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Combat Logistics Force Levels: Methodology and Results

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Summary

Background and methodology

The Director, Strategic Mobility and Combat Logistics Division (N42) in the Office of the Chief of Naval Operations recently asked CNA to investigate the future force structure of the Combat Logistics Force (CLF) based on current peacetime presence requirements. The sponsor was interested in finding what changes in force structure will be needed due to:

- The retirement of legacy ships and the commissioning of new ships
- New assumptions based on maintenance and transit between theaters
- Post-September 11 combatant requirements.

We used a timeline methodology to assess the capabilities of a specific force structure in meeting CLF peacetime presence requirements. The timelines use peacetime carrier battle group (CVBG) schedules as a guideline for CLF ship scheduling. We investigated two transition plans in this report: one with a transition to 12 T-AKEs that we called Alternative I[1], and one with a transition to 9 T-AKEs and 4 T-AOE(X)s that we called Alternative II. These new ships replace 17 legacy ships—4 AOE-1s, 6 T-AFSs, and 7 T-AEs. We used a timeline of 2003 to 2020, which covers three phases:

- From 2003 through 2006, the near-term future, when the legacy ships are still operational

1. Alternative I is similar to the Navy's Program of Record as of Spring 2002.

- From 2007 through 2015, the mid-term future, during which the CLF transitions from legacy classes to the new classes, including the Military Sealift Command (MSC) civilian modification (CIVMOD) alterations that the T-AOE-6s will require
- From 2016 through 2020, the far-term future, when all legacy ships have been retired and all T-AKEs and T-AOE(X)s have become operational in the fleet.

These timelines enabled us to construct force-level transition plans for the CLF that show, year by year, the number of:

- CLF ships of each type that are needed in a full operating status (FOS) to meet prescribed peacetime presence requirements[2]
- AOEs that are undergoing conversion from Navy operation to MSC operation and, later, are in extended maintenance to receive the CIVMOD alteration
- T-AKEs and T-AOE(X)s that have been delivered and have begun full operation
- Legacy ships that have been retired.

Based on the results of the timelines, we also investigated in less detail a third alternative, Alternative III, which transitions to a CLF of 11 T-AKEs and 2 T-AOE(X)s.

Results

To meet the presence requirements with any Alternative in the near-term years, we determined that it was necessary to activate two T-AOs and two T-AEs from ROS to FOS early in FY 2003, resulting in 15 FOS T-AOs and 6 FOS T-AEs. We found that if the (T)-AOEs [this notation refers to all AOEs in the near-term future] in WestLant are used as shuttle ships when they are there for times beyond the (T)-AOE

2. While we do not propose building ships for the purpose of putting them in a reduced operational status (ROS), we found that not all CLF ships in our timelines are continuously required in FOS to fulfill peacetime presence requirements, and we have placed those ships in ROS.

presence requirement, it is not necessary to activate either a T-AO or a T-AE in FY 2003, and it may not be necessary to activate both of those ships.

During the transition, from 2007 to 2016, the total number of CLF ships gradually decreases as new classes of ships enter the fleet, because each ship replaces one or two legacy ships. The number of FOS ships fluctuates and eventually decreases by 2015.

In the final 5 years, 2016 to 2020, the transition is complete and no ships are undergoing conversion. Table 1 shows a summary of the two alternative CLFs that we used in our transition plans, plus the third alternative that we did not investigate with a timeline. All alternatives are able to provide much of the required peacetime presence.

Table 1. Alternative CLF force levels in the far-term (2016-2020)

Ship Type	Alternative I		Alternative II		Alternative III	
	FOS	ROS	FOS	ROS	FOS	ROS
T-AOE-6	4	0	4	0	4	0
T-AOE(X)	0	0	2	2	2	0
T-AO	15	1	14	2	14	2
T-AKE	11	1	9	0	9	2
Total	30	2	29	4	29	4

Alternative I in the far-term future would have 30 ships in FOS, with two shuttle ships (a T-AO and a T-AKE) in ROS that could be activated to serve either as shuttle ships or, together, as a substitute CVBG station ship. Alternative II would have 29 FOS ships, plus two new-construction T-AOE(X)s in ROS that could be activated to serve as station ships, and two T-AOs in ROS.

If all four T-AOE(X)s in Alternative II were maintained in FOS, the excess T-AOE(X) presence could be applied to the shuttle ship requirements of the T-AO and T-AKE. Consequently, an additional T-AO and/or a T-AKE could probably be placed in ROS.

Alternative III is an adjustment from Alternative II that does not contain the excess T-AOE(X)s in ROS. It includes 11 T-AKEs, 6 T-AOEs, and 16 T-AOs, totaling 33 ships. Of these ships, two T-AOs and two T-AKEs are in ROS. The ROS T-AKEs could be activated to act as substitute CVBG station ships (with the T-AOs) if needed, and could also help to fulfill the shuttle T-AKE requirements.

To summarize:

- All alternatives are identical in the near term in composition and thus in the peacetime presence they provide.
- During most of the mid-term transition period, Alternative II requires slightly (1-2) more ships and generates slightly more presence in home waters than Alternative I (they do equally well in overseas theaters).
- In the far-term future, Alternative I requires one more FOS ship than Alternative II, and the two alternatives are comparable in fulfilling presence requirements.

Introduction

The CLF is composed of the ships whose mission is to provide logistics support to Navy ships, with fuel, ordnance, food, repair parts, and other stores. These ships enable combatants to remain on station and continue their primary mission, without having to resupply at a port. They are particularly important when combatants are unable to receive supplies from local ports in theater because force protection measures do not allow it.

The current CLF consists of four types of ships:

- The fast combat support ship, the AOE, which is a triple-product ship having storage space for fuel, ordnance, and dry and refrigerated stores. The AOE primarily serves as a carrier battle group station ship—it replenishes combatant ships of the CVBG during transits as well as in the overseas theater. There are eight AOEs—four AOE-1 class ships and four AOE-6 class ships. One AOE-6 class ship has been transferred to the MSC, one is currently undergoing the transfer, and the other two will be transferred by 2005. The Navy plans to decommission the four AOE-1s from 2006 to 2007.

- The fleet oiler of the T-AO 187 class, which carries Diesel Fuel Marine (DFM) for ships' propulsion and JP-5 jet fuel for aircraft. There are currently 16 T-AOs, all operated by the MSC. Two of these ships are in Category B (Cat B) in the National Defense Reserve Fleet and one is in ROS. They are 10 to 15 years old.

- The combat stores ship, MSC-operated T-AFS, carries dry and refrigerated stores and provisions. All six T-AFSs are in FOS. Most of them are over 30 years old, and they are scheduled to be decommissioned starting in about 2008.

- The ammunition ship, the T-AE. Four of these ships are in FOS and operated by MSC and three are in ROS. These ships are scheduled to be decommissioned over the next 10 years.

The T-AO, T-AFS, and T-AE serve as shuttle ships, transiting between the closest resupply port and the combatants at sea. They replenish the CVBG station ship, and also directly resupply combatants. When necessary, a T-AO and T-AE together serve as a substitute CVBG station ship.

The Chairman, Joint Chiefs of Staff (CJCS) Global Naval Force Presence Policy (GNFPP) states the number of Navy combatant ships that must be present in each overseas theater during the year. For example, a presence requirement of 0.50 for the aircraft carrier implies that a carrier must be in the theater for half of the year—183 out of 365 days. The GNFPP presence values are based on the JCS's assessment of the amount of combatant ship presence required in the several theaters for national defense and other priorities. Based on these combatant presence requirements, the Navy Fleet commanders determine the CLF ship presence needed in each theater to support this force.

From these CLF presence requirements, it is necessary to determine the force structure required to meet them. For example, if a theater had a 1.0 presence requirement for a certain type of ship, more than one of those ships would be needed to meet the requirement, due to maintenance, transit times, deployment length restrictions, and other scheduling considerations.

The Director, Strategic Mobility and Combat Logistics Division (OPNAV N42), asked CNA to investigate future CLF force structure requirements based on current presence requirements and ship acquisition plans. The sponsor wanted to find out what changes in force structure will be needed due to:

- The retirement of legacy ships and the commissioning of new ships
- New assumptions based on maintenance and transit between theaters

- Post-September 11 combatant requirements.

We used an assessment methodology that enables us to calculate and display the CLF force structure year by year. This methodology involves creating timelines in which we schedule each CLF ship month by month, and then calculate the cumulative presence of each ship type in each theater. The results allow us to assess the capabilities of a particular force structure to meet all specified presence requirements.

The methodology also allows us to investigate the transition to new ships as the Navy decommissions current ships. Currently, the Navy plans to procure 12 T-AKEs—double-product ships that can carry both ordnance and dry stores. These ships will replace the T-AEs and T-AFSs. There is concern, however, that as the AOE-1s are decommissioned, using a T-AKE with a T-AO as a CVBG station ship will not meet battle group needs. As a result, the Navy is now contemplating building a new class of multi-product CLF ship known as a T-AOE(X) that would replace the AOE-1s as CVBG station ships. Therefore, in this document we have used our methodology to investigate CLF force-level requirements with and without the T-AOE(X).

Timeline methodology and assumptions

When CNA conducted the analysis of alternatives (AOA) for the Auxiliary Dry Cargo Carrier, the TADC(X) (now referred to as the T-AKE (Auxiliary Cargo and Ammunition Ship)), we found that we needed a means of depicting the transition of the CLF from the present to the future well beyond when that new class entered the fleet [1]. Associated with the CLF transition plan was the need to represent the employment of CLF ships to fulfill certain peacetime presence requirements in each theater where the U.S. Navy customarily operates, in order to determine how many CLF ships were required in FOS. As a result, we developed a spreadsheet methodology that enabled us to depict the notional employment of each ship through the various maintenance and operating evolutions it would normally experience in peacetime. We could then calculate the numbers and types of CLF ships needed to meet the prescribed peacetime presence in each theater. This methodology became known as the “timeline methodology” because the notional ship schedules are depicted as timelines for all CLF ships in the Atlantic Fleet (LANTFLT) and Pacific Fleet (PACFLT).

The timeline methodology was also used to develop a series of CLF transition plans for a 1999 OPNAV Working Group that was convened by N76 to work in conjunction with the LANTFLT and PACFLT headquarters staffs to determine peacetime CLF requirements [2]. It was used subsequently in support of the 2000 CINCLANTFLT “Fleet Analysis of the CLF” study and mid-2001 deliberations by fleet representatives on the number of TAFSs that are required in peacetime [3, 4].

Timeline description

We created the timelines in Microsoft Excel, with separate timelines for PACFLT and LANTFLT CLF ships. They show notional monthly scheduling of every CLF ship, as well as CVBG deployments, from FY 2003 through FY 2020. For each month, we assigned a color code to each ship representing the theater in which the ship is located. When a ship is undergoing maintenance or training, or is in ROS, we assigned no color to it for that month. Ships both in ROS and Cat B were labeled as “ROS” in the timelines.

The timelines schedule all LANTFLT and PACFLT CLF ships throughout the course of each year, built on CVBG deployment schedules. We used the most recent CVBG schedules for the first 5 years, obtained from the GNFPP conference, and then repeated the schedule into later years [5]. Each CVBG includes as its station ship a (T)-AOE, or a T-AO paired with a T-AE or T-AKE.

We wrote a program in Visual Basic that calculates the amount of presence for each month for each type of ship. The program sums the contribution of each ship for each theater. We then averaged the amount of presence for each ship type in each theater for every year. The results show whether the ships are meeting presence requirements based on a specific set of maintenance, transit, and deployment assumptions.

Peacetime presence requirements

We needed to determine presence requirements to apply to the timelines. The following sections describe how we chose the requirements that we used.

Initial use of presence requirements in the timeline methodology

In June 1997, to assist CNA in its AOA of the TADC(X), CINCLANTFLT and CINCPACFLT provided us with the presence requirements that they endeavored to achieve with CLF ships in order to provide logistics support of their battle force ships (see table 2) [6]. The requirements included not only those for the overseas theaters where the Navy operates—the Mediterranean (Med), the Central Command area of responsibility (CentCom), and the Western Pacific and Indian Ocean (WestPac)—but also those for the theaters contiguous to the United States—the Western Atlantic including the Caribbean

(WestLant) and the Eastern and Middle Pacific (EastPac). CNA subsequently used these CLF presence requirements both in an expanded AOA of the entire CLF in 1998 as the basis for determining the force structure required to meet them, and to compute peacetime force-level requirements for an OPNAV CLF Working Group in 1999 [1].

Table 2. CLF presence requirements on 17 June 1997

	LANTFLT		PACFLT		
	WestLant	Med	CentCom	WestPac	EastPac
AOE[a]	0.75	1.00	0.75	0.33	0.75
T-AO[b]	2.33	2.00	1.00	2.00	2.00
T-AE[b]	0.75	0.00	0.00	1.00	0.75
T-AFS	0.00	1.00	1.00[c]	1.50	0.00

a. The AOE requirement is fulfilled by both AOEs and substitute station ships (a T-AO plus a T-AE).
b. When acting as a substitute station ship, the ships' presence is not counted towards the T-AO or T-AE presence.
c. It was informally understood that this requirement would be jointly filled by PACFLT and LANTFLT T-AFSs.

Current presence requirements

In July 2001 CINCLANTFLT hosted a CLF working group meeting to discuss CLF presence and force structure requirements. The group assessed the presence requirements based on previous requirements and historical data. Table 3 shows the values they determined [7].

Table 3. CLF presence requirements in August 2001

	LANTFLT			PACFLT		
	WestLant	Med	CentCom	CentCom	WestPac	EastPac
(T)-AOE[a]	0.75	1.00	0.50	0.50	0.33	0.75
T-AO[b]	2.33	2.00	0.00	1.00	2.00	2.00
T-AE[b]	0.75	0.00	0.00	0.00	1.30	1.00
T-AFS	0.00	1.00	0.50	0.50	1.85	0.00

a. The (T)-AOE requirement is fulfilled by both (T)-AOEs and substitute station ships (a T-AO plus a T-AE)

b. When acting as a substitute station ship, the ships' presence is not counted towards the T-AO or T-AE presence.

The working group recognized that CentCom had become a theater in which battle force ships and CLF shuttle ships of both fleets operated each year, and it subdivided the CentCom column into a column for each fleet. In view of the fact that a CVBG of each fleet was operating there about half of each year, with an AOE as a station ship, each fleet would provide an AOE (or T-AOE when the AOE 6 class ships transition to the MSC) 0.50 annually. Similarly, each fleet agreed to provide a T-AFS to CentCom for half of the year.

CLF presence requirements during Operation Enduring Freedom

Following the 11 September 2001 terrorist attacks, presence requirements for CVBG deployments essentially changed in a number of areas. For example, from October 2001 to July 2002, the LANTFLT CVBG was deployed mostly to CentCom rather than to the Med [8]. Similarly, from October to December 2001 the Forward Deployed Naval Force (FDNF) carrier was deployed to CentCom out of its normal rotation [9]. With the changed CVBG (and amphibious ready group (ARG)) presence in overseas theaters, we perceived a number of *de facto* changes in presence requirements for CLF ships, with increases in CentCom and reductions in the Med and in WestPac. Specifically, two AOEs, two T-AOs, and two T-AFSs were in CentCom, and eventually one T-AE went there as well [10]. Concomitantly, the AOE presence in the Med dropped to only that which resulted from AOEs transiting with CVBGs through the theater (< 0.33).

Post-OEF CLF presence requirements

By the end of April 2002, the number of CVBGs and ARGs in CentCom had dropped to one each, or half the number that had been present for most of the past 8 months. Also during April, the number of CLF ships dropped from seven to three, with an AOE, a T-AO, and a T-AFS remaining to support the CVBG and the ARG [11]. We therefore did not increase any CLF presence requirements due to OEF.

Based on the GNFPP CVBG schedules, in the future LANTFLT and PACFLT will both contribute about half of the CVBG presence requirement in CentCom [5]. This will allow the LANTFLT CVBGs to be present more of each year in the Med, their traditional forward operating theater. However, based on the schedules, the CVBGs will still not be present in the Med every day of the year. We therefore reduced the Med (T)-AOE requirement to 0.75, recognizing that the (T)-AOE requirement will vary with the CVBG presence there.

In some cases the July 2001 working group established increased presence requirements on the basis of historical presence data from 1999 and 2000 (table 3). But for two of these cases, we did not observe from their data that there was a need for more operating days in the theater. Thus, we decreased the presence requirements to their original value—the WestPac T-AFS from 1.85 to 1.50 and the EastPac T-AE from 1.00 to 0.75 [12]. We kept the WestPac T-AE at its increased value.

In the past, the AOE presence requirement in WestPac was 0.33, which reflected the presence derived from AOEs accompanying the CVBGs that transited from EastPac to CentCom. However, that value discounts the presence contributed by the FDNF CVBG station ship. Consequently, we assumed that a substitute station ship was required at all times for the FDNF CVBG, and thus increased the WestPac (T)-AOE requirement to 1.33.

In 2007 the T-AKEs will become operational in the fleet. In view that they will replace the T-AEs and T-AFSs, we assumed that the presence requirement for the T-AKE in each region would be the sum of the requirements for the two types of ships it is replacing.

Therefore, we assume that the CLF presence requirements for the foreseeable future will resemble the numbers shown in table 4. The values in blue show the changes we made from table 3.

Timeline assumptions

We made every effort to construct employment and deployment timelines for CLF ships (see the appendix) that are reasonable with

Table 4. CLF future presence requirements

	LANTFLT			PACFLT		
	WestLant	Med	CentCom	CentCom	WestPac	EastPac
(T)-AOE	0.75	***0.75***	0.50	0.50	***1.33***	0.75
T-AO	2.33	2.00	0.00	1.00	2.00	2.00
T-AE	0.75	0.00	0.00	0.00	1.30	***0.75***
T-AFS	0.00	1.00	0.50	0.50	***1.50***	0.00
T-AKE	0.75	1.00	0.50	0.50	2.80	0.75

respect to the events depicted in the course of the ships' operational cycle. To do so, we obtained planning factors from the Navy and made assumptions that are associated with the following:

- The periodicity and duration of major maintenance events
- The sequence and duration of workup events leading to forward deployments and the deployments themselves
- The duration of transits between theaters, including the number of days that do not contribute to peacetime presence
- The length of ship transition periods from Navy to MSC operation, and major ship conversion availabilities
- The timing and duration of other key events in CLF transition from legacy to new CLF ships.

The following sections explain the assumptions that we used for the CLF timelines, and our rationale for doing so.

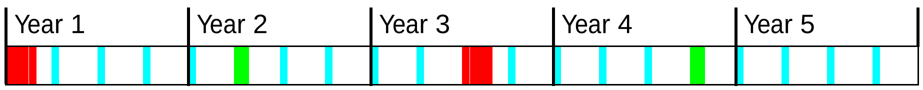
Maintenance

The following sections describe the maintenance assumptions for CLF ships in the MSC and in the Navy.

MSC ship maintenance

CLF ships in the MSC follow maintenance cycles that include periodic preventive maintenance events in ship repair facilities. Figure 1 shows a notional maintenance schedule for a 5-year period for an MSC ship. Major maintenance events occur every 15 months, alternating between mid-term availabilities (MTAs) that last 30 days (green) and regular overhauls (ROHs) that last 60 days (red). In quarters where major maintenances are not scheduled, the ship undergoes a 14-day voyage repair (VR), shown in blue. Over 5 years, the number of maintenance days varies each year, from 56 to 102 days. The average number of maintenance days per year is 81.

Figure 1. Notional maintenance schedule for an MSC ship



An MSC ship is operationally available to the fleet for 270 days out of 365 days each year, with the balance of the year devoted to maintenance and availability for inspections, training, and other MSC events. MSC does not need all of those 95 days for maintenance in years when ROHs do not take place, but the ships still are not available for Navy use during that time. However, the timing of these extra MSC days is flexible, and they can be worked around naval needs. We have decided that due to this flexibility in years of less maintenance, ships can be counted as present for more than 270 days each year.

Although VRs must be completed each quarter, there is flexibility in when they can be scheduled within the quarter. Also, in most cases a ship can be brought out of a VR within 72 hours. Consequently, we counted CLF ships as contributing to theater presence when they are in a VR. This strategy is consistent with the way the Navy counts presence of combatant ships in quarterly selective readiness availabilities (SRAs) in overseas theaters [13].

The final concern with maintenance scheduling is flexibility and unpredictability. Many CLF ships are more than 20 years old. As ships age, they require more, and sometimes unexpected, maintenance to keep them operational. To account for this unpredictability, we added 30 days of maintenance to the MTAs and ROHs, bringing them to 60-day and 90-day availabilities, respectively. This strategy of addressing unexpected maintenance was confirmed by MSC [4, 14].

In considering all of the above, in our timelines we scheduled MSC ships for major maintenance availabilities every 15 months or less, alternating between 2- and 3-month periods. These periods do not count as ship presence in a theater. We did not schedule VRs because they count towards presence.

Navy ship maintenance

Most CLF ships are already assigned to the MSC. However, there are still six Navy AOEs (that number will reach zero in 2008). They are subject to more stringent Navy operating and personnel tempo (OpTempo and PersTempo) restrictions, and maintenance and training requirements than MSC ships. In our timelines for Navy-operated AOEs, after each deployment we scheduled a month of post-deployment standdown, then a 4-month maintenance availability (SRA or equivalent), and then 6 months of basic and intermediate-level training before they join other ships of the CVBG in the Inter-Deployment Training Cycle (IDTC). These months do not contribute to presence because the AOEs are not providing logistics support during these periods of maintenance and training.

AOE workup for deployment

When a (T)-AOE works up in preparation for a forward deployment, it participates with other ships of the CVBG in the IDTC. The IDTC includes two major pre-deployment training events, the Compatibility Training Underway Exercise (COMPTUEX) and the Joint Task Force Exercise (JTFEX). The months in which these exercises are conducted count towards the (T)-AOE presence requirements in the home theater because the (T)-AOEs are supporting the CVBG combatants. One month prior to deployment, all CVBG ships are inport for Preparation for Overseas Movement (POM), and this month does not count towards presence. T-AOs, T-AEs, and T-AKEs also follow these guidelines when they are employed as substitute CVBG station ships.

Transit between theaters

When a ship is in FOS, it is inevitably in one of the five theaters. However, if a CLF ship is at the boundary of a theater during its inter-theater transit, it is unlikely to be near enough to any combatants to resupply them. Therefore, based on input from the July 2001 CLF working group, we chose to treat transit time as contributing to presence only if the CLF ship transited in company with combatant ships.

CVBG station ships

(T)-AOEs and substitute CVBG station ships transit as a part of a CVBG. Therefore, we did not take any portion of the month during transit away from their presence calculation. To best represent the transit of the CVBG deployment to the Med, 30 percent of both the first and last months of the deployment count towards WestLant presence (with the remainder applied to the Med presence). For CVBGs deploying to WestPac, 25 percent counts towards EastPac presence, with the balance of the month applied to WestPac.

Shuttle ships

COMSC supplied us with transit times between major ports in several overseas theaters [15]. We list these times in table 5. Based on these times, table 5 shows the portions of the transit month that we have counted and not counted towards presence in our timelines.

Table 5. Shuttle ship transit times between theaters and the distribution of the month during transit

Transit between theater 1 and theater 2	Transit time (days)	Fraction towards theater 1	Fraction not counted	Fraction towards theater 2
WestLant ⇔ Med	10.5	0.1	0.3	0.6
Med ⇔ CentCom	12.5	0.1	0.3	0.6
WestPac ⇔ CentCom	18.8-19.7	0.1	0.7	0.2
EastPac ⇔ WestPac	14-24.2	0.1	0.7	0.2

There is one exception to the shuttle ship transit time omissions. PACFLT stated that it sends T-AFSs to CentCom only with a CVBG [16]. Because a PACFLT T-AFS transits with the CVBG, and therefore is in company with it during much of the transit, we counted the full T-AFS transit as contributing to presence in one or more theaters. When the T-AKEs replace the T-AFSs, the same criterion applies.

Deployment lengths

Currently, CLF ship deployments are 6 months long. Navy ships limit deployment durations to 6 months portal-to-portal in order to avoid exceeding OpTempo and PersTempo requirements. MSC ships, however, do not have these Navy tempo restrictions, so their deployments can be extended. MSC has stated that 9-month deployments are feasible if mariner recruiting and retention permits [15]. The advantage of extending deployments is that it would reduce these ships' time in transit each year, thereby increasing their contribution to presence within theaters. We investigated a few scenarios in timelines where we used either 6- or 9-month deployments for the shuttle ships. Using 9-month deployments, we found there was an increase in presence in each theater for each type of ship, but usually by less than 0.1. Even though in most cases the presence did not change greatly, using 9-month deployments simplified construction of our timelines. We therefore chose to schedule all MSC CLF shuttle ship deployments for up to 9 months.

Deployments to CentCom are different from those to the Med or to WestPac because anti-terrorism and force protection concerns prohibit performing quarterly VRs. Consequently, T-AEs, T-AFSs, and T-AKEs must leave CentCom to get a 14-day VR. Therefore, we did not deploy these ships to CentCom for longer than 4 months at a time.

AOE conversions

The four AOE-6 class ships are being transferred to the MSC. First, they undergo a hot transfer—a 6-month maintenance availability and personnel transfer period during which the ship is converted for MSC operation. One AOE has already completed the hot transfer, the second began in June 2002, and the two in PACFLT will transition in the next couple of years. About 8 years later, they will undergo a 12-month major maintenance availability to complete MSC CIVMOD alterations. The CIVMOD is then followed by a 3-month period for inspections, trials, and workup prior to returning to the fleet.

CLF transition

We used the most recent acquisition plans for the dates of delivery to the Navy and to the Fleet of both the T-AKEs and T-AOE(X)s [17, 18]. As we brought a new ship into the timelines on the date set for fleet delivery in the acquisition plans, we retired a legacy ship that same month, starting with the AOE-1 class ships. N42 submitted proposed changes to the Navy's Ship and Aircraft Data Tables (SASDT) that show new planned commissioning and retirement dates of the CLF ships [19]. In the SASDT submission, the order of ships being retired was based on the age and wear of the ship—the poorer the material condition of the ship, the sooner it was retired. We followed the N42 order of ship type retirements in each fleet, but did not always retire them in the same year. For example, in the SASDT submission, a T-AFS is scheduled to be decommissioned in FY 2009 when the seventh T-AKE enters the fleet. A T-AE and a T-AFS are scheduled to be decommissioned in FY 2010 when the eighth T-AKE enters the fleet. Instead, we decommissioned a T-AFS and T-AE when the seventh T-AKE entered the fleet in FY 2009, and decommissioned a T-AFS in FY 2009 when the eighth T-AKE entered the fleet.

FDNF carrier battle group

There is an FDNF CVBG homeported in WestPac, which deploys to CentCom every few years. This CVBG needs a station ship with it at all times when it is conducting battle group operations. Therefore, we assigned a T-AO and T-AE / T-AKE to act as the permanent substitute station ship for the FDNF CVBG. These CLF ships are also homeported in WestPac, but they do not count towards the theater presence for CLF shuttle ships. Instead they count towards the (T)-AOE presence in the theater where the FDNF CVBG is located.

Other considerations

We have based our analysis of the CLF structure on many assumptions. Our results might have been different if our assumptions had changed. In addition, the timeline method of analysis has limitations. We discuss some of these issues in this section.

Presence requirements

The CLF force levels that we developed are primarily predicated on seeking to achieve the presence requirements provided to CNA by the fleet (table 3). We do not know whether these presence requirements are sufficient or excessive to the logistics support requirements of forward-deployed naval forces, and comparable support requirements in theater contiguous to the United States. If we were given different presence requirements, our results would change.

We chose to calculate the theater presence requirement of the T-AKE by summing the requirement for the T-AE and T-AFS in each theater, because these are the ships that the T-AKE is replacing. However, the T-AKE should have greater efficiency in providing logistics support to combatant naval forces because it is able to provide either ordnance or dry stores, or both. So the presence requirements for this type ship might not need to equal the sum of T-AE and T-AFS presence requirements. Also, the T-AKE will have a small cargo fuel capacity that will enable it to refuel small combatants or otherwise augment the theater oiler capabilities. The additional flexibility of a dual-product T-AKE with a cargo fuel capacity needs to be explored more thoroughly.

The T-AO and T-AE/T-AKE devoted to the FDNF CVBG as a substitute station ship may be able to contribute to the shuttle ship requirements of the theaters that they are in. Therefore, our assumption that these ships do not count towards the shuttle ship presence requirement is conservative.

Presently, (T)-AOEs are scheduled concurrently with CVBGs so that they will be present for battle group events in preparation for and during forward deployments. The amount of peacetime presence that (T)-AOEs provide in each theater therefore derives from the presence that the associated CVBGs provide in each theater, which may or may not equal their prescribed annual presence requirement. As an example, we were given a 1.33 presence requirement in WestPac, which is fulfilled by the FDNF CVBG (hence, its substitute station ship) plus CVBGs (and their station ships) from EastPac. When we applied the PACFLT CVBG deployment patterns, we calculated that during several years the actual CVBG (hence, (T)-AOE) presence in WestPac did not achieve the 1.33 requirement. This example shows that whether or not (T)-AOEs achieve the required presence in an overseas theater is entirely dependent on the way the CVBG deployments are scheduled.

Timeline limitations

Transition plan results are highly dependent on the CVBG schedules that they use. If CVBG deployments became more frequent, (T)-AOE deployments would become more frequent, possibly increasing the need for substitute station ships. This in turn could lead to a need for more FOS T-AOs, T-AEs, or T-AKEs. The same trends would apply if CVBG deployments became less frequent.

The timelines show a notional employment and deployment schedule for every ship in the CLF. We chose the schedules in a subjective manner, so that the presence requirements and maintenance schedule would be met, and the scheduling would look as easy to meet as possible. Because we chose the schedules manually, other schedules could also result in meeting the requirements. We do not know whether these other schedules would result in greater efficiency or greater acceptance by the Navy.

The timeline results are based entirely on theater presence requirements. They do not themselves show the effects of ship and theater characteristics on combatant needs. For example, the WestPac theater is very large, and combatant ships—the CLF's customers—may be conducting operations nearly simultaneously in several different areas within that theater. A higher-speed ship may be able to meet more customer replenishment needs than a slower ship. In fact, the principal argument for construction of the T-AOE(X) is to replace the AOE-1 class ships in order to provide high-speed, multi-product ships as station ships. The transition plans and timeline methodology we have used in this analysis are not able to validate or contradict this argument.

We did not investigate the result of changing CLF presence, and therefore force structure, requirements in response to a contingency. We know from Operations Desert Storm and Enduring Freedom that any significant growth in the number of combatant ships in a theater attendant to a contingency will require a larger number of CLF ships for logistics support.

The timeline methodology calculates how many ships are needed in FOS to maintain certain prescribed levels of force presence in various theaters around the world. Another method that has been used to determine force levels is to analyze the logistics demand of the combatant forces afloat, both in the combat theater and in contiguous theaters through which combatant forces must transit. This method, instead of using presence requirements, directly assesses supply needs and the ships required to deliver them, and can investigate both peacetime and wartime requirements. The results obtained from this other force-level assessment process may give additional insight into CLF responsibilities and capabilities.

Force structure requirements and capabilities

We prepared timelines to support two CLF transition plans (see appendix). The first, Alternative I, contains a CLF that is consistent with the Navy's Program of Record for the CLF, in that it includes one CLF acquisition program—12 ships of the T-AKE class. Alternative II contains a CLF that reflects two CLF acquisition programs in the next decade: nine ships of the T-AKE class and four ships of a new three-product ship called the T-AOE(X). The T-AOE(X) would replace the four ships of the AOE-1 class as CVBG station ships.

Our transition plans and supporting timelines extend from 2003 through 2020, and are divided into three periods:

- From 2003 through 2006, the near-term future when all legacy ships are still operational and AOE-6 class ships undergo hot transfers to the MSC
- From 2007 through 2015, the mid-term future during which the CLF transitions from legacy-type classes to the new classes, including the MSC CIVMOD alterations that the T-AOE-6s will require
- From 2016 through 2020, the far-term future when all T-AFSs, T-AEs, and AOE-1s have been retired and all T-AKEs and T-AOE(X)s have become operational in the fleet.

Succeeding sections will summarize each of the alternatives, noting the mix and number of CLF ships that are required to fulfill the prescribed presence in all five operating theaters. They will also note where our timelines did not completely produce the required presence, and the reasons therefore. In the near-term period, the two transition plans and timelines are identical because the CLF consists of the same mix of ship types. Thus, we will summarize the near term in the Alternative I section only.

CLF Alternative I

The transition plan for Alternative I is shown in table 6. Force levels are as of the first day of each Fiscal Year.

Table 6. The numbers and status of each ship type for the timeline transitioning to 12 T-AKEs (Alternative I)

	Near-term years				Mid-term years									Far-term years				
Ship type	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20
AOE-1 FOS	4	4	4	4	3	1	0	0	0	0	0	0	0	0	0	0	0	0
AOE-6 FOS	2	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Under Conversion	1	1	1	0	0	0	0	0	1	1	1	1	1	0	0	0	0	0
T-AOE FOS	1	2	3	4	4	4	4	4	3	3	3	3	3	4	4	4	4	4
T-AOE ROS	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
T-AO FOS	13	15	15	15	15	15	15	15	15	16	16	15	15	15	15	15	15	15
T-AO ROS	3[a]	1	1	1	1	1	1	1	1	0	0	1	1	1	1	1	1	1
T-AE FOS	4	6	6	6	4	4	4	3	2	2	2	2	0	0	0	0	0	0
T-AE ROS	3	1	1	1	2	2	2	2	0	0	0	0	0	0	0	0	0	0
T-AFS FOS	6	6	6	6	6	5	4	0	0	0	0	0	0	0	0	0	0	0
T-AFS ROS	0	0	0	0	0	1	1	2	2	0	0	0	0	0	0	0	0	0
T-AKE Delivered	0	0	0	1	2	2	2	3	2	0	0	0	0	0	0	0	0	0
T-AKE FOS	0	0	0	0	1	3	5	8	9	11	11	11	11	11	11	11	11	11
T-AKE ROS	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1
Total FOS	30	34	34	35	33	32	32	30	29	32	32	31	29	30	30	30	30	30
Total Conversion	1	1	1	0	0	0	0	0	1	1	1	1	1	0	0	0	0	0
Total ROS	6	2	2	2	3	4	4	5	4	1	1	2	2	2	2	2	2	2
Total	37	37	37	37	36	36	36	35	34	34	34	34	32	32	32	32	32	32

a. Two of the T-AOs are in CAT B, not ROS.

Near-term period (2003-2006)

The timelines start with the CLF ships in their current operating status (FOS or ROS). In this and later periods, we activate ships that are in ROS when we cannot reach the presence requirements in our timelines with the current CLF, and we place FOS ships in ROS when the presence resulting from the CLF is considerably greater than the requirement.

(T)-AOEs

Throughout this period there are eight AOE class ships, with the AOE-6s undergoing hot transfer to the MSC so that by FY 2006 there are four AOE-1s and four T-AOE-6s in the force. Planned CVBG deployments are such that a (T)-AOE is present in the Med only for 60 percent of the year. Therefore, our timelines do not maintain the required 0.75 presence in that theater. The EastPac (T)-AOE requirement is also not met in 2003, due to the obligatory maintenance and training that PACFLT (T)-AOEs must undergo during that year. Similarly, we do not achieve the 1.33 WestPac (T)-AOE presence requirement in 2006, during which the FDNF CVBG is deployed out-of-area to CentCom.

In home theaters (EastPac and WestLant), there is excess presence of (T)-AOEs during most of these years. Since the (T)-AOE is both an ammunition ship and an oiler, we explored the feasibility of employing excess (T)-AOE presence in EastPac and WestLant to fulfill any shortfall in T-AO or T-AE presence in those areas, as an alternative to activating ROS T-AOs and T-AEs (which we discuss in the following sections). We found that there is not sufficient excess (T)-AOE presence in EastPac to apply to any shortfalls in the Pacific theater. We determined that the excess (T)-AOE presence in WestLant could fulfill the shortfall in either T-AO or T-AE presence there, if we did not activate a ROS T-AE or ROS T-AO for that purpose. While our methodology is not able to test it, it is also possible that the multi-purpose (T)-AOEs in WestLant could simultaneously fulfill the shortfall in both T-AO and T-AE presence in that theater during those years.

T-AOs

In FY 2003 we activated two T-AOs from ROS, one in each fleet, totalling 15 FOS T-AOs. Activating a T-AO in LANTFLT enables meeting combatant commander presence requirements in 2003 and 2006, but it results in a large excess of T-AO presence in WestLant in 2004 and 2005. However, in 2003 and 2006 the WestLant (T)-AOE presence greatly exceeds its requirement, by more than 1.00. The excess (T)-AOE presence could be used as a shuttle oiler to fulfill T-AO requirements instead of the T-AO being activated from ROS.

In PACFLT, an additional T-AO is needed because of the FDNF CVBG substitute station ship requirement as well as shuttle oiler requirements. We used this additional oiler alternatively in WestPac and EastPac. Even with that activation, T-AOs do not meet their East-Pac requirement in 2004 because one PACFLT T-AO must act as a substitute station ship.

T-AEs

We activated two T-AEs in 2003, one in each fleet, leading to a total of six FOS ammunition ships. In LANTFLT, a T-AE must be activated because the one T-AE in that fleet is required as a substitute station ship in 2003 and 2006. If an additional T-AE had not been activated, the T-AE presence requirements in 2004 and 2005 would still be reached, but the presence in 2003 and 2006 would be practically zero. Instead of using it towards T-AO presence, the excess (T)-AOE presence in these years could be used to offset any T-AE presence shortfalls, allowing the T-AE to remain in ROS. The two FOS LANTFLT T-AEs are brought down to ROS after 2006.

In PACFLT, the activated T-AE is needed to fill in for the T-AE employed continuously as the FDNF CVBG station ship. In 2004, the sole EastPac-based T-AE must serve as a substitute CVBG station ship. Because of this, the EastPac presence requirement is not attained that year. There is excess (T)-AOE presence during this year, however, and a (T)-AOE could be used as a shuttle T-AE so that the requirement is met. But even with the (T)-AOE used as a shuttle ship, the ROS T-AE needs to be activated.

T-AFSs

The six T-AFSs met all presence requirements. We followed fleet T-AFS deployment patterns: PACFLT sends a T-AFS with its CVBGs when they deploy to CentCom, and LANTFLT T-AFSs deploy for 4 months in CentCom.

Mid-term period (2007-2015)

As explained earlier, this is the transition period for the CLF when the AOE-1s, the T-AFSs and the T-AEs are retired as the T-AKEs are delivered to the Navy. The first T-AKE will be operational in July 2006.

In the timelines, for each T-AKE brought into the fleet, at least one ship was retired in the same month. We followed the order of the ship types retiring from each fleet that is specified in N42's SASDT submission [19].

T-AOEs

The AOE-1s retire between 2006 to 2007, leaving a total of four T-AOE-6s in FOS. The T-AOE-6s undergo their CIVMOD conversions from 2011 to 2015, one at a time, so that there are only three FOS T-AOEs in any of those years. Because of these events, more substitute station ships are required to support CVBG deployments during this transition period.

The T-AOEs only reach their Med requirement in 2013, and the WestPac requirement is occasionally not met. Periodically, one fleet or the other does not meet the prescribed CentCom T-AOE presence, but the sum of the two fleets' presence each year meets or exceeds the required presence of 1.00 in that theater. These presence values result directly from the CVBG schedules.

T-AOs

When we retire the AOE-1s, a T-AO along with a T-AE or T-AKE must act as a substitute station ship on a regular basis—at least every third CVBG deployment. This need increases when the T-AOE-6s undergo their CIVMOD conversions to MSC—two or three T-AOs a year must act as station ships.

From 2007 to 2011, the 15 FOS T-AOs continue to meet most presence requirements. After the CIVMOD conversions are complete in LANTFLT, one T-AO can be placed in ROS in 2013, leaving six LANTFLT FOS T-AOs. Then, there are a couple of years in which the WestLant requirement is not met, but the available presence is close to the 2.33 requirement. In PACFLT, to compensate for the nonavailability of T-AOE-6s in 2013 and 2014 during their CIVMOD conversions, we activated the LANTFLT ROS T-AO in 2011 and transferred it to PACFLT. Even with nine T-AOs in PACFLT, EastPac presence requirements are not met in 2013 or 2014.

T-AFSs, T-AEs, and T-AKEs

The four AOE-1s are retired as the first four T-AKEs enter the fleet. Thereafter, T-AEs and T-AFSs retire as the remaining T-AKEs deliver to the fleet. All presence requirements are met in these years except in CentCom in 2015, when the PACFLT T-AKE presence is constrained by the duration of CVBG deployments to that theater per the PACFLT scheduling policy.

As LANTFLT T-AKEs join the fleet, they can fulfill the ammunition ship presence requirements as well as meet substitute station ship presence requirements. Therefore, we were able to retire one LANTFLT T-AE in 2006 and place the other two in ROS. The three T-AFSs, however, must remain in FOS until they are retired, except for the final year (2010) of the last T-AFS. After 2009, only five FOS T-AKEs are needed in LANTFLT to meet presence requirements, so we placed one in ROS in 2010. Once the T-AOE CIVMOD conversions are complete in 2012, LANTFLT requires only four T-AKEs in FOS; thus, we put another T-AKE in ROS in 2013.

In PACFLT, as the T-AKEs enter the fleet we are able to place one T-AFS and one T-AE in ROS while still meeting presence requirements. The rest of the T-AEs must remain in FOS until retired, with two of them staying active through 2014. All six PACFLT T-AKEs are needed in FOS. Also, to meet presence requirements in 2012 we activate a LANTFLT ROS T-AKE and transfer it to PACFLT. Five of these seven T-AKEs are home-ported in WestPac.

Far-term period (2016-2020)

After the Alternative I transition is complete, most presence requirements are met with a CLF composed of the following:

- In LANTFLT, two T-AOEs, six T-AOs, and four T-AKEs in FOS, and one T-AO and one T-AKE in ROS
- In PACFLT, two T-AOEs, nine T-AOs, and seven T-AKEs in FOS.

The main presence deficiency is with the WestLant T-AOs, which do not meet their 2.33 requirement about half of the time, and are short by as much as 0.28 one year. We could have activated the ROS T-AO to eliminate the presence shortfall, but we chose not to do so because that would have generated a large amount of excess presence in WestLant. On the other hand, the T-AO presence in EastPac always exceeds the 2.00 requirement significantly. We chose not to put a T-AO in ROS in this case because it would have created presence values lower than the requirement by about 0.50 for some years.

It is important to emphasize that the CVBG schedules control much of the CLF presence capabilities. If the LANTFLT CVBG schedule became more rigorous, e.g., requiring a 0.75 presence in the Med and a comparable T-AOE Med presence, the LANTFLT ROS T-AO and T-AKE could be activated to provide a greater substitute station ship capability. If PACFLT CVBG deployments were scheduled more frequently, however, there would be no CLF ships in ROS to activate. Only the excess T-AO and T-AKE presence would be available to assist in meeting any additional station ship requirements.

CLF Alternative II

Table 7 shows the transition plan for Alternative II, showing force levels as of the first day of each Fiscal Year.

Table 7. The numbers and status of each ship type for the timeline transitioning to 9 T-AKEs and 4 T-AOE(X)s (Alternative II)

	Near-term years				Mid-term years									Far-term years				
Ship type	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20
AOE-1 FOS	4	4	4	4	3	1	0	0	0	0	0	0	0	0	0	0	0	0
AOE-6 FOS	2	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Under Conversion	1	1	1	0	0	0	0	0	1	1	1	1	1	0	0	0	0	0
T-AOE(X) Delivered	0	0	0	0	0	0	0	0	1	0	2	1	0	0	0	0	0	0
T-AOE FOS	1	2	3	4	4	4	4	4	3	4	5	6	6	7	6	6	6	6
T-AOE ROS	0	0	0	0	0	0	0	0	0	0	0	1	1	1	2	2	2	2
T-AO FOS	13	15	15	15	15	15	15	15	15	16	16	14	14	14	14	14	14	14
T-AO ROS	3[a]	1	1	1	1	1	1	1	1	0	0	2	2	2	2	2	2	2
T-AE FOS	4	6	6	6	4	4	4	3	3	3	3	0	0	0	0	0	0	0
T-AE ROS	3	1	1	1	2	2	2	2	1	0	0	0	0	0	0	0	0	0
T-AFS FOS	6	6	6	6	6	5	4	1	1	1	1	0	0	0	0	0	0	0
T-AFS ROS	0	0	0	0	0	1	1	1	1	1	0	0	0	0	0	0	0	0
T-AKE Delivered	0	0	0	1	2	2	2	1	1	0	0	0	0	0	0	0	0	0
T-AKE FOS	0	0	0	0	1	3	5	8	9	9	9	9	9	9	9	9	9	9
T-AKE ROS	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total FOS	30	34	34	35	33	32	32	31	31	33	34	29	29	30	29	29	29	29
Total Conversion	1	1	1	0	0	0	0	0	1	1	1	1	1	0	0	0	0	0
Total ROS	6	2	2	2	3	4	4	4	3	1	0	3	3	3	4	4	4	4
Total	37	37	37	37	36	36	36	35	35	35	35	33	33	33	33	33	33	33

a. Two of the T-AOs are in CAT B, not ROS.

Near-term period

As previously explained, Alternative II timelines are identical to those of Alternative I because CLF ship types during the near-term period are the same in both cases.

Mid-term period (2007-2015)

In Alternative II, nine T-AKEs are acquired, followed by four T-AOE(X)s. As each of these ships enters the fleet, we retire one or two of the AOE-1s, T-AFSs, and T-AEs. As mentioned previously, we used the most recent SASDT submission to determine the order in which ship types will retire from each fleet [19].

T-AOEs

The AOE-1 class ships retire from 2006 through 2007, the AOE-6 class ships undergo CIVMOD conversions from 2011 to 2015, and the four T-AOE(X)s enter the fleet between the years of 2011 and 2014. We found that LANTFLT requires only three T-AOE type ships in order to meet all (T)-AOE presence requirements for which LANTFLT is responsible; hence, we placed the second T-AOE(X) in ROS almost immediately. In PACFLT we retained the second T-AOE(X) in FOS a year longer to compensate for the T-AOE-6 CIVMOD conversions still taking place in that fleet. We then put it in ROS, leaving two T-AOE-6s and one T-AOE(X).

Between 2007 and 2015, the T-AOEs reach their Med requirement only in 2013; the WestPac requirement is also occasionally not met during that period. The combined T-AOE presence from both fleets in CentCom meets the requirement there.

With the addition of the T-AOE(X)s, Alternative II becomes different from Alternative I in two ways:

- Fewer substitute station ships are necessary.
- There is a greater WestLant and EastPac T-AOE presence.

These changes do not alter the presence deficiencies in the Med and WestPac.

T-AOs

The T-AOs follow the same schedule as in Alternative I until 2014, with one LANTFLT ROS T-AO activated in 2011 and then transferred to PACFLT. The other 15 T-AOs are all in FOS until 2014. Because the entering T-AOE(X)s alleviate some of the need for T-AOs as substitute station ships, in 2014 we place one T-AO from each fleet in ROS, leaving 14 in FOS (as compared to 15 retained in FOS in Alternative I). The only year that the T-AO does not meet a presence requirement is in 2008 in EastPac, when a T-AO must deploy as a substitute station ship and all other EastPac T-AOs are undergoing maintenance.

T-AKEs, T-AFSs, and T-AEs

The delivery of the first nine T-AKEs in Alternative II is identical to that event in Alternative I, and the transitioning and retirement of T-AEs and T-AFSs is almost the same in both Alternatives. All of the presence requirements are met during the transition period until 2013. The WestLant requirement is not met from 2013 to 2015 and the EastPac requirement is not met in 2015.

In PACFLT, as the T-AKEs enter we place two T-AFSs and one T-AE in ROS. The rest must remain in FOS until retired. The final T-AEs retire in 2013 (compared to 2014 in Alternative I). Once the T-AOE-6 CIVMOD conversions are complete in LANTFLT, one of its four T-AKEs is transferred to PACFLT. This T-AKE enters PACFLT in 2012, which allows the presence requirements to continue to be met.

Far-term period (2016-2020)

As with Alternative I, once the transition is complete almost all presence requirements are met with the following CLF force levels:

- In LANTFLT, three T-AOEs, six T-AOs, and three T-AKEs in FOS; one T-AOE and one T-AO in ROS
- In PACFLT, three T-AOEs, eight T-AOs, and six T-AKEs in FOS; one T-AOE and one T-AO in ROS.

WestLant T-AO presence exceeds requirements by 0.39 or more but not enough to justify putting another LANTFLT T-AO in ROS. The T-AKEs in PACFLT do not meet their EastPac presence requirement in 2016, and in LANTFLT do not quite reach the WestLant requirement in most years. Given the number of CLF ships in EastPac (over 4.5 on average) and in WestLant (almost 5), other types of CLF ships might be able to perform the required functions of T-AKEs when their presence is deficient in those theaters.

Two T-AOE(X)s are in ROS during these years. If in FOS, they could be employed to fulfill shuttle ship presence requirements. With the T-AOE(X)s in FOS, it might be possible to put a T-AO and/or a T-AKE in ROS. However, the fleets generally consider the AOE only for station ship needs, so this practice may not be acceptable.

As previously mentioned, the CVBG schedule controls much of the CLF presence capabilities. But unlike in Alternative I, if the CVBG forward deployments increased such that the actual presence equalled the T-AOE requirement in forward theaters, in Alternative II both LANTFLT and PACFLT would have ROS T-AOEs that could be activated to meet these new requirements. Thus, there would be no need for additional substitute station ships.

Summary of results

Figures 2 and 3 show the total number of CLF ships each year for Alternatives I and II. Figure 2 shows the number of CLF ships for 2003 through 2009 when the transition plans are the same for both Alternatives. Figure 3 contains two columns for each year from 2010 through 2020: the left column shows the numbers of CLF ships required for Alternative I (12 T-AKEs) for each year, and the right column shows those required for Alternative II (9 T-AKEs and 4 T-AOE(X)s).

Figure 2. Number of CLF ships from FY 2003 through 2009

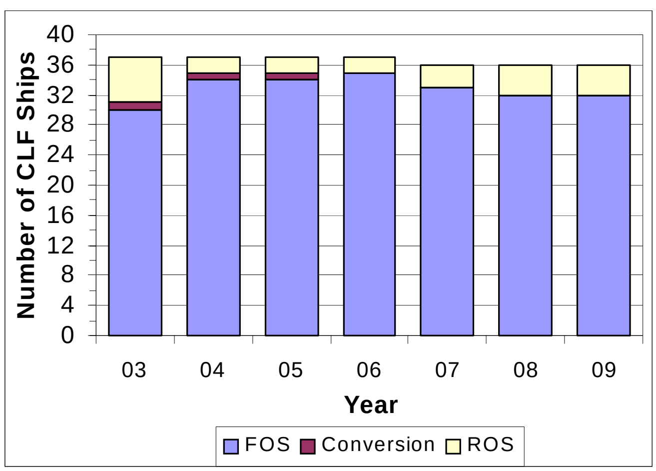
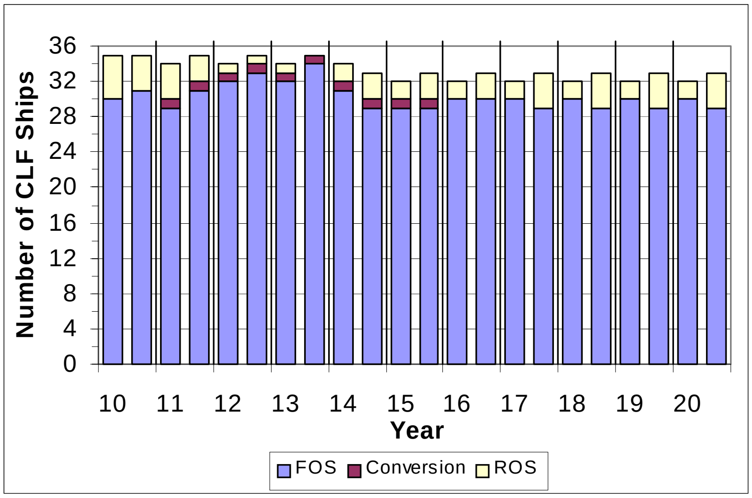


Figure 3. Number of CLF ships from FY 2010 to 2020. Alternative I is on the left, and Alternative II is on the right

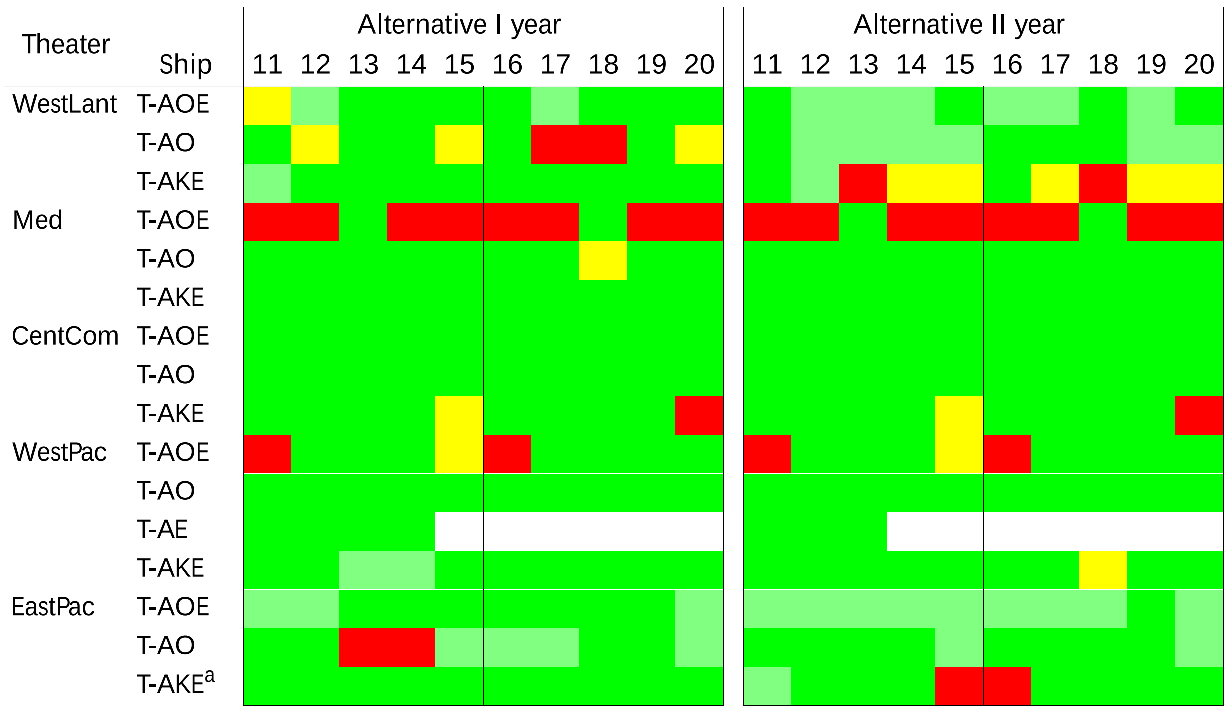


The red bar in the first three columns in figure 2 represents an AOE-6 undergoing hot transfer to the MSC. The figure shows that, to achieve the required peacetime presence with our timelines, we needed to increase by four the number of CLF ships in FOS in 2003. As explained on page 25, the CLF transition period begins in 2007, with all T-AOE-6s under MSC operation and the first T-AKE entering the fleet, and two fewer ships (33 vice 35) required in FOS. The total number of ships drops by one, from 37 to 36, when the first legacy shuttle ship, the ROS T-AE, is retired that year.

As figure 3 shows, the number of FOS ships fluctuates as the transition period continues and the T-AOE-6 CIVMOD conversions (shown as red bars) occur. Alternative II requires more ships than Alternative I in FOS until 2014 to meet presence requirements. In the final 4 years, when the CLF transition is complete, Alternative I has one fewer ship than Alternative II, but Alternative I requires one more ship in FOS.

Figure 4 shows how well the CLF ships meet their presence requirements from 2011 to 2020. If the region is green, the presence requirements are met—if light green, there is an excess presence of 0.50 or more. If it is yellow, the ships do not meet, but come close to meeting, the requirement (within 0.10). And if it is red, the presence requirements are not met. In the case of the WestPac T-AEs, the white indicates that type of ship has been replaced by T-AKEs in that theater..

Figure 4. How well CLF ships meet presence requirement from 2010 to 2020



a. If this T-AKE (T-AE) requirement was 1.00 as stated in table 3, due to PACFLT CV loadout policies, the EastPac presence requirement would not be met in most years.

In the Med, CentCom, and WestPac, all shuttle ships meet their presence requirements with only a few exceptions in both Alternatives. T-AOEs do so in CentCom, and do so in most years in WestPac. They do not meet the requirement in the Med—but as we have noted previously (see page 22), the T-AOE presence in overseas theaters is entirely dependent on CVBG deployment schedules.

Once the transition is complete in 2016, there are three main differences in the success that the alternative CLFs have in meeting presence requirements:

- In WestLant, in four out of the five final years, the T-AKEs meet their presence requirement in Alternative I, but do not meet the requirement in Alternative II.
- In WestLant, the T-AOs do not meet the presence requirements in three of the last five years in Alternative I, while they do (with some excess) in Alternative II.
- In EastPac, the T-AKEs meet all presence requirements in Alternative I, but do not meet the requirement in one of the last 5 years in Alternative II.

Another difference between the two alternatives is in the numbers and the types of ships placed in ROS:

- One T-AKE and one T-AO in ROS in Alternative I
- Two T-AOE(X)s and two T-AOs in ROS in Alternative II.

In Alternative I there is a LANTFLT T-AO in ROS that could be activated to ease or eliminate the oiler shortfall in WestLant. In Alternative II there are no T-AKEs in ROS that could be activated to FOS to ease the shortfalls in WestLant shown in figure 4. This would imply that Alternative I is preferable.

Alternative III

Another alternative (Alternative III) that may be worth considering would be to acquire 11 T-AKEs and two T-AOE(X)s. This, in effect, would change the two T-AOE(X)s that are in ROS in Alternative II to T-AKEs. This combination of alternatives is advantageous because:

- In Alternative I, the T-AOs must be employed frequently as substitute station ships. With Alternative III, the two T-AOE(X)s would eliminate that employment of the T-AOs.
- In Alternative II, the T-AKE presence requirement is not met. With Alternative III, there are two T-AKEs in ROS that could help meet the unsatisfied portion of the presence requirement.

Conclusions

We conclude by comparing the force structure requirements and capabilities of the Alternatives.

In the near term,

- All Alternatives provide the same presence because in those years the alternative CLFs are identical.
- All Alternatives require activating two T-AOs and two T-AEs from ROS to FOS to meet presence requirements. If (T)-AOEs in WestLant are used as shuttle ships when they generate excess (T)-AOE presence, it is not necessary to activate either a T-AO or a T-AE in FY 2003, and it may not be necessary to activate both of those LANTFLT ships.

In the mid term,

- All Alternatives provide nearly identical presence in overseas theaters, and Alternative II is slightly better in fulfilling presence in home waters than Alternative I.
- To meet presence requirements, Alternative II requires slightly (1-2) more ships than Alternative I in FOS until 2014, but Alternative I retires the final two T-AEs a year later than Alternative II.

In the far term,

- Alternative I contains 32 ships, with two in ROS. Alternatives II and III have 33 ships, with four in ROS. All Alternatives fulfill nearly all presence requirements.
- The difference between Alternatives II and III is that in Alternative II two T-AOE(X)s, versus two T-AKEs, are in ROS.

- Alternative I is the only Alternative that requires the use of shuttle ships as substitute station ships.
- If CVBG deployments increase, all Alternatives contain ships in ROS that can be activated to meet CVBG station ship needs—Alternative I has a substitute station ship in LANTFLT, Alternative III has one in each fleet, and Alternative II has a T-AOE(X) in each fleet.
- If the four T-AOE(X)s in Alternative II are maintained in FOS, one additional shuttle ship from each fleet could probably be placed in ROS.

Appendix

This appendix shows the timelines we investigated to assess CLF structure requirements for Alternatives I and II. We split LANTFLT and PACFLT in the timelines. We created a CVBG schedule based on the GNFPP schedule specified to 2007 [5], and repeated it through 2020.

Within each fleet, we group ship types separately and denote the theater in which they are present each month by color, as shown in the timeline. Besides having a color code, a ship can also be in maintenance, in training, or in ROS.

For each month, we sum the presence of each ship type in each theater. When forward deployments occur, we count the first and last month of that deployment towards theaters as described on page 17 and in table 5 to account for transit times. We average the ship types' presence for each year, shown at the end of the timelines. We also note the presence requirement and the average of the yearly averages.

During the transition period when T-AKEs are entering the fleet and T-AEs and T-AFSs are retiring, we summed the theater contributions from the different ship types as appropriate. For example, in EastPac there is a 0.75 T-AE presence requirement and no T-AFS presence requirement. When both T-AEs and T-AKEs are in EastPac, they are summed and must meet a 0.75 presence (the T-AKEs are acting as T-AEs). In one theater, WestPac, there is both a T-AE and T-AFS requirement. We found that the T-AEs were able to meet their requirement in WestPac without any contribution from the T-AKEs, so until the T-AEs were retired, the T-AKE presence was summed with the T-AFS presence, and only needed to meet the T-AFS requirement (1.50). After the T-AEs retired, the T-AKE requirement was increased to 2.80. If the yearly average presence for a ship is colored grey, then we summed it with another ship, shown below the T-AKE averages.

The following table lists the abbreviations used in the timeline.

Table 8. List of abbreviations

Abbreviation	Meaning
WL	Western Atlantic
CC	Central Command
EP	Eastern Pacific
WP	Western Pacific
T	Training
S	Post-deployment standdown
M	Maintenance
C	CVBG COMPTUEX
J	CVBG JTF exercise
P	CVBG preparation for overseas movement period
D	Delivery to MSC
W	Post-delivery workup
DC	Decommissioning/Inactivation period
ACT	Activation period
RQRD	Presence requirement

First we show the timelines for LANFLT and PACFLT for Alternative I—the case when there are 12 T-AKEs (figures 5 and 6). Then we show the timelines for Alternative II—the case when there are nine T-AKEs and four T-AOE(X)s (figures 7 and 8).

Figure 5. LANTFLT timeline for Alternative I

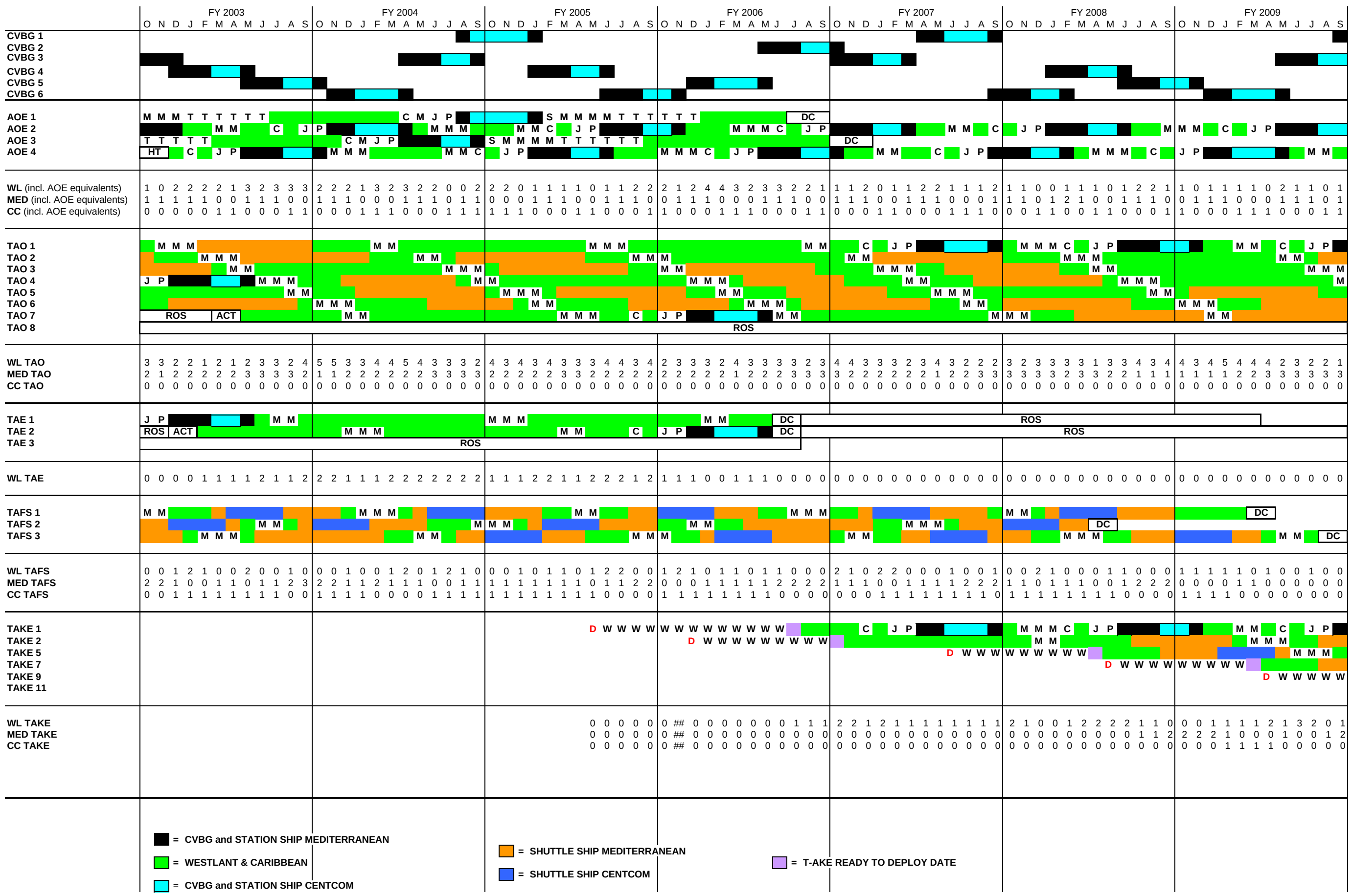


Figure 5. LANTFLT timeline for Alternative I

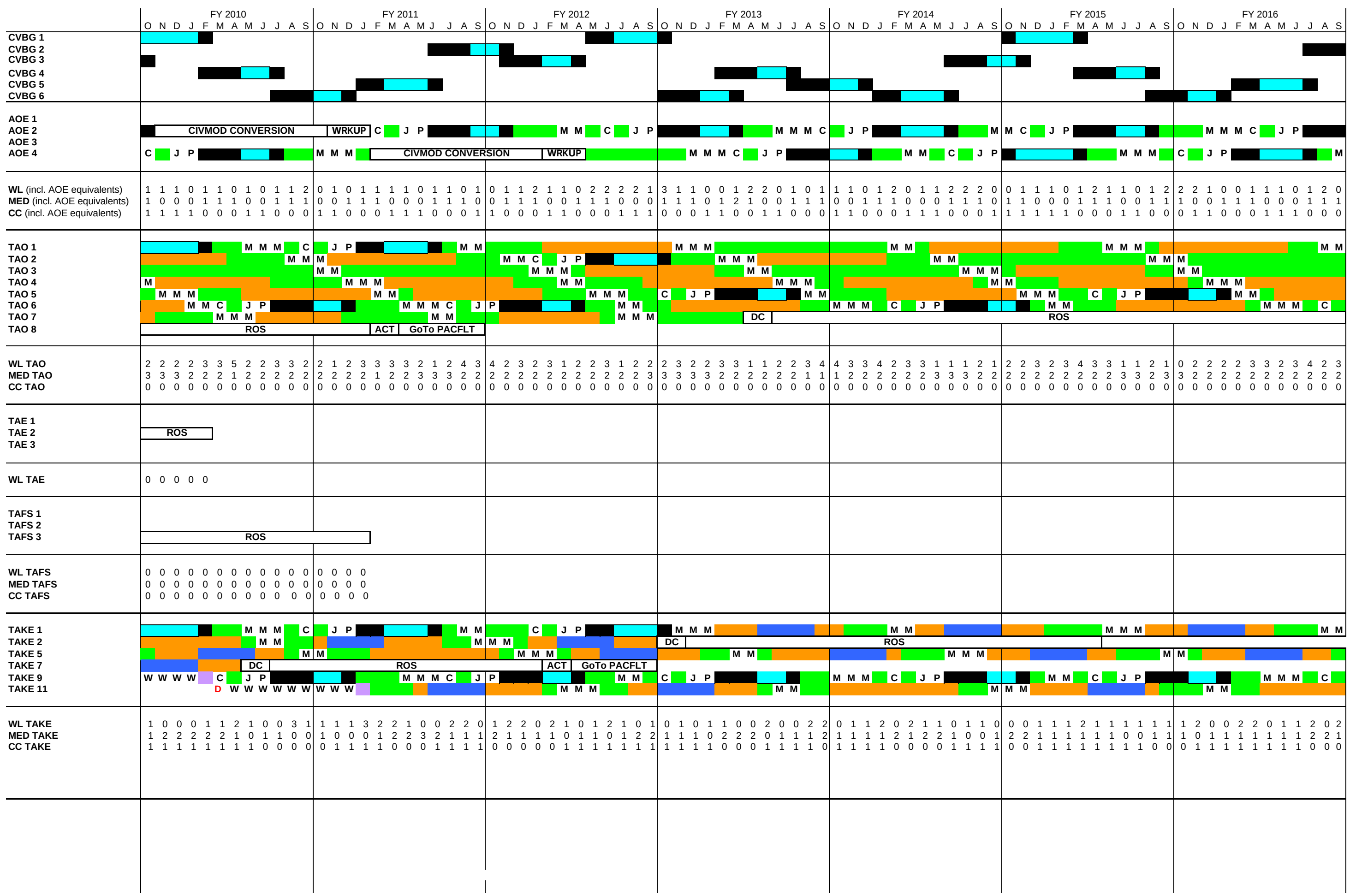
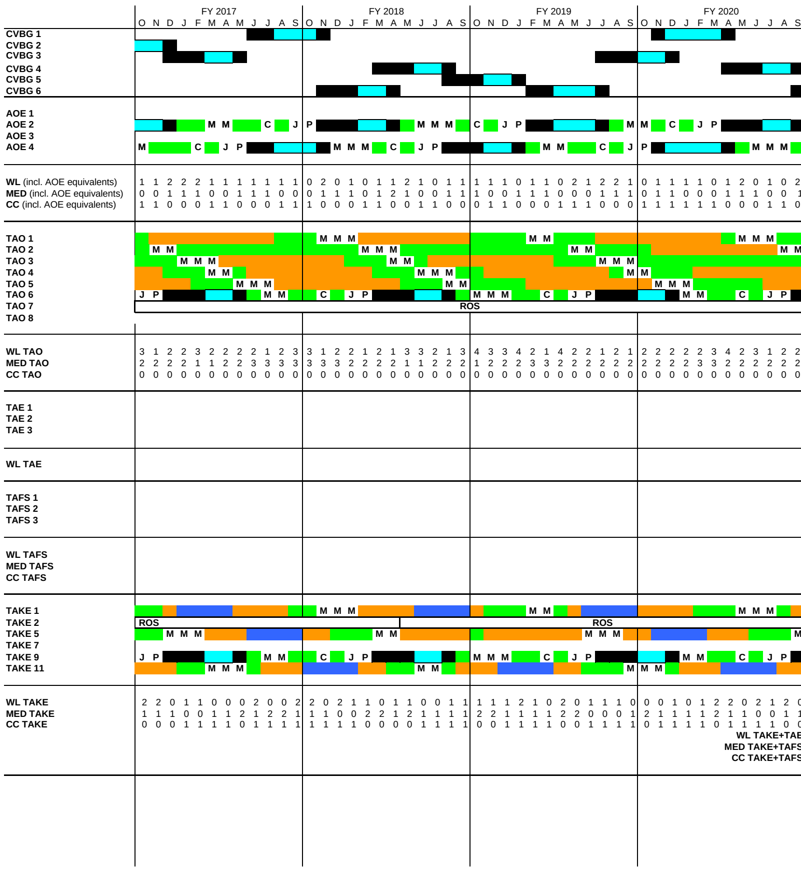


Figure 5. LANTFLT timeline for Alternative I



Note: Where shown in red below, presence is less than the required (RQRD) presence.
Note: At all times, an AOE (or substitute station ship) is in company with the forward deployed CVBG.

Average annual presence

	RQRD	AVE	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
WL (incl. AOE equivalents)	**0.75**	1.17	1.93	1.82	1.10	2.43	1.23	0.93	0.87	0.79	0.68	1.27	0.98	1.10	0.90	0.93	1.27	0.82	1.10	0.82
MED (incl. AOE equivalents)	**0.75**	0.59	0.73	0.60	0.57	0.48	0.60	0.73	0.54	0.62	0.48	0.48	0.85	0.48	0.60	0.57	0.48	0.77	0.57	0.52
CC (incl. AOE equivalents)	**0.50**	0.48	0.33	0.50	0.50	0.50	0.42	0.42	0.50	0.50	0.50	0.50	0.33	0.50	0.58	0.42	0.50	0.42	0.42	0.67

Average annual presence

	RQRD	AVE	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
WL TAO	**2.33**	2.64	2.39	3.72	3.55	2.89	2.97	2.96	3.22	2.64	2.47	2.31	2.38	2.37	2.31	2.37	2.14	2.05	2.46	2.30
MED TAO	**2.00**	2.03	2.10	2.02	2.05	2.02	2.02	2.08	2.05	2.02	2.05	2.02	2.05	2.00	2.02	2.00	2.02	1.97	2.00	2.05
CC TAO	**0.00**	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Average annual presence

	RQRD	AVE	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
WL TAE	0.75		0.83	1.75	1.50	0.50	0.00	0.00												

Average annual presence

	RQRD	AVE	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
WL TAFS	**0.00**	0.57	0.63	0.71	0.71	0.70	0.79	0.46	0.59	0.00										
MED TAFS	1.00		1.03	1.03	1.03	1.07	1.03	0.87	0.15	0.00										
CC TAFS	0.50		0.53	0.53	0.53	0.53	0.53	0.53	0.27	0.00										

Average annual presence

	RQRD	AVE	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
WL TAKE	0.75					0.25	1.25	1.18	1.12	0.87	1.28	1.13	0.78	0.88	0.96	1.12	0.88	0.88	0.97	0.96
MED TAKE	1.00					0.00	0.00	0.27	0.88	1.14	1.07	1.00	1.07	1.00	1.03	1.07	1.03	1.00	1.00	1.03
CC TAKE	0.50					0.00	0.00	0.00	0.27	0.53	0.53	0.53	0.53	0.53	0.53	0.53	0.53	0.53	0.53	0.53
WL TAKE+TAE	**0.75**	1.06	0.83	1.75	1.50	0.75	1.25	1.18	1.12	0.87	1.28	1.13	0.78	0.88	0.96	1.12	0.88	0.88	0.97	0.96
MED TAKE+TAFS	**1.00**	1.04	1.03	1.03	1.03	1.07	1.03	1.13	1.03	1.14	1.07	1.00	1.07	1.00	1.03	1.07	1.03	1.00	1.00	1.03
CC TAKE+TAFS	**0.50**	0.53	0.53	0.53	0.53	0.53	0.53	0.53	0.53	0.53	0.53	0.53	0.53	0.53	0.53	0.53	0.53	0.53	0.53	0.53

	AVE	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
WL CLF TOTAL	5.12	5.78	8.00	6.86	6.77	6.25	5.53	5.80	4.30	4.43	4.71	4.15	4.36	4.17	4.42	4.28	3.75	4.52	4.07

Figure 6. PACFLT timeline for Alternative I

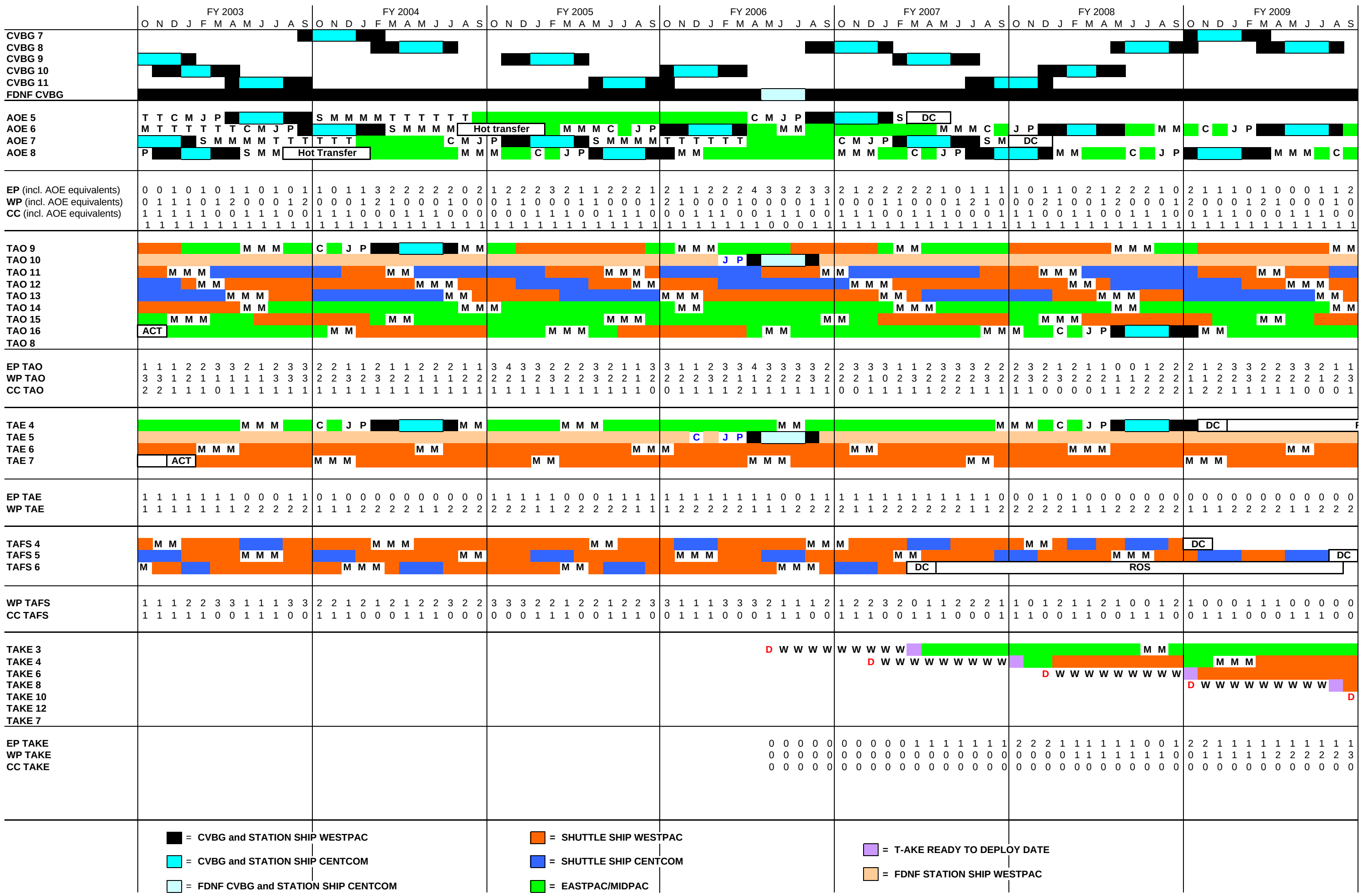


Figure 6. PACFLT timeline for Alternative I

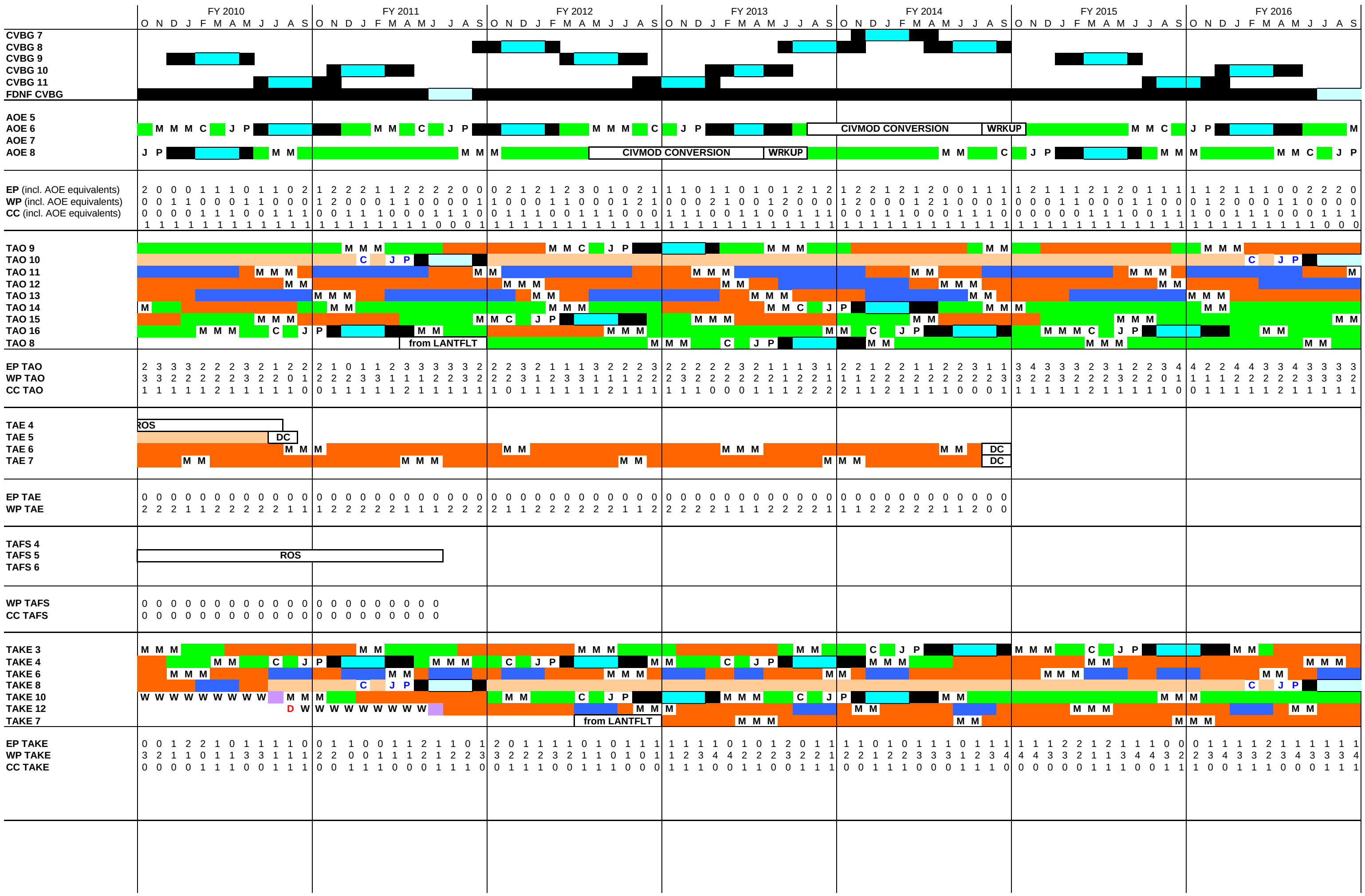
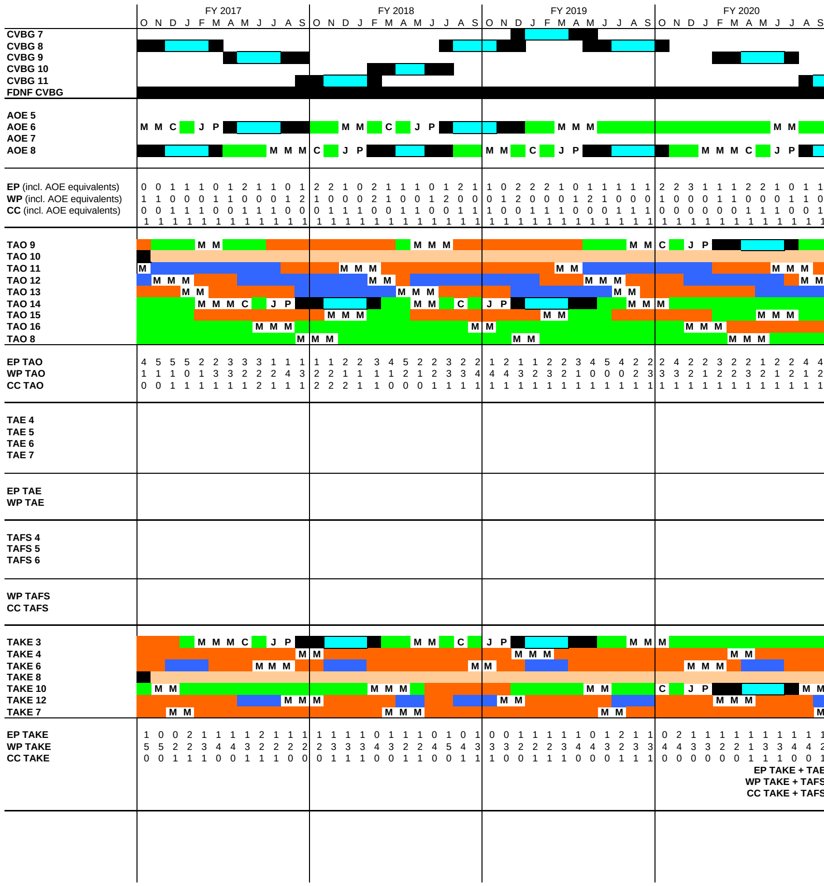


Figure 6. PACFLT timeline for Alternative I



Note: Where shown in red below, presence is less than the required (RQRD) presence.
Note: At all times, an AOE (or substitute station ship) is in company with the forward deployed CVBG.

Average annual presence

	RQRD	AVE	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
EP (incl. AOE equivalents)	**0.75**	1.19	0.46	1.48	1.81	2.33	1.42	1.00	0.77	0.81	1.42	1.25	0.83	1.10	1.23	1.06	0.77	1.08	1.00	1.50
WP (incl. AOE equivalents)			0.63	0.35	0.35	0.42	0.42	0.50	0.48	0.27	0.42	0.50	0.42	0.56	0.27	0.35	0.48	0.50	0.50	0.33
CC (incl. AOE equivalents)	**0.50**	0.52	0.67	0.50	0.50	0.50	0.58	0.58	0.50	0.50	0.50	0.50	0.67	0.50	0.42	0.58	0.50	0.58	0.58	0.33
	FDNF		1.00	1.00	1.00	0.75	1.00	1.00	1.00	1.00	0.75	1.00	1.00	1.00	1.00	0.75	1.00	1.00	1.00	1.00
	WP total - **1.33**	1.39	1.63	1.35	1.35	1.17	1.42	1.50	1.48	1.27	1.17	1.50	1.42	1.56	1.27	1.10	1.48	1.50	1.50	1.33

Note: TAOs 10, 11, 12, and 13 are home ported in WP

Average annual presence

	RQRD	AVE	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
EP TAO	**2.00**	2.26	2.02	1.53	2.44	2.60	2.36	1.44	2.12	2.28	2.02	2.02	1.87	1.69	2.77	3.17	2.94	2.45	2.44	2.52
WP TAO	**2.00**	2.04	1.99	2.00	2.09	2.06	2.00	2.07	2.02	2.09	2.06	2.00	2.01	2.01	2.07	2.04	2.01	2.01	2.08	2.07
CC TAO	**1.00**	1.04	1.13	1.07	1.00	1.05	1.07	1.05	1.00	1.05	1.05	1.07	1.05	1.00	1.05	1.05	1.00	1.05	1.07	1.07

Note: TAEs 5, 6 and 7 are home ported in WP

Average annual presence

	RQRD	AVE	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
EP TAE	**0.75**		0.75	0.08	0.75	0.83	0.92	0.17	0.00	0.00	0.00	0.00	0.00	0.00						
WP TAE	**1.30**	1.61	1.42	1.58	1.67	1.67	1.67	1.75	1.58	1.67	1.67	1.67	1.67	1.33						

Note: All TAFSs are home ported in WP

Average annual presence

	RQRD	AVE	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
WP TAFS	**1.50**		1.83	1.83	2.17	1.83	1.58	1.00	0.33											
CC TAFS	**0.50**		0.67	0.50	0.50	0.50	0.58	0.58	0.50											

Note: TAKEs 6, 7, 8 and 12 are home ported in WP. TAKE 4 is home ported in WP after 2014.

Average annual presence

	RQRD	AVE	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
EP TAKE							0.58	1.10	1.19	0.85	0.79	0.84	0.85	0.76	1.08	1.01	1.01	0.76	0.84	1.00
WP TAKE	**2.80**	2.89					0.00	0.62	1.55	1.53	1.50	1.52	2.37	2.35	2.83	3.10	3.02	3.18	2.85	2.92
CC TAKE							0.00	0.00	0.00	0.50	0.50	0.50	0.67	0.50	0.42	0.58	0.50	0.58	0.58	0.33
EP TAKE + TAE	**0.75**	0.90	0.75	0.08	0.75	0.83	1.50	1.27	1.19	0.85	0.79	0.84	0.85	0.76	1.08	1.01	1.01	0.76	0.84	1.00
WP TAKE + TAFS	**1.50**	1.83	1.83	1.83	2.17	1.83	1.58	1.62	1.88	1.53	1.50	1.52	2.37	2.35						
CC TAKE + TAFS	**0.50**	0.52	0.67	0.50	0.50	0.50	0.58	0.58	0.50	0.50	0.50	0.50	0.67	0.50	0.42	0.58	0.50	0.58	0.58	0.33
EP CLF TOTAL		4.12	3.20	3.56	4.65	5.22	4.92	4.34	3.99	3.75	4.27	4.09	3.69	3.87	4.39	4.11	3.79	3.85	3.92	4.57

Figure 7. LANTFLT timeline for Alternative II

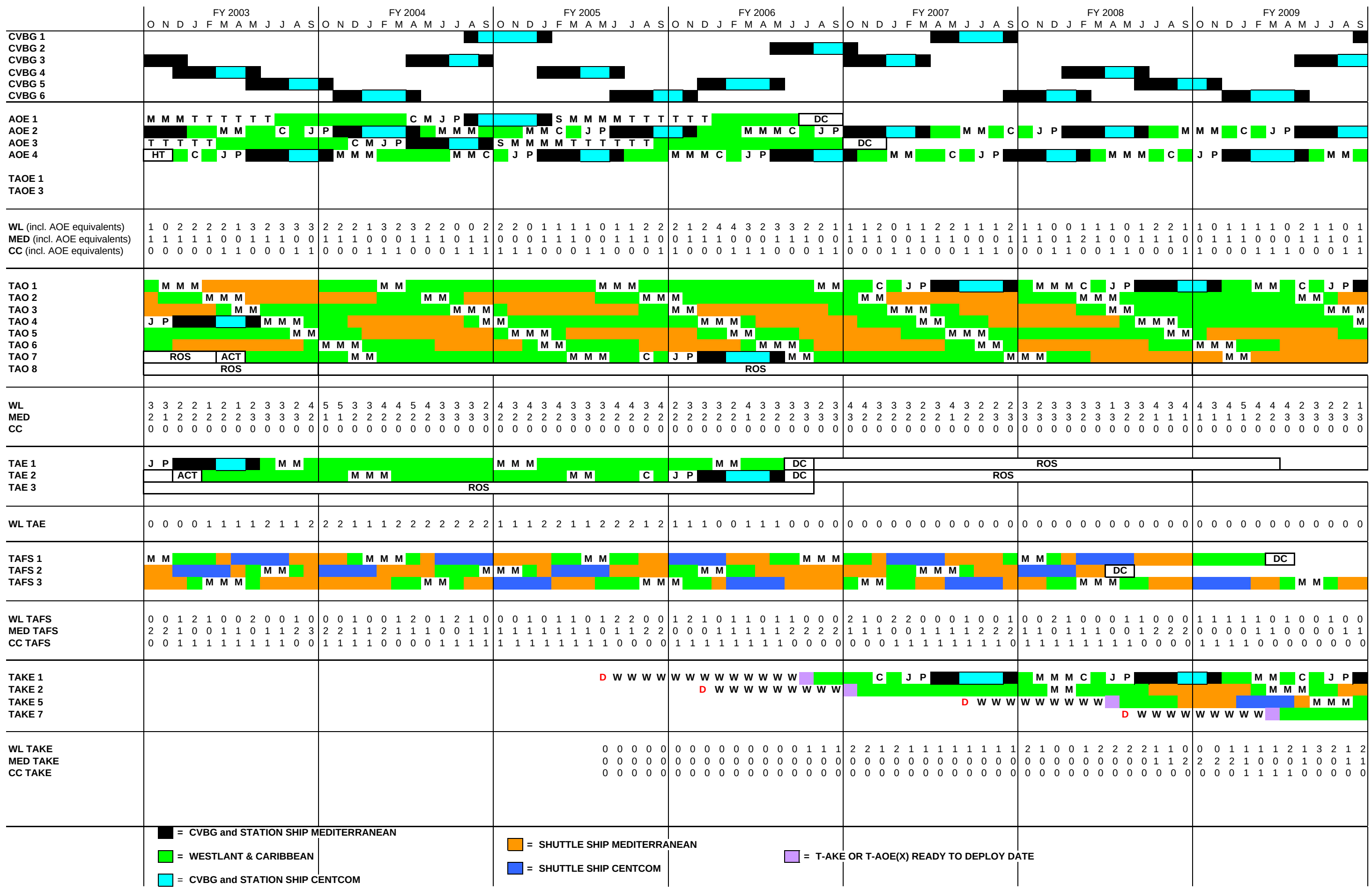


Figure 7. LANTFLT timeline for Alternative II

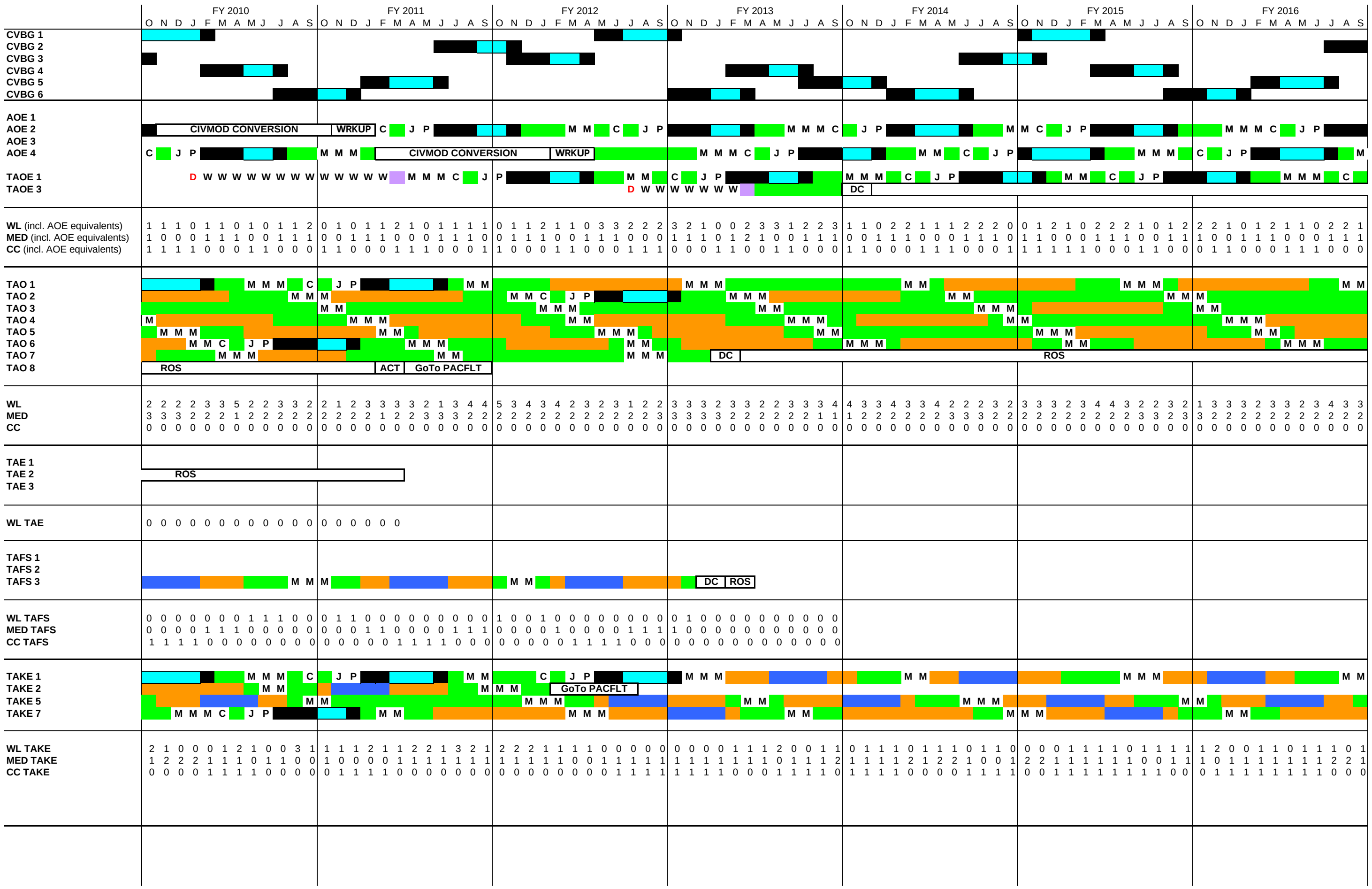
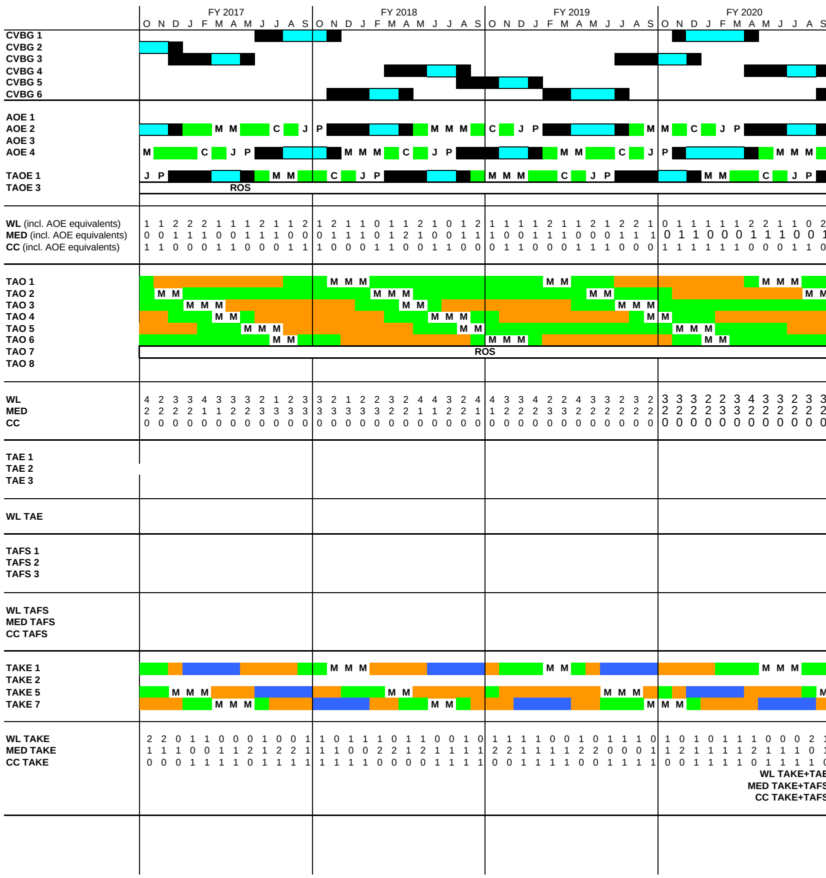


Figure 7. LANTFLT timeline for Alternative II



Note: Where shown in red below, presence is less than the required (RQRD) presence.
Note: At all times, an AOE (or substitute station ship) is in company with the forward deployed CVBG.

	RQRD	AVE	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
WL (incl. AOE equivalents)	0.75	1.34	1.93	1.82	1.10	2.43	1.23	0.93	0.87	0.79	0.85	1.52	1.82	1.27	1.15	1.27	1.43	1.07	1.35	1.07
MED (incl. AOE equivalents)	0.75	0.60	0.73	0.60	0.57	0.48	0.60	0.73	0.54	0.62	0.48	0.48	0.85	0.48	0.60	0.57	0.48	0.77	0.57	0.52
CC (incl. AOE equivalents)	0.50	0.46	0.33	0.50	0.50	0.50	0.42	0.42	0.50	0.50	0.50	0.50	0.33	0.50	0.58	0.42	0.50	0.42	0.42	0.67

0.60

	RQRD	AVE	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
WL	2.33	2.93	2.39	3.72	3.55	2.89	2.97	2.96	3.22	2.64	2.63	2.89	2.88	2.96	2.89	2.79	2.81	2.72	2.96	2.88
MED	2.00	2.03	2.10	2.02	2.05	2.02	2.02	2.08	2.05	2.02	2.05	2.02	2.05	2.00	2.02	2.00	2.02	2.05	2.00	2.05
CC	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

	RQRD	02-19	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
WL TAE	0.75		0.83	1.75	1.50	0.50	0.00	0.00	0.00	0.00	0.00									

	RQRD	AVE	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
WL TAFS	0.00	0.56	0.63	0.71	0.71	0.70	0.79	0.46	0.60	0.26	0.18	0.18	0.09							
MED TAFS	1.00		1.03	1.03	1.03	1.07	1.03	0.87	0.28	0.23	0.37	0.32	0.05							
CC TAFS	0.50		0.53	0.53	0.53	0.53	0.53	0.53	0.27	0.27	0.27	0.27	0.00							

	RQRD	AVE	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
WL TAKE	0.75					0.25	1.25	1.18	1.28	0.94	1.53	0.86	0.62	0.72	0.71	0.78	0.71	0.63	0.72	0.71
MED TAKE	1.00					0.00	0.00	0.27	0.75	0.92	0.67	0.75	0.98	1.00	1.03	1.07	1.03	1.00	1.00	1.03
CC TAKE	0.50					0.00	0.00	0.00	0.27	0.27	0.27	0.27	0.53	0.53	0.53	0.53	0.53	0.53	0.53	0.53
WL TAKE+TAE	0.75	0.99	0.83	1.75	1.50	0.75	1.25	1.18	1.28	0.94	1.53	0.86	0.62	0.72	0.71	0.78	0.71	0.63	0.72	0.71
MED TAKE+TAFS	1.00	1.05	1.03	1.03	1.03	1.07	1.03	1.13	1.03	1.15	1.03	1.07	1.03	1.00	1.03	1.07	1.03	1.00	1.00	1.03
CC TAKE+TAFS	0.50	0.49	0.53	0.53	0.53	0.53	0.53	0.53	0.53	0.53	0.53	0.53	0.53	0.53	0.53	0.53	0.53	0.53	0.53	0.53
WL CLF TOTAL		5.57	5.78	8.00	6.86	6.77	6.25	5.53	5.97	4.63	5.19	5.44	5.41	4.94	4.75	4.84	4.95	4.42	5.02	4.66

Figure 8. PACFLT timeline for Alternative II

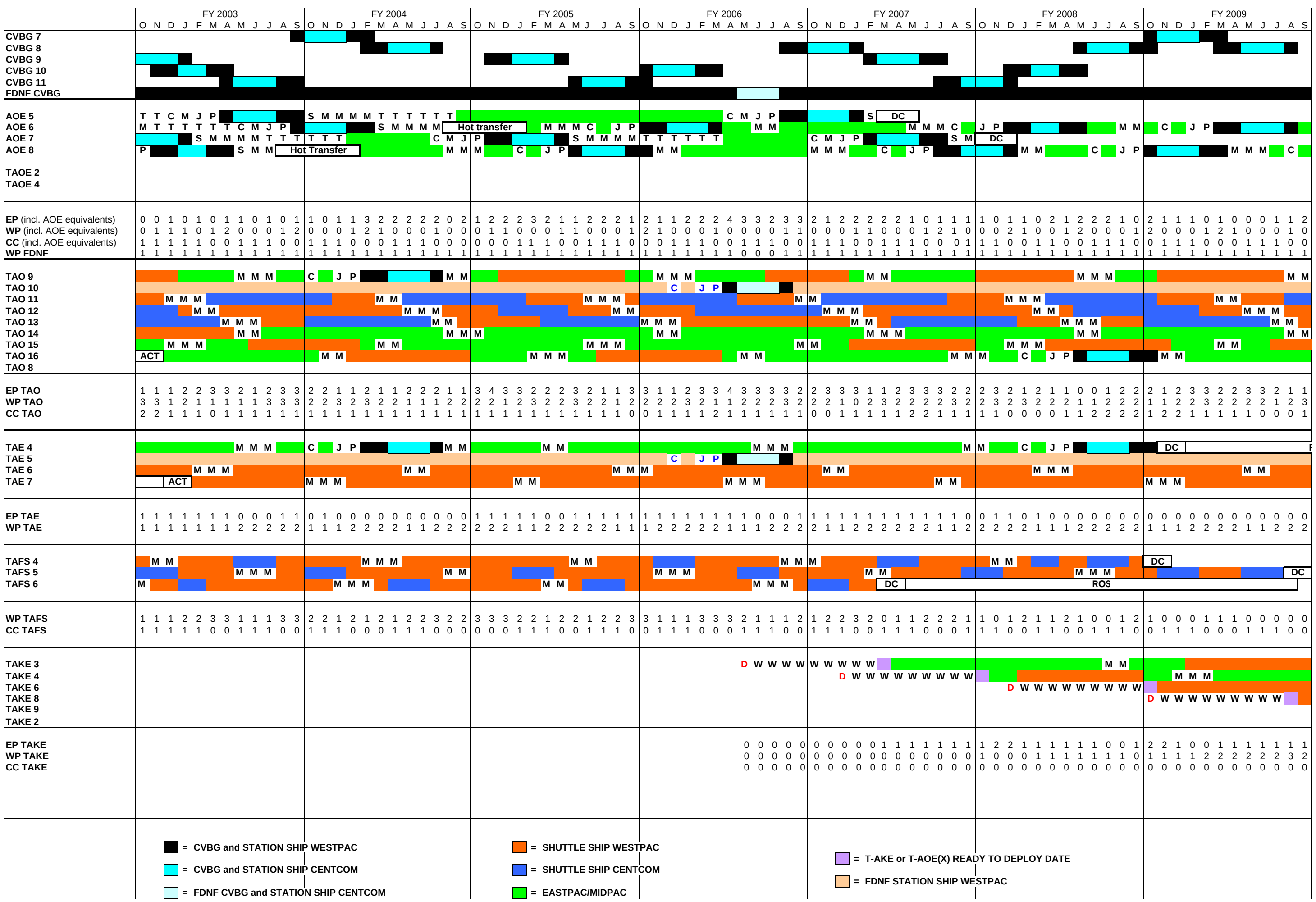


Figure 8. PACFLT timeline for Alternative II

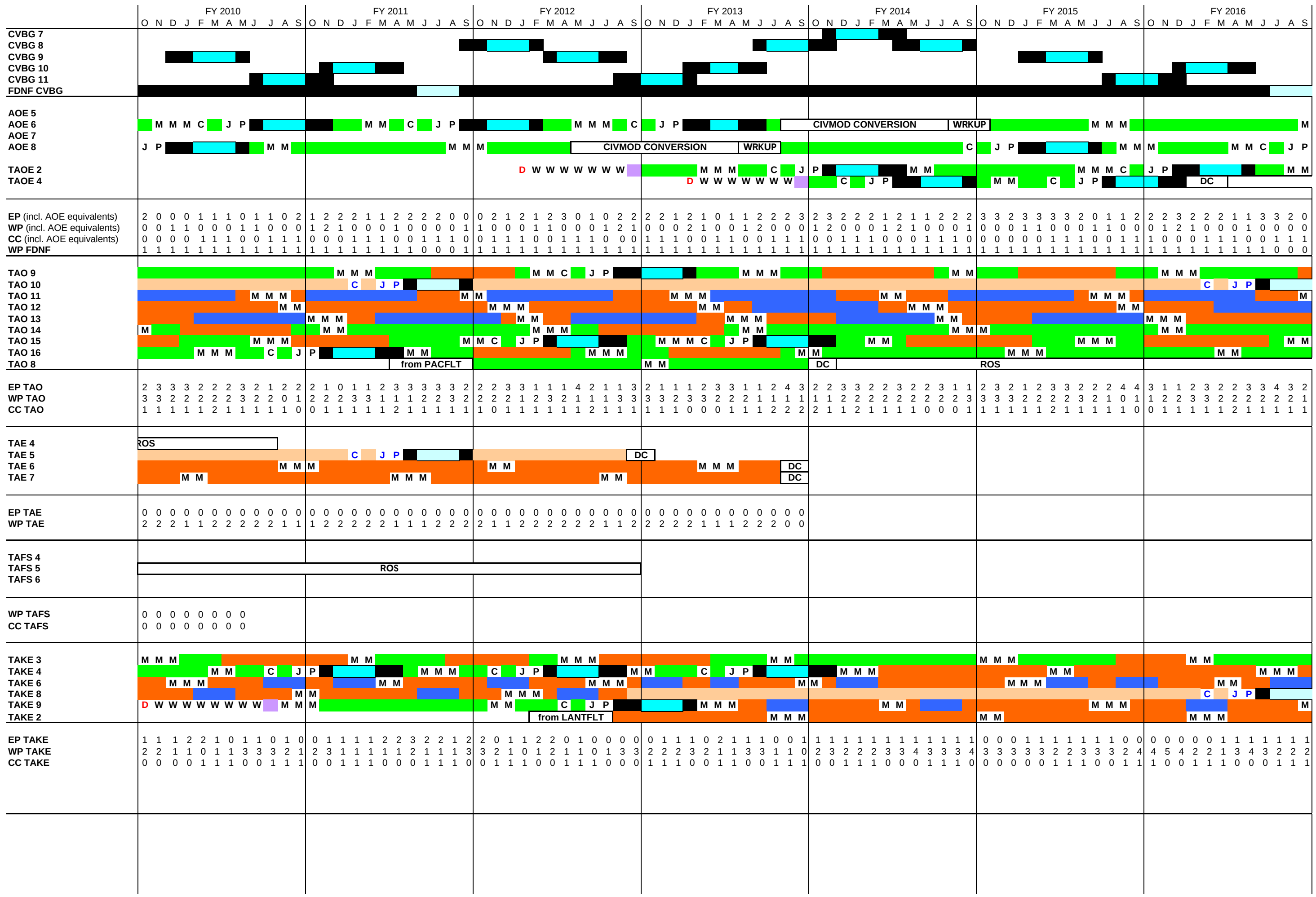
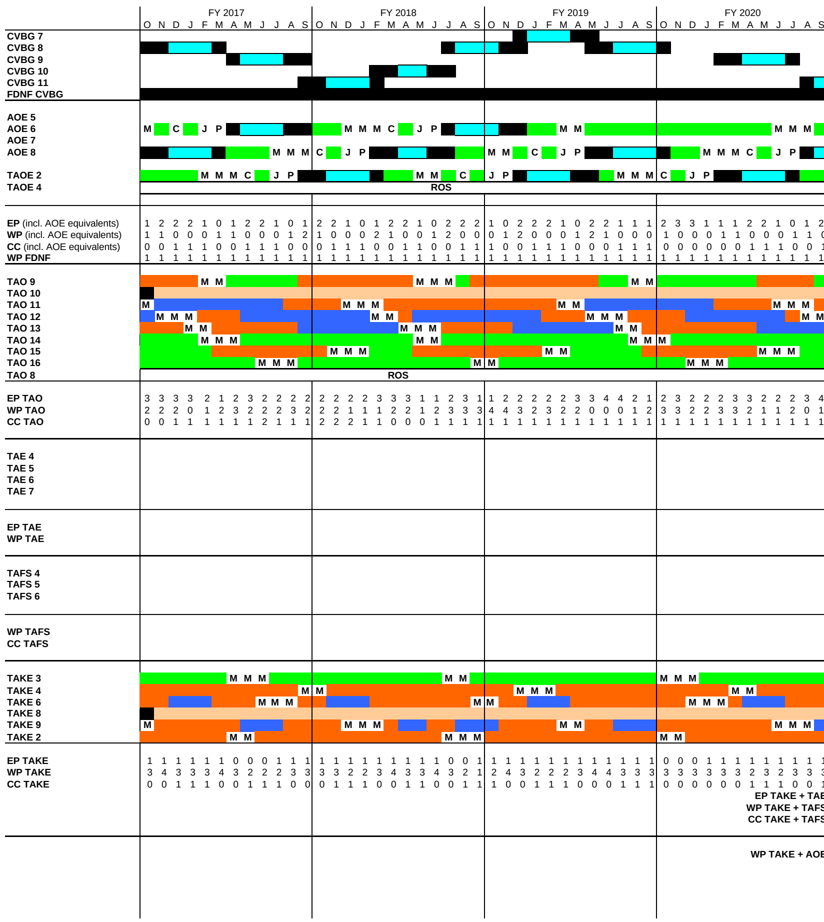


Figure 8. PACFLT timeline for Alternative II



Note: Where shown in red, presence is less than the required (RQRD) presence.
Note: At all times, an AOE (or substitute station ship) is in company with the forward deployed CVBG.

Average annual presence

	RQRD	AVE	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
EP (incl. AOE equivalents)	0.75	1.41	0.46	1.48	1.81	2.33	1.42	1.00	0.77	0.81	1.42	1.33	1.50	1.77	2.23	1.90	1.27	1.33	1.17	1.67
WP (incl. AOE equivalents)		0.44	0.63	0.35	0.35	0.42	0.42	0.50	0.48	0.27	0.42	0.50	0.42	0.56	0.27	0.35	0.48	0.50	0.50	0.33
CC (incl. AOE equivalents)	0.50	0.54	0.67	0.50	0.50	0.50	0.58	0.58	0.50	0.50	0.50	0.50	0.67	0.50	0.42	0.58	0.50	0.58	0.58	0.33
WP FDNF	FDNF		1.00	1.00	1.00	0.75	1.00	1.00	1.00	1.00	0.75	1.00	1.00	1.00	1.00	0.75	1.00	1.00	1.00	1.00
	WP total - **1.33**	1.39	1.63	1.35	1.35	1.17	1.42	1.50	1.48	1.27	1.17	1.50	1.42	1.56	1.27	1.10	1.48	1.50	1.50	1.33

Note: TAOs 10, 11, 12, and 13 are home ported in WP

Average annual presence

	RQRD	AVE	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
EP TAO	2.00	2.17	2.02	1.53	2.44	2.60	2.36	1.44	2.12	2.28	2.02	2.03	2.03	2.19	2.52	2.44	2.36	2.12	2.36	2.53
WP TAO	2.00	2.04	1.99	2.00	2.09	2.06	2.00	2.07	2.02	2.09	2.06	2.02	2.08	2.01	2.07	2.07	2.01	2.01	2.00	2.00
CC TAO	1.00	1.05	1.13	1.07	1.00	1.05	1.07	1.05	1.00	1.05	1.05	1.07	1.05	1.00	1.05	1.05	1.00	1.05	1.07	1.07

Note: TAEs 5, 6 and 7 are home ported in WP

Average annual presence

	RQRD	AVE	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
EP TAE	0.75		0.75	0.08	0.83	0.75	0.92	0.25	0.00	0.00	0.00	0.00	0.00							
WP TAE	1.30	1.61	1.42	1.58	1.67	1.67	1.67	1.75	1.58	1.67	1.67	1.67	1.42							

Note: All TAFSs are home ported in WP

Average annual presence

	RQRD	AVE	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
WP TAFS	1.50		1.83	1.83	2.17	1.83	1.58	1.00	0.33											
CC TAFS	0.50		0.67	0.50	0.50	0.50	0.58	0.58	0.50											

Note: TAKEs 6 and 8 are home ported in WP. TAKEs 4, 9, and 2 are home ported in WP after 2013 and 2014.

Average annual presence

	RQRD	AVE	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
EP TAKE							0.58	1.02	1.02	0.93	1.52	0.77	0.76	1.00	0.59	0.59	0.75	0.83	1.00	0.75
WP TAKE	2.80	2.85					0.00	0.70	1.70	1.68	1.53	1.53	1.77	2.83	2.85	2.85	2.92	2.75	2.92	2.83
CC TAKE							0.00	0.00	0.00	0.50	0.50	0.50	0.67	0.50	0.42	0.58	0.50	0.58	0.58	0.33
EP TAKE + TAE	0.75	0.88	0.75	0.08	0.83	0.75	1.50	1.27	1.02	0.93	1.52	0.77	0.76	1.00	0.59	0.59	0.75	0.83	1.00	0.75
WP TAKE + TAFS	1.50	1.77	1.83	1.83	2.17	1.83	1.58	1.70	2.03	1.68	1.53	1.53	1.77							
CC TAKE + TAFS	0.50	0.54	0.67	0.50	0.50	0.50	0.58	0.58	0.50	0.50	0.50	0.50	0.67	0.50	0.42	0.58	0.50	0.58	0.58	0.33
WP TAKE + AOE	EP CLF TOTAL	4.46	3.23	3.09	5.09	5.68	5.27	3.71	3.90	4.02	4.95	4.13	4.28	4.96	5.35	4.93	4.38	4.28	4.52	4.94

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