DDG 51 CL (FDNF)	PROG	DSRA SRA CM	2 2	83 15	85	9.5 7 3.4	DSRA ----- SRA ----- SRA ----- SRA ---- 0 15 17 32 34 49 51 ---- SRA ----- DSRA 66 68 83 85

OPNAVNOTE Historical Example -- Updated information found in Student Support Materials

EOC – Engineered Operating Cycle

PM – Planned Maintenance

PROG – Progressive Maintenance

INAC – Inactivation

IRR – Combined Inactivation, Reactor Compartment Disposal, Hull Recycling

DMP – Depot Modernization Period

EOH – Engineered Overhaul

SRA – Selected Restricted Availability

DSRA – Drydocking SRA

PMA – Phased Maintenance Availability

DPMA – Drydocking PMA

Duration – Length of an availability

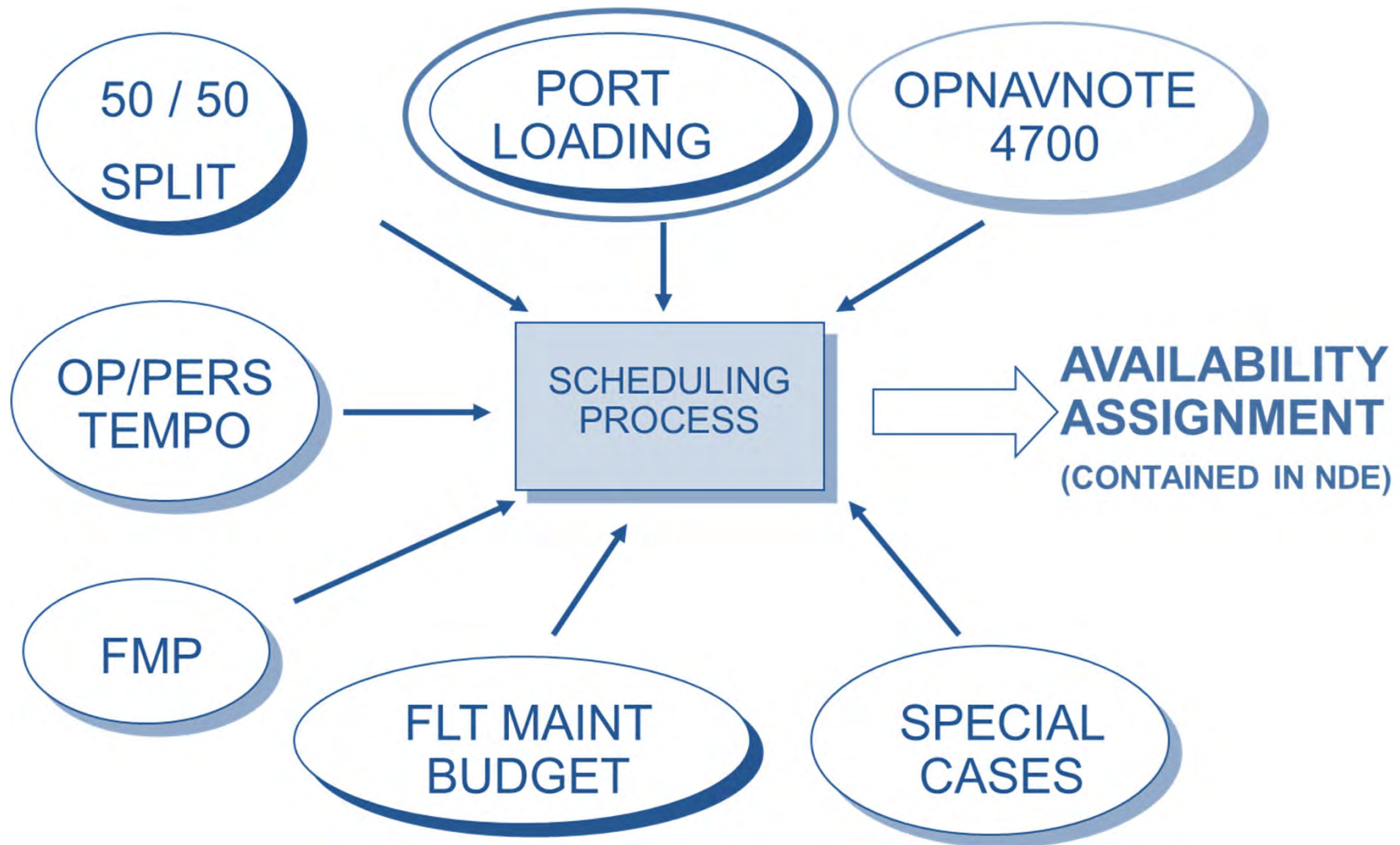
Interval – Length between the completion of prior depot availability and the start of the next one

Cycle – Length between the completion of prior overhaul (or docking availability if maintenance strategy has no overhauls) and the completion of the next one

Notional timelines for each class of ship



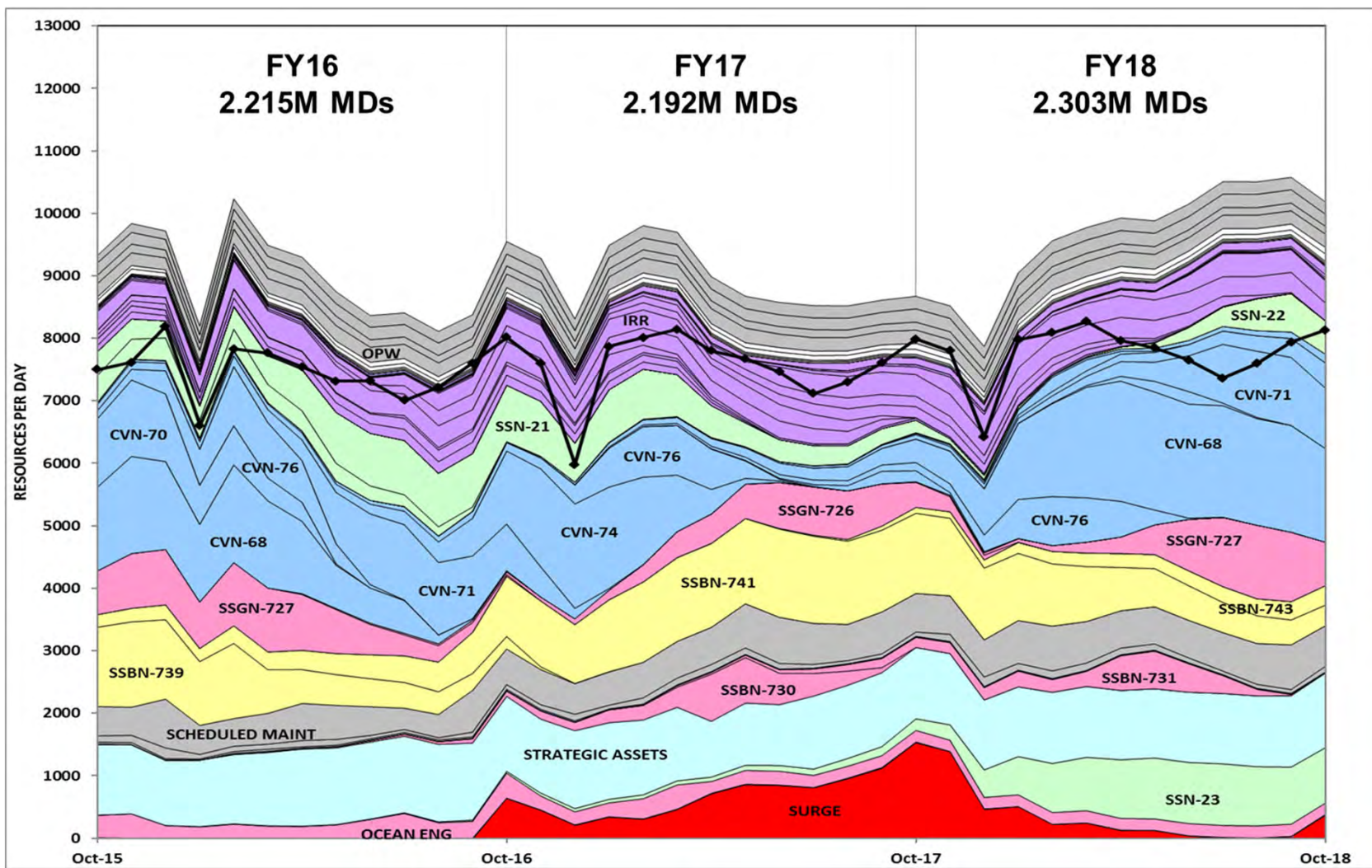
Scheduling Process for CNO Availabilities





Workload and Resource Report (WARR)

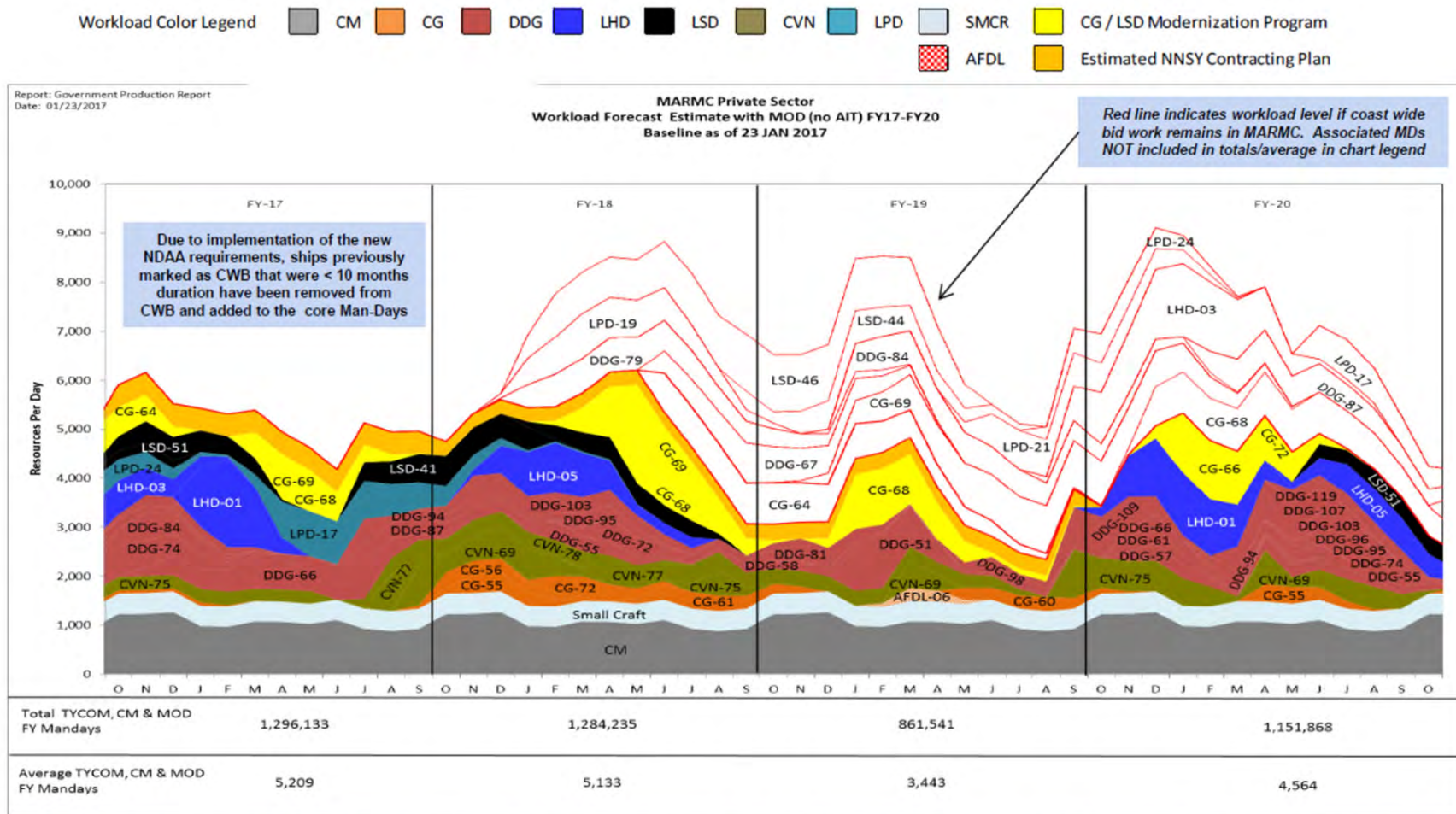
Naval Shipyard (NSY)





Port Loading Chart

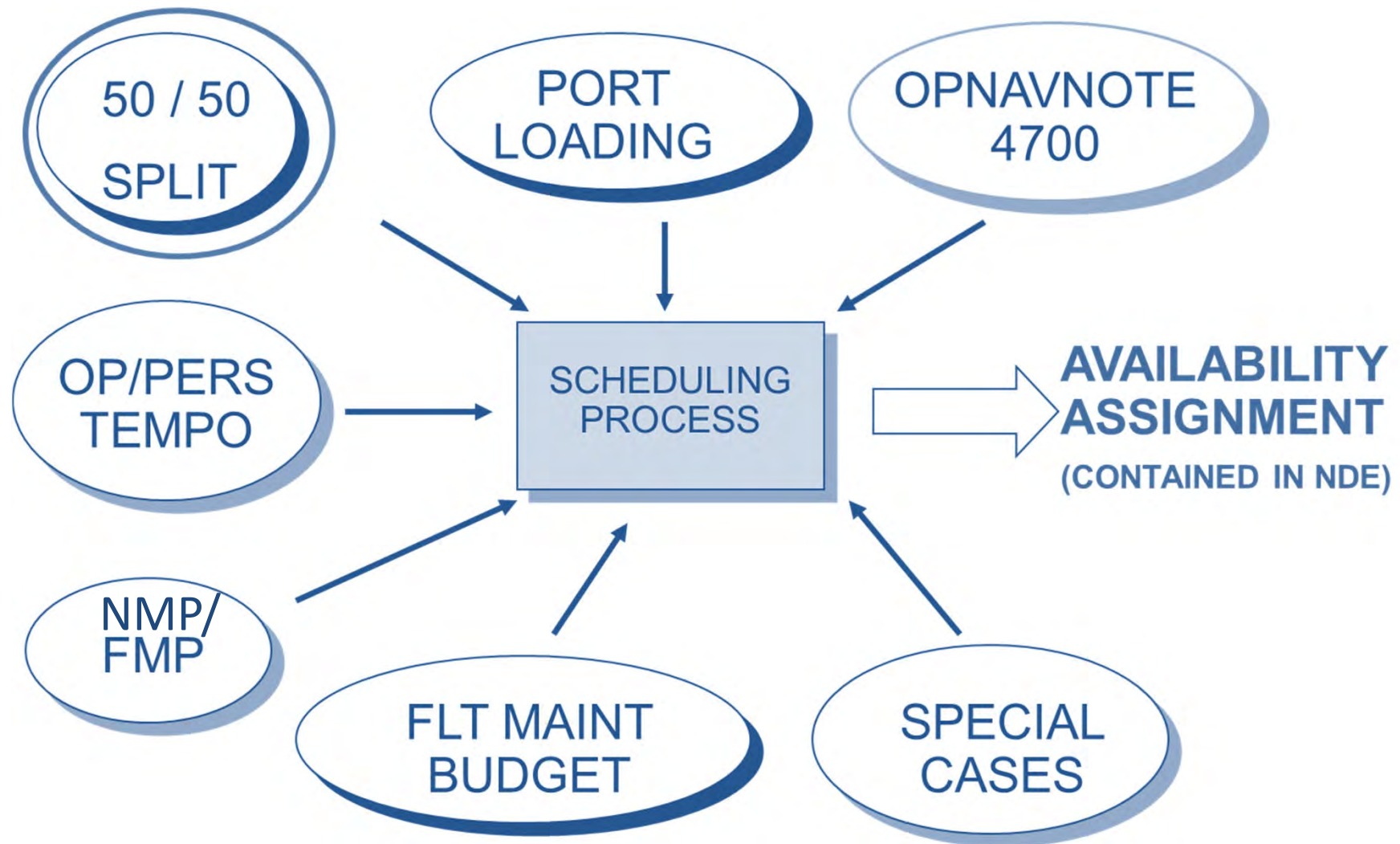
Regional Maintenance Center (RMC)



"Intent of this information is to provide U.S. DoD industry contractors a general schedule for information and planning purposes for upcoming surface ship maintenance periods- It does not constitute any request for information or request for proposals or any commitment to contract for work in accordance with this plan. This information is to assist U.S. DoD industry contractors by providing a broad overview of frequently changing (driven by U.S. Navy operations) maintenance schedules and is not a guarantee of workload or exact ship schedules"



Scheduling Process for CNO Availabilities





50/50 Split

- Title 10 U.S.C. Section 2466 mandates a 50/50 Public/Private split
- Applies to all DoN depot maintenance; ship, aircraft, and Marine Corps depot maintenance
 - A **minimum** of 50% of DoN depot maintenance funding must be accomplished by public depots
 - **No more than** 50% of DoN depot maintenance funding can be accomplished by private sector
 - Excluded from calculation:
 - CVN refueling (SCN)
 - Contracted elements of a Public Shipyard availability work package



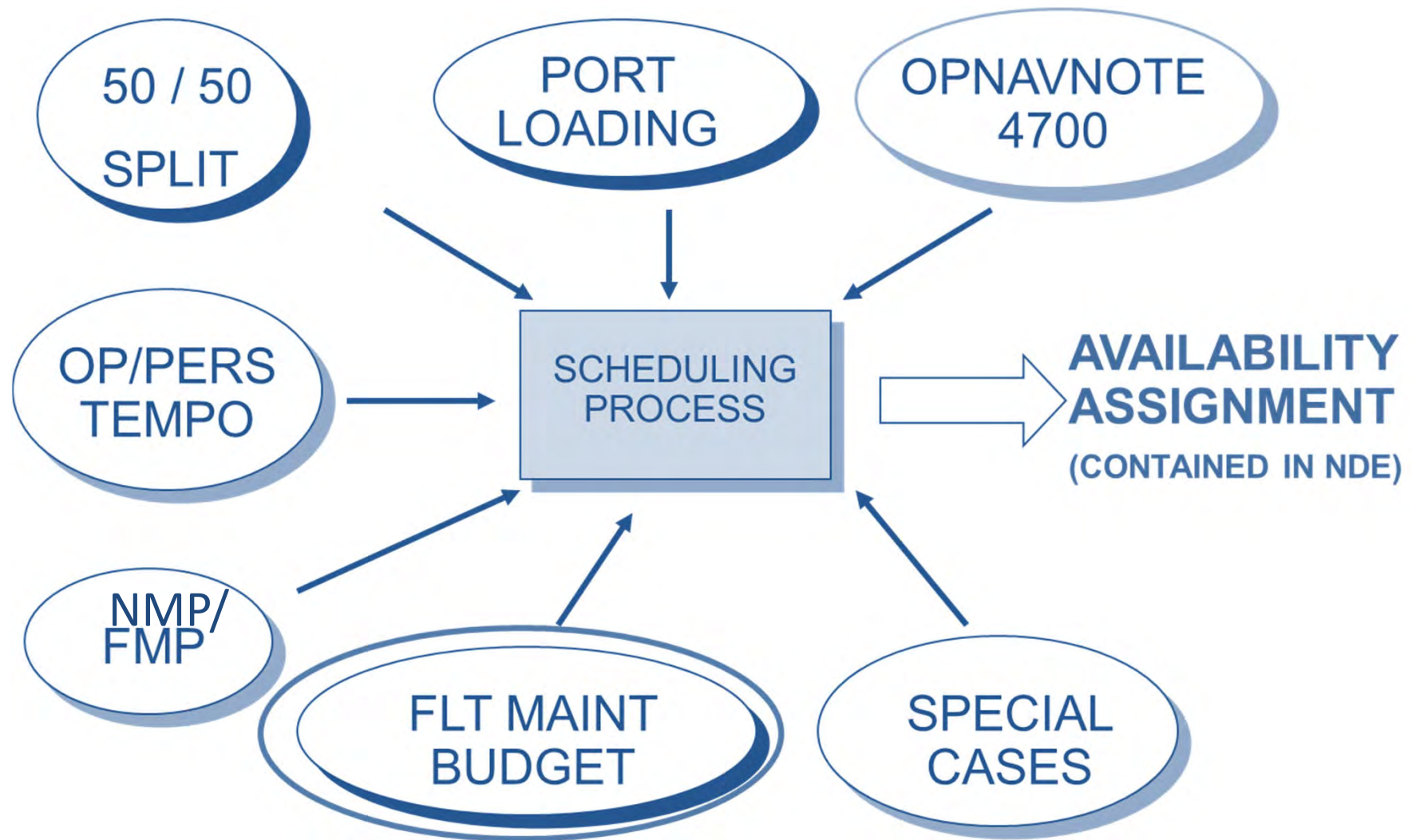
Depot Maintenance

- NSY Assignments
 - Type of work
 - Nuclear Ships
 - Considerations
 - Urgent operational commitments
 - Homeport skills/facilities
 - Workload capacity
 - Dry-dock availability
 - No less than 50%
- Private Competition
 - Type of work
 - Conventional surface ships
 - Large deck ship dry-docking
 - CVN refueling (Newport News)
 - Considerations
 - Homeport (quality of life)
 - Length of Availability
 - ≤ 10 months – homeport Bid
 - > 10 Months – coast-wide Bid
 - Contractor dock availability
 - Awarding work where capacity exists
 - No more than 50%

Private sector gets most of the conventional ship workload



Scheduling Process for CNO Availabilities



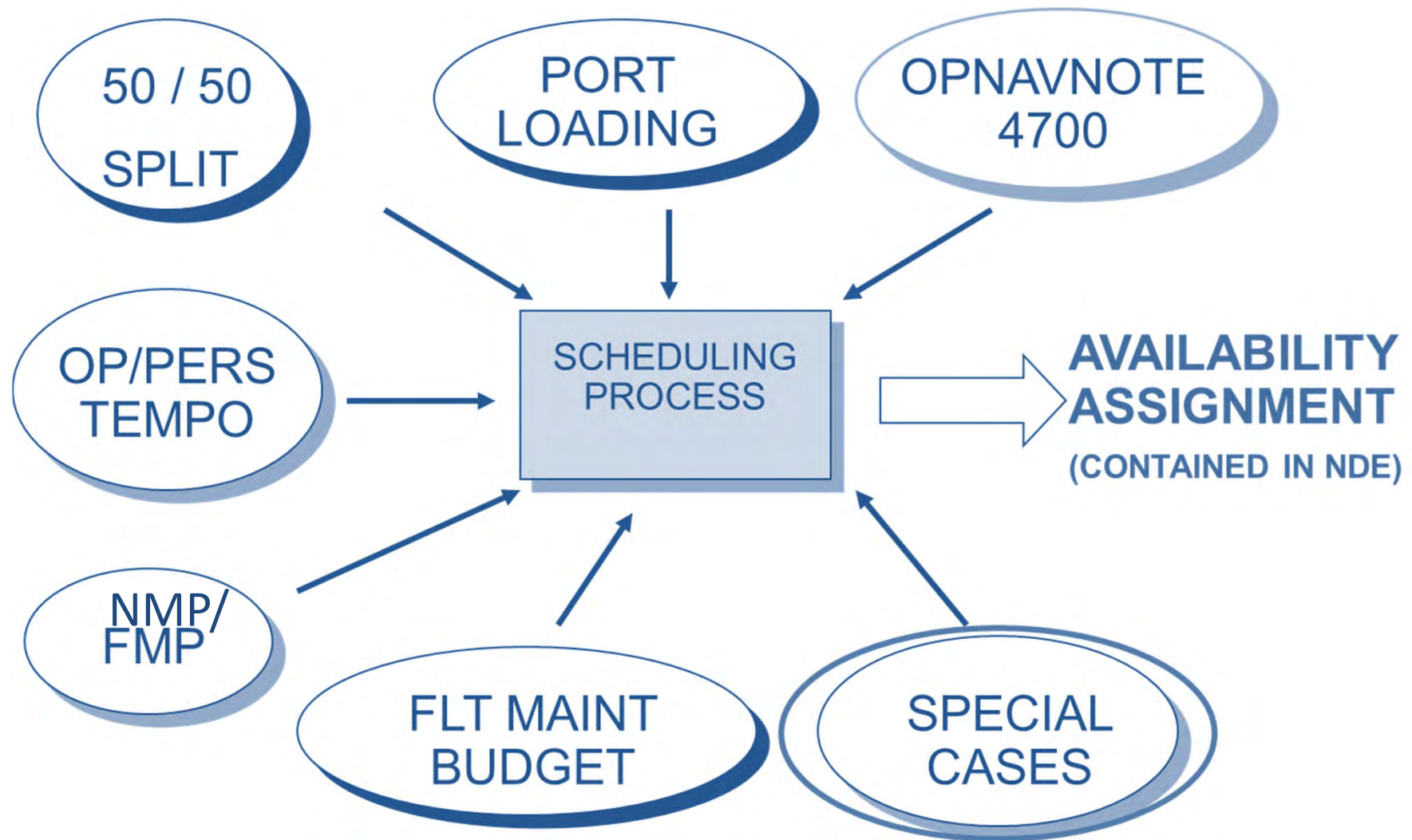


Budget

- For a given availability, there may be several customers (e.g., PMS 495, PEO C4I, TYCOM, etc.)
- For a given customer, there will be a maintenance portion of the budget and/or a modernization portion
- Future Years Defense Planning (FYDP) maintenance budget estimates account for notional maintenance plus an estimate for emergent work
- FYDP modernization budget estimates are based on planned specific alterations. This is covered in detail in the Navy Modernization Program (NMP) lecture
- President's Budget entries may reflect more accurate estimates as execution date approaches



Scheduling Process for CNO Availabilities





Special Cases

- Urgent repair needs
 - Underway repair
 - Emergent dry docking
 - Ship collision or battle damage
- Scheduling and assignment of special cases use essentially the same approval process
 - All stakeholders must understand the ripple effects



USS COLE heavy lift by M/V Blue Marlin

US Navy photo



Approval Process for CNO Availabilities

Process

The **Fleet Availability Scheduling Team (FAST)** develops proposed schedule by integrating OPNAVNOTE 4700 Maintenance with operational requirements

They propose workload allocations based on NSY workload, homeport, private sector industrial base and other considerations, ensuring workload is within budgeted resources

FAST recommends a proposed schedule for Fleet Maintenance Board of Directors (FMBOD) approval

Membership

- FAST
 - OPNAV N83, N2/N6, N95, N96
 - CFFC/CPF N43
 - CNRMC/SEA 04
 - TYCOM
 - NAVWAR
 - Other PMOs as required
- FMBOD
 - Fleet Maintenance Officers (chair)
 - SEA 04/08
 - OPNAV N43
 - TYCOM N43
 - CNRMC/SEA 21



Overview

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Types of Availabilities

- CNO Scheduled Availabilities (not all inclusive)
 - Regular Overhaul (ROH)
 - Complex Overhaul (COH)
 - Engineered Refueling Overhaul (ERO)
 - Phased Maintenance Availability (PMA)
 - Depot Modernization Period (DMP)
 - Planned Incremental Availability (PIA)
 - Docking Planned Incremental Availability (DPIA)
 - Selected Restricted Availability (SRA)
 - Docking Selected Restricted Availability (DSRA)
 - Continuous Incremental Availability (CIA)
- Fleet Scheduled Availabilities
 - Technical Availability (TAV)
 - Restricted Availability (RAV)
 - Fleet Maintenance Availability (FMAV)
 - Continuous Maintenance Period (CMAV)
 - Voyage Repair (VR)



LCS-8 Post-Shakedown Availability
US Navy Photo



Engineered Operating Cycle (EOC)

- Structured, engineered approach with a goal of sustaining or increasing operational availability (A_o) and minimizing time spent in depot-level availabilities. Major elements include:
 - Periodic inspections of selected systems and equipment
 - Periodic maintenance tasks during the ship's life-cycle
 - Scheduled availabilities to accomplish maintenance and modernization
 - Extensive modernization to maintain and upgrade ship warfighting capability
- Submarine Class example:
 - 688 CL (719 - 773)
 - 2 Docking SRAs, DMP at 120 Months
 - 2 Docking SRAs, EOH at 240 Months



Depot Modernization Period – DMP
Engineered Overhaul - EOH
Selected Restricted Availability – SRA

Refueling and Overhaul - ROH



Progressive Maintenance (PROG)

- Maintenance strategy that supports specific ship classes that are designed for reduced manning
- Limited organizational level maintenance
- Specific ships homeported in forward deployed areas with operational tempos that limit length of intervals available for accomplishment of maintenance
- Major modernization every 10 years
- Supply rotatable pool
- Homeported at a dedicated repair facility
- Maximize operational time



Selected Restricted Availability – SRA

Drydock Selected Restricted Availability – DSRA



Phased Maintenance (PM)

- Maintenance scenario in which depot level maintenance is performed through a series of short, frequent Phased Maintenance Availabilities (PMAs)
- Repairs are authorized based on actual material condition by Port Engineer or Maintenance Manager
- Availabilities performed in homeport
- Class Examples:
 - AS
 - LCC 20 CL
 - LPD 4 CL, LSD 41 CL

Drydock Phased Maintenance Availability – DPMA





Incremental Maintenance Plan (IMP)

- Maintenance philosophy that keeps CVNs in an acceptable material condition through incremental depot actions
- CVN 68 and CVN 78 Class
- Aircraft carriers assigned to IMPs are maintained through Carrier Incremental Availabilities (CIAs), Planned Incremental Availabilities (PIAs), and Docking Planned Incremental Availabilities (DPIAs)
- Still requires Refueling and Complex Overhaul (RCOH) at mid-life
- CVN 68 Class example:
 - Planned Incremental Availability (PIA) of 6 months, 30-months operational, PIA of 6 months, 30-months Operational, DPIA of 16 months





Continuous Maintenance

- An availability type where *depot-level maintenance* is conducted throughout the fiscal year on vessels *outside of scheduled CNO availabilities*
- A process that involves the *near continuous flow of work candidates to the most appropriate maintenance level and activity for accomplishment*
- Timed to best support operations, it migrates from a centralized time-based batch process to a decentralized condition-based nearly continuous process
- Goals
 - Increase operational availability
 - Maximize use of maintenance resources
 - Continuously validate Current Ship's Maintenance Project (CSMP)
 - Develop real time knowledge of maintenance requirements and costs, and readiness



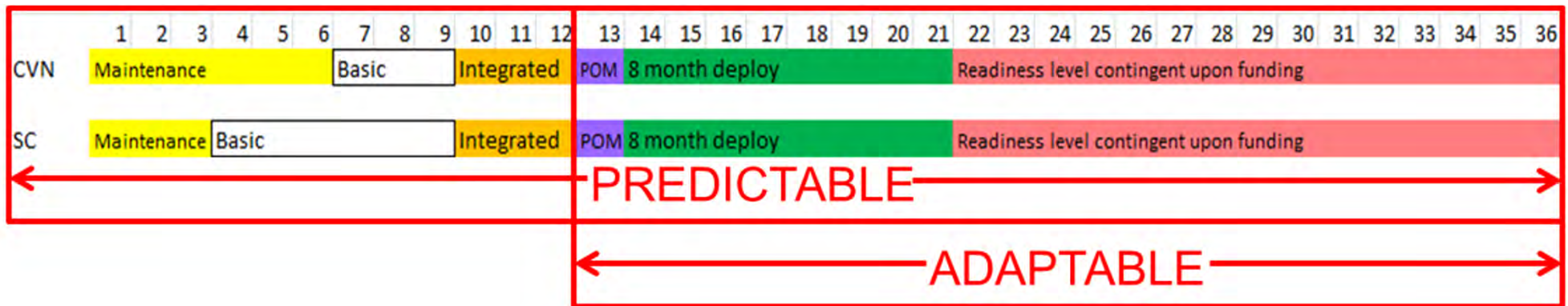
Optimized Fleet Response Plan (O-FRP)

- *Developed to enhance the stability and predictability for our Sailors and families by aligning deployable units to a 36-month training and deployment cycle*
- All required maintenance, training, evaluations, and a single eight-month deployment are to be efficiently scheduled throughout the cycle in such a manner to drive down costs and increase overall fleet readiness
- Streamline the inspection and evaluation process and maintain a level of surge capacity
- Reduces time at sea and increases homeport tempo for Sailors over 36-month period
- O-FRP is for all deployable groups and units from the Carrier Strike Group (CSG) to Amphibious Readiness Group/Marine Expeditionary Unit (ARG/MEU) to submarines



O-FRP

- Maximum Operational Availability (A_o)
 - 36-month cycle
 - Supply-based; surge capacity dependent upon funding
 - Maximum forward presence with available capacity and funding
 - Predictable, yet adaptable



For the sunk cost of maintenance & training, maximize A_o with a clean chain of command and an acceptable Personnel Tempo (PERSTEMPO)



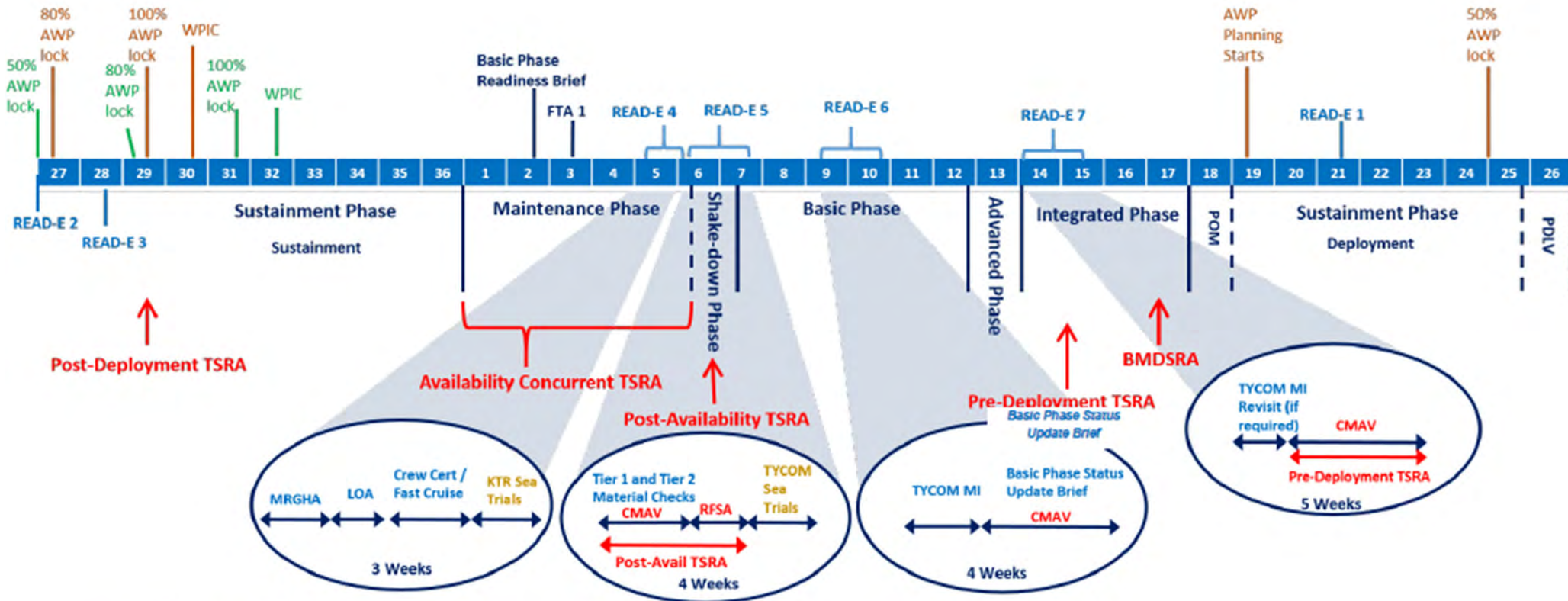
O-FRP

- O-FRP cycles account for availability planning and execution:
 - Aligned with Cruiser/Destroyer (CRUDES) assignments to CSGs
 - Aligned with Amphibious ship assignments to ARGs
 - Stable, predictable and have integrated maintenance and modernization
 - Allow for proper CNO availability planning
 - Allow for timely port loading adjustments
 - Integrated with material assessments
 - Aligned to 36-month Surface Ship Class Maintenance Plan (CMP)
 - **O-FRP has not historically accounted for increased availability durations as a vessel ages. This is being considered for future ship classes (e.g. COLUMBIA)**
- Modernization improvements contain:
 - Interoperable and aligned CSG and ARG Command, Control, Computers, Communications, Combat Systems & Intelligence (C5I) capabilities
 - Integrated System Operational Verification Test (SOVT) to include all associated supporting systems

Stable, predictable, integrated maintenance & modernization that aligns and synchronizes deployable group capabilities



Example: CSG O-FRP



INSURV Minimal Notice Material Inspection scheduled in either Integrated Phase or Sustainment Phase

AWP Planning Milestones based on FFP Contract Strategy (non-coastwide bid)

AWP Planning Milestones based on Contract Strategy (coastwide bid)



Summary

- What document defines the overall ship maintenance policy?
- What is the Navy's ship maintenance policy?
- What document defines the maintenance policy for a particular class of ship and is developed by the SPM?
- Which maintenance philosophy is based on major modernization every 10 years and ships homeported at a dedicated repair facility?
- What ship class utilizes the incremental maintenance plan?