A Study to Determine Impacts on Cost and Readiness Of Variations in the Development and Release Cycle of the F/A-18 EF and EA-18G Software Configuration Set (SCS)
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EXECUTIVE SUMMARY

This project was completed by Patuxent River EMBA Cohort Consulting Team, on behalf of PMA-265, and facilitated through the Naval Postgraduate School Executive MBA program.

The three main objectives of the project were: (1) Determine impacts on cost and readiness of variations in the development and release cycle of the F/A-18 E/F and EA-18G System Configuration Set (SCS); (2) Provide the F/A-18 Program Office with a clearer picture of the current trends associated with varying the SCS release cycle; (3) Provide the program office with a means to evaluate cost and readiness impacts of the SCS release cycle.

This project focused on four main areas of interest: (1) Identification of fixed and variable costs incurred in the development and fielding of the F/A-18 SCS for use in the identification of cost impacts due to variation in SCS release interval; (2) Programmatic and schedule impacts on external stakeholders due to variations in SCS release interval; (3) F/A-18 Fleet training and readiness impacts due to variation in SCS release interval; (4) Determining SCS release plan that balances capability, schedule, costs and impacts to the war fighter to ensure delivery of the right readiness, at the right time, at the right cost.

Based on the analysis of the SCS release interval, we determined that a one year interval was too short, 4 years was too long, and the optimal interval is somewhere between 2 and 3 years.
Utilizing historical SCS cost and developmental timelines provided by the Advanced Weapons Lab, we determined that 88% of the cost associated with releasing an SCS were variable, and only 12% were fixed. Modeling this data and running cost models excursions at varying SCS release intervals, we determined that the greatest cost was associated with a 1 year SCS release interval and that costs decreased as the SCS release interval increased. Implementing a 4 year SCS release cycle results in savings of up to $63.5 million as compared to one year SCS release costs.

Examining typical Aircrew, Squadron and Air Wing training plans, we determined that a 1 year SCS release interval resulted in decreased Aircrew Flight proficiency and increased training requirements. As the SCS release interval increased to 4 years, Aircrew, Squadron and Air Wing proficiency increased and training plans were optimized.

SCS release intervals for a major SCS (delivers capability and implements software fixes) and minor SCS (implements software fixes only) were also examined to determine optimal combination that resulted in delivery of both new capability as well as fixes to software. A combination of a major SCS combined with a minor SCS release will result in software anomalies being fixed quicker while delivering equivalent capability to the fleet over the 8 year life of the F/A-18 Flight Plan.

While most of the criteria we analyzed indicated longer SCS release intervals were optimal, there were some criteria that indicated short SCS release intervals were optimal. Analyzing current program capability roadmaps, from all stakeholders who implement capability on to the F/A-18 E/F, we determined that a 1 or 2 year SCS release
interval best aligned with current program office capability road maps. As the SCS release interval increased to 4 years, program office capability road maps were misaligned with SCS releases, resulting in significant program cost and schedule impacts.

Longer SCS release intervals will negatively impact the delivery of required capability to the fleet. The F/A-18 E/F is the lead platform for many new capabilities being released to the fleet. All capabilities implemented on the F/A-18 are tightly integrated with the SCS, and if F/A-18E/F SCS release interval is extended, the introduction of those capabilities will also be extended.

Combining all the results from the different focus areas, we determined that a 36 month major / 18 month minor SCS release interval best balances capability, schedule, costs and external stakeholder impacts. However, due to limitations of the DOD acquisition process timeline, many program offices have developed acquisition plans based on existing SCS release timelines, and shifting them now could significantly impact those programs. As such, we performed additional analysis with SCS release interval impacts to current program capability roadmaps more heavily weighted, which indicated that a 24 month major / 12 month minor SCS release interval provided the best balance for all parameters (cost, schedule, performance and other program office roadmaps).
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I. INTRODUCTION AND BACKGROUND

A. INTRODUCTION

Due to increasing Department of Defense budget pressures and fiscal realities, Naval Aviation operates as an enterprise that meticulously manages every budget dollar in order to buy the “right readiness, at the right time, at the right cost.” Historically, new versions of the software configuration set (SCS) for the F/A-18 EF and EA-18G have been released once per year at a development cost approaching $100M per release. In FY2008, PMA-265 made the decision to increase the SCS release cycle to two years. This study examines the SCS release interval process and stakeholder requirements to determine the impacts to cost and readiness of various SCS release intervals.

B. BACKGROUND

Currently, SCS for the F/A-18 EF and EA-18G are released about once per year with H4 (Higher Order Language, HOL, update number 4) planned for Jan 2009, H5 in July 2009 and H6 in Sept 2010. Starting with SCS H8, PMA-265 established a 2-year release cycle, with H8 planned to release in 2012, H10 in 2014. This decision to move to a 2-year release cycle was based upon available funding, reduced efficiencies driven by overlapping SCS releases, and throughput capacity at the Program Office (PMA-265), China Lake Advanced Weapons Lab (AWL) and Test and Evaluation Squadron 9 (VX-9).
Each SCS is aligned with planned capability releases to support Combatant Command (COCOM) requirements, fleet requirements and funding availability. With each SCS release, there are significant impacts on cost, capability, logistics, interoperability and testing. Developing an effective long term SCS release plan that balances capability, schedule, costs and impacts to the warfighter will ensure delivery of the right readiness, at the right time, at the right cost.

C. PROJECT OBJECTIVES

The cost and readiness impacts of the recent shift from a 1 year to a 2 year SCS release cycle are not entirely clear. Additionally, the impact of a further lengthening of the SCS release cycle is unknown. This study examines the cost and readiness impacts of a 1, 2 and 4 year SCS release cycle in order to provide the program office with a clearer picture of the trends associated with lengthening the SCS release cycle. This information will provide the program office with a means to evaluate the cost and readiness impacts of the most recent SCS release cycle change, as well as any future changes in the SCS release cycle.

D. PROJECT SCOPE

The scope of this study was limited due to time constraints and the potential complexity of the proposed effort. The scope of this study is described below:

- SCS releases were examined only for the F/A-18 EF and EA-18G.
• F/A-18 E/F and EA-18G Flight Plan Increments 1-4 only were examined.
• Only one year, two year, three year and four year release cycles were investigated.
• The current software development process and schedule as provided by the Advanced Weapons Lab (AWL) at China Lake, CA was examined to determine appropriate timeframes for each phase of the software development cycle.
• Aircraft and weapons roadmaps were utilized as provided by their respective program offices for use in determining the phasing of requirements for each SCS release.
• The F/A-18 A-D SCS software development and release cycle was not investigated, but similar conclusions may be applicable due to similarities.
• Modifications to the roadmaps were not recommended as a means of determining the optimal SCS release cycle.
• Program budgeting and contracting impacts were not evaluated.
II. METHODOLOGY

Data collection and analysis consisted of three primary efforts; identification and analysis of costs, analysis of the impact on readiness, and benchmarking against other similar programs to consider the reasonableness of the proposed recommendations and conclusions.

A. IDENTIFICATION AND ANALYSIS OF COSTS

Operational capability to be delivered over the next 8 years was held constant and cost was varied with the goal of comparing total costs of delivering the same capability over an 8 year period using 4 different SCS release schedules (SCS release every 1, 2, 3, or 4 years). This resulted in the modeling of 8 total SCS releases for the annual release, 4 total SCS releases for the 2 year release, 2.6 total SCS releases for the 3 year release, and 2 total SCS releases for the 4 year release cycles over the 8 year period. The cost analysis modeled a $100M SCS using a typical 41 month development cycle based on SCS H8 for the annual release scenario (i.e., 8 SCS total over 8 years). For the 2, 3 and 4 year release cycle, we modeled a $200M, $300M, and $400M SCS respectively. Variable costs were scaled up proportionately (i.e., twice the capability = twice the cost for variable costs). Fixed costs were estimated based on historical data. Costs that were a combination of fixed and variable were estimated based on historical data and discussions with key personnel. Costs were escalated over the 8 year period based on historical data.
B. ANALYSIS OF THE IMPACT ON READINESS

We obtained and reviewed the F/A-18 A-F and EA-18G turnaround training cycles to determine impacts on and alignment with the fleet from a 1, 2, 3 and 4 year SCS release option. We also obtained and reviewed aircraft, weapon system, weapon and mission planning roadmaps to determine impacts on and alignment with the fleet from a 1, 2, 3, or 4 year SCS release cycle. To determine fleet operator requirements and perceptions/expectations for receipt of capability to fleet F/A-18 EF and EA-18G squadrons, we held discussions with Strike Fighter Wing and Strike Fighter Weapon School staffs.

We also held discussions with Commander Naval Air Forces (CNAF) to determine impacts of varying SCS release timelines, as well as discussions with commodores, commanding officers, and operations officers from air wings and squadrons on both the East and West coast of the United States. A complete copy of the questions asked during the interviews is provided in Appendix A.

C. BENCHMARK OF SIMILAR TACTICAL FIGHTER PROGRAMS

To ascertain existing comparable data points and reasoning, we benchmarked operational flight program (OFP) software development release cycles from other tactical fighter jet aircraft (F-16, F-15, F-22, F-35).
III. RESULTS

A. IDENTIFICATION AND ANALYSIS OF COSTS

Current Advanced Weapons Lab (AWL) software development process and schedule were utilized to determine appropriate timeframes for each phase of the software development cycle. Costs and schedules based on historical SCS development data from the AWL. Based on historical data, a typical $100M SCS takes 23.5 months to develop (includes requirements, design, development, verification, validation, and operational test phases) with the percentage of the budget figures presented in Table 1 below. Modeling a $100M SCS using these figures (months and % of budget) yields the costs/month in Table 1.

<table>
<thead>
<tr>
<th>Phase</th>
<th>Months</th>
<th>% of Budget</th>
<th>Total Cost</th>
<th>Cost/Month</th>
<th>Costs Structure</th>
</tr>
</thead>
<tbody>
<tr>
<td>Requirements</td>
<td>3</td>
<td>15%</td>
<td>$15,000,000</td>
<td>$5,000,000</td>
<td>Variable</td>
</tr>
<tr>
<td>Design</td>
<td>9</td>
<td>50%</td>
<td>$50,000,000</td>
<td>$5,555,556</td>
<td>Variable</td>
</tr>
<tr>
<td>Development</td>
<td>4.5</td>
<td>24%</td>
<td>$24,000,000</td>
<td>$5,333,333</td>
<td>Variable</td>
</tr>
<tr>
<td>Verification</td>
<td>1</td>
<td>4%</td>
<td>$4,000,000</td>
<td>$4,000,000</td>
<td>Variable</td>
</tr>
<tr>
<td>Validation</td>
<td>1</td>
<td>2%</td>
<td>$2,000,000</td>
<td>$2,000,000</td>
<td>Variable</td>
</tr>
<tr>
<td>Operational Test</td>
<td>5</td>
<td>5%</td>
<td>$5,000,000</td>
<td>$1,000,000</td>
<td>Variable/Fixed</td>
</tr>
</tbody>
</table>

SCS costs and development times for the design, development, verification and validation phases were considered variable and scaled linearly resulting in the timelines presented in Table 2.
For operational test (OT) costs, we estimated that a 1 year release took 5 months of OT, a 2 year release took 6 months of OT, a 3 year release took 7 months of OT, and a 4 year release took 8 months of OT\(^2\). As a result, OT was determined to be primarily a fixed cost with a small variable cost component. Trainer costs were scaled at 10% of SCS development costs for 1 year release, 9% for 2 year release, 8% for 3 year release and 7% for 4 year release\(^3\). The Joint Mission Planning System (JMPS) was determined to be a completely fixed cost at $1M dollars\(^4\). The total costs for OT, Trainer, and JMPS updates for 1, 2, 3 and 4 year SCS release intervals is presented in Table 3.

Table 3. OT, Trainer, and JMPS Costs

<table>
<thead>
<tr>
<th>Release Cycle</th>
<th>Operational Test</th>
<th>Trainers</th>
<th>JMPS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Year</td>
<td>$.5 M</td>
<td>$1 M</td>
<td>$1 M</td>
</tr>
<tr>
<td>2 Year</td>
<td>$.6 M</td>
<td>$1.8 M</td>
<td>$1 M</td>
</tr>
<tr>
<td>3 Year</td>
<td>$.7 M</td>
<td>$2.3 M</td>
<td>$1 M</td>
</tr>
<tr>
<td>4 Year</td>
<td>$.8 M</td>
<td>$2.8 M</td>
<td>$1 M</td>
</tr>
</tbody>
</table>

Based on historical data\(^1\), the escalation factors presented in Table 4 were used to escalate the cost per month for each phase over an 8 year period. These escalated costs,
along with the development phase timelines from Table 2 were used to compute total costs for each SCS release cycle option (see Figure 1 below).

Table 4. Costs Per Month With Escalation

<table>
<thead>
<tr>
<th>Phase</th>
<th>Escalation</th>
<th>Year 1</th>
<th>Year 2</th>
<th>Year 3</th>
<th>Year 4</th>
<th>Year 5</th>
<th>Year 6</th>
<th>Year 7</th>
<th>Year 8</th>
</tr>
</thead>
<tbody>
<tr>
<td>Requirements</td>
<td>7.00%</td>
<td>$5,000,000</td>
<td>$5,724,500</td>
<td>$6,125,215</td>
<td>$6,553,980</td>
<td>$7,012,759</td>
<td>$7,503,652</td>
<td>$8,028,907</td>
<td>$8,590,931</td>
</tr>
<tr>
<td>Design</td>
<td>16.00%</td>
<td>$5,555,556</td>
<td>$6,360,556</td>
<td>$6,805,794</td>
<td>$7,282,200</td>
<td>$7,791,954</td>
<td>$8,337,391</td>
<td>$8,921,008</td>
<td>$9,545,479</td>
</tr>
<tr>
<td>Development</td>
<td>7.00%</td>
<td>$5,333,333</td>
<td>$6,106,133</td>
<td>$6,533,563</td>
<td>$6,990,912</td>
<td>$7,480,276</td>
<td>$8,003,895</td>
<td>$8,564,168</td>
<td>$9,163,660</td>
</tr>
<tr>
<td>Verification</td>
<td>7.00%</td>
<td>$4,000,000</td>
<td>$4,579,600</td>
<td>$4,900,172</td>
<td>$5,243,184</td>
<td>$5,610,207</td>
<td>$6,002,921</td>
<td>$6,423,126</td>
<td>$6,872,745</td>
</tr>
<tr>
<td>Validation</td>
<td>7.00%</td>
<td>$2,000,000</td>
<td>$2,289,800</td>
<td>$2,450,086</td>
<td>$2,621,592</td>
<td>$2,805,103</td>
<td>$3,001,461</td>
<td>$3,211,563</td>
<td>$3,436,372</td>
</tr>
<tr>
<td>Operational Test</td>
<td>7.00%</td>
<td>$1,000,000</td>
<td>$1,144,900</td>
<td>$1,225,043</td>
<td>$1,310,796</td>
<td>$1,402,552</td>
<td>$1,500,730</td>
<td>$1,605,781</td>
<td>$1,718,186</td>
</tr>
</tbody>
</table>

Figure 1. Total Cost for 1, 2, 3, and 4 Year Release Intervals

Lengthening the SCS release cycle (and consequently reducing the number of SCS releases in the 8 year period) resulted in some fixed cost savings. The largest fixed cost savings was associated with the shift from a 1 to a 2 year release interval. For example, in Table 5, a shift from a 1 year to a 2 year release interval reduces the number of JMPS updates by 4 over the 8 year F/A-18 Flight Plan, whereas, a shift from a 2 year to a 3 year
release interval reduces the number of JMPS updates by 1.4, and from 3 year to 4 year, by 0.6.

Table 5. JMPS and OT Updates by SCS Release Interval

<table>
<thead>
<tr>
<th>SCS Release Interval (Years)</th>
<th>Number of JMPS and OT Updates</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>8</td>
</tr>
<tr>
<td>2</td>
<td>4</td>
</tr>
<tr>
<td>3</td>
<td>2.6</td>
</tr>
<tr>
<td>4</td>
<td>2</td>
</tr>
</tbody>
</table>

Overall there is only a 5.8% cost difference between the most expensive SCS release cycle option and the least expensive SCS release cycle option. This is due to the fact that 88% of the costs of SCS production are variable (see Table 6), minimizing the cost impact of changing the SCS release interval.

Table 6. Cost and Timeline Summary with Escalation

<table>
<thead>
<tr>
<th></th>
<th>Development Costs / Timeline</th>
<th>Deployment Costs / Timeline</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Requirements</td>
<td>Design</td>
</tr>
<tr>
<td>Fixed / Variable</td>
<td>Variable</td>
<td>Variable</td>
</tr>
<tr>
<td>% Of Total SCS Costs</td>
<td>14%</td>
<td>45%</td>
</tr>
<tr>
<td>% Of Total SCS Development Time</td>
<td>15%</td>
<td>45%</td>
</tr>
<tr>
<td>Escalation Factor</td>
<td>7%</td>
<td>16%</td>
</tr>
<tr>
<td>% SCS Variable / Fixed</td>
<td>88% Variable</td>
<td></td>
</tr>
</tbody>
</table>
B. ANALYSIS OF THE IMPACT ON READINESS

To determine the impact on readiness we analyzed the following factors; SCS schedule, training and deployment, Authorization to Operate (ATO) timelines, and aircraft, weapon system, and mission planning roadmaps.

1. SCS Schedule Analysis

Manning/workload was modeled based on cost/month and SCS overlap. For all SCS release intervals, two SCS will be in development simultaneously. However for 2-4 year SCS release intervals gaps appear due to the time gained from the relatively fixed OT period (OT phase does not scale up linearly). During the design phase (near the end), there is a 5-14 month gap where only one SCS is under development. This leads to stability in the program office, Commander Operational Test and Evaluation Force (COTF), VX-9 etc.
Variability is defined as a shift from working one SCS to two, or from two SCS to one. Stability is defined as the amount of time that the same numbers of SCS are worked continuously. Figure 2 shows that a longer SCS release interval cycle increases stability over time. Over a 10 year period, the average number of SCS in simultaneous development is equal for the 4 different SCS release intervals. However, SCS workload variability is much greater for a 1 year SCS release interval as compared to the 4 year release interval. This variability results in the SCS development team workload continuously changing. The lower the number of variations, the greater the stability. As stability in the process increases, the development team is better able to plan and execute their program.
2. Analysis of Training and Deployment Timelines

Fleet response indicated that receiving an SCS 14-16 months prior to deployment is optimal, receiving an SCS not later than 6 months prior to deployment would allow them to be combat ready, and finally, they preferred to receive an SCS update after, vice during, deployment (see Figure 3).

![Figure 3. Operational Impact of SCS Release Cycle](image)

Plotting out the inputs, we derived an “SCS exclusion Zone”. The “SCS exclusion zone” is a period of time that would not be optimal for a squadron to receive an SCS update, which would require delivery of an early version of an SCS for them to train with or delay a squadron from receiving an SCS update until after deployment.

Assuming an SCS release at the beginning of a typical squadron turnaround training plan, Table 7 depicts the number of times an SCS would be released during an “exclusion zone” time period for various SCS release intervals over an 8 year period.
The longer SCS release intervals minimized the number of SCS released in an “exclusion zone,” providing better support for squadron training plans.

Table 7. Impact of SCS Release Cycle on Exclusion Zone Release

<table>
<thead>
<tr>
<th>Major SCS Release Interval (Yr)</th>
<th># SCS released in Exclusion Zone</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>4</td>
</tr>
<tr>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>3</td>
<td>1</td>
</tr>
<tr>
<td>4</td>
<td>2</td>
</tr>
</tbody>
</table>

Applying the same concept to Air Wing training and deployment schedules, we again determined that over an 8 year period, longer SCS release intervals minimized the number of SCS released in an “exclusion zone”, providing better support for Air Wing training plans (see Table 8).

Table 8. SCS Release Timing Impact

<table>
<thead>
<tr>
<th>Major SCS Release Interval (Year)</th>
<th>% of Air wings negatively impacted due to SCS release timing</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>80%</td>
</tr>
<tr>
<td>2</td>
<td>38%</td>
</tr>
<tr>
<td>3</td>
<td>34%</td>
</tr>
<tr>
<td>4</td>
<td>21%</td>
</tr>
</tbody>
</table>

Based on discussions with F/A-18 E/F operational squadrons, aircrews require approximately 6 months to train and become proficient with new SCS. Figure 4
graphically depicts timelines associated with both SCS training and SCS employment for varying SCS release intervals.

<table>
<thead>
<tr>
<th>SCS Release Interval (years)</th>
<th>Time in Years</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>6 Months</td>
</tr>
<tr>
<td>2</td>
<td>6 Months</td>
</tr>
<tr>
<td>3</td>
<td>6 Months</td>
</tr>
<tr>
<td>4</td>
<td>6 Months</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>SCS Release Interval (years)</th>
<th>Time in Years</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>6 Months Train (50%)</td>
</tr>
<tr>
<td>2</td>
<td>18 Months Employ (75%)</td>
</tr>
<tr>
<td>3</td>
<td>30 Months Employ (83%)</td>
</tr>
<tr>
<td>4</td>
<td>42 Months Employ (88%)</td>
</tr>
</tbody>
</table>

Figure 4. SCS Release Cycle and Time to Employ

As depicted above in Figure 4, for a 1 yr SCS release interval, an aircrew trains with an SCS for 6 months to gain proficiency before they can effectively employ the weapon system. Once fully trained, aircrew will fly the F/A-18 with that SCS for only 6 more months before a new SCS is released and the aircrew must start the training cycle again. As the SCS release interval increases to 4 years, an aircrew trains for the same 6 months on a new SCS, but are able to employ the weapon system with the SCS they are trained on for a much longer time.

Based on historical data\(^3\), aircraft simulator software updates lag aircraft software by 3-6 months (6 months after an SCS is incorporated into the aircraft, it is incorporated into all simulators). Figure 5 below graphically depicts the timelines associated with aircraft and simulator SCS alignment.
Figure 5. Aircraft and Simulator Alignment

Based on Figure 5, for a 1 year SCS release interval, simulator software will not be aligned with aircraft software for 6 months. In many cases, this can / will result in negative training and limiting fleet aircrew simulator usage to basic training missions only. Instead of utilizing the simulator to train on advanced tactics, squadrons will choose to train in the aircraft, increasing overall readiness costs.

As the SCS release interval increases, simulator software updates still lag aircraft software by 3 – 6 months, but over the long term, the percentage of time that simulator software matches aircraft software goes up significantly. This will result in increased simulator utilization, decreased readiness costs and most likely, better trained aircrew.

3. Analysis of ATO Timelines

Prior to an SCS entering the operational test phase, an ATO is required. The ATO process starts during the development phase of the SCS, takes six months to complete
and certifies the SCS ready for OT. If there are changes to the SCS late in the development cycle, changes to the ATO are issued utilizing a Memorandum of Change (MOC) process, which takes 3 months to complete. Figure 6 graphically depicts the timelines associated with ATO / MOC and SCS developmental timelines.

![Figure 6. ATO Impacts on Major SCS Release Interval](image)

In a one year SCS release interval, the ATO / MOC process constitutes 25% of the total SCS development cycle time. With a longer release interval, there is more time for the ATO/MOC process, allowing more flexibility in determining when the process is initiated and less chance of a schedule slip due to delays in this process.
In 2008, PMA-265 transitioned from a 1 year SCS release interval to a 2 year interval. One result of this transition was that SCS H7, due to release in 2011, was cancelled and programs needed to be adjusted to fit in the H6 / 2010 and H8 / 2012 timeframe. Most program offices were able to adjust their program schedules and fit within the new SCS timelines. Two programs have not resolved their program schedule misalignment with the SCS schedule, and will either delay the deployment of a new capability or will require an additional SCS release (additional funds will be required) to support their programs (see Figure 7). Based on the current F/A-18 program office capability roadmaps, a 1 or 2 year SCS release intervals provides the most flexibility and least impact to F/A-18 Program Office as well as other stakeholder capability roadmaps.
As the SCS release interval increases past 2 years, the F/A-18 Program Office as well as other stakeholder capability roadmaps will be significantly impacted. For example, increasing the SCS release interval to 3 years (Figure 8 below) will require 7 additional programs to make schedule adjustments of up to 18 months. This is a significant impact to those programs and will either cause significant delays in the deployment of a new capability and/or will require an additional SCS release (additional funds will be required) to support their program.
Due to the lengthy DOD acquisition process timeline, most program offices are currently executing acquisition programs based on acquisition plans developed many years ago under the constraints of published SCS release timelines. A typical program, from POM submission through delivery of capability to the fleet, can take over 6 years and requires a significant amount of early planning and coordination between all Stakeholders. Shifting the SCS release interval past 2 years, without the prior coordination and planning of all stakeholders, will result in significant impacts to the F/A-18 and other NAVAIR program office road maps.
5. Stakeholder Preferences

Eighty-five people answered the discussion questions in Appendix A. See Appendix B for respondent demographics and raw data.

Survey results indicated that both delivering new capability as well as fixing existing software anomalies are equally important factors in determining a recommended SCS release interval (Figure 9).

![Figure 9. Most Important Factor Affecting SCS Release Cycle](image)

Additional survey data suggested that delivering an SCS balanced with both new capabilities and software fixes is also highly desired (Figure 10).

![Figure 10. New Capability VS Anomaly Resolution](image)
The two SCS release options available for delivery of new capability and implementing fixes to existing anomalies are (1) major SCS or (2) major / minor SCS release. A major SCS release delivers both capability and implements fixes, with the fixes being implemented on the major SCS release timeline. A major / minor SCS release interval delivers capability on the major SCS release timeline, and delivers fixes on both the major and minor SCS release timeline.

For example, for the 24 month major H4 SCS release interval, capability and fixes will be delivered in 2008 and then again in 2010. Anomalies discovered during the development of the 2008 H4 major SCS will be implemented 2 years later, in the next major SCS release in 2010.

On the other hand, for the 24 month major / 12 month minor H4 SCS release interval, capability will be delivered in 2008 and then again in 2010. Anomalies discovered during the development of the 2008 major H4 SCS will be implemented in both the 2009 minor H4+ SCS release and also the 2010 major H6 SCS release.
The major/minor SCS release costs the same and delivers equivalent capability as a major SCS release. However, the major/minor SCS release provides the additional benefit of delivering fixes to the fleet 50% faster than the major SCS release timeline (Figure 11).

C. BENCHMARK OF SIMILAR TACTICAL FIGHTER PROGRAMS

SCS release cycle varied greatly depending on platform. In general, aircraft that are in production or that have systems in production, favor a shorter SCS release interval (Figure 12). The Joint Strike Fighter (F-35), which is still in development, plans on annual SCS updates until the aircraft is established in the fleet\(^5\). A one year release cycle facilitated the fielding of the new Block II F/A-18 E/F with the Advanced Crew Station
and AESA Radar System. As the aircraft and their systems mature and stabilize, the requirement to address critical issues through frequent SCS releases will diminish and the SCS release interval can be extended.

![SCS Release Interval Diagram](image)

**Figure 12. Tactical Fighter Benchmarks**

The F-22 program office plans for major update releases every 3 years, called increments (normally containing both software and hardware). Minor updates are planned for every 18 months. These are software only and will fix OT issues as well as bring added capability to the aircraft. These updates were meant to be a one pass effort for both DT and OT. The two drivers for the current release interval are hardware / software development time and fiscal constraints.

The F-16 program office plans for major software releases for pre-block F-16s (25/30/32) approximately every 2 years with no minor releases. For the block
(40/42/50/52) F-16s the program plans on a major release every 3 years and one minor release every 18 months. The drivers for the current release interval are the development process, requirements definition, scoping/costing level of effort, development, and testing. The F-15E program office plans for a major update release every 5 years. As part of the F-15E program office acquisition strategy, the plan is not to fix software deficiencies discovered outside of DT/OT unless deemed to be critical. The primary driver for the F-15E software release interval is continuity (the F-15E program office has always operated in this manner).

D. SUMMARY

Based on the analysis of 10 criteria impacted by the SCS release interval, we determined that a 1 year interval was too short, 4 years was too long, and the optimal interval is somewhere between 2 and 3 years. The 10 criteria considered were fleet preference (surveys), cost, throughput stability, F/A-18 Flight Plan execution, squadron training, air wing training, aircrew training, simulator training, anomaly resolution and capability assertion. This analysis was applied separately to a 1, 2, 3, and 4 year SCS release intervals.

Figure 13 is a graphical depiction of the analyzed results for the 10 criteria. To evaluate each criterion the legend in the figures below indicates color coded circles which are each given a weighted value. The green circle indicates “best” with a value of (+1), the yellow circle indicates “neutral” with a value of (0) and the red circle indicates
“worst” with a value of (-1). Values of all criteria are added horizontally and the summary of the total score is noted in the far right column. The total score is utilized to determine the best choice for a major/minor SCS release interval.

For example, from our cost analysis, we determined that the 1 year SCS release interval had the highest impact to cost. As such, under the cost criteria in Figure 13, the one year SCS release interval is colored red, 2 and 3 years are colored yellow or yellow / green and 4 years is colored green. Doing this for all criteria and then summing up the results, we determined that a 36 month major / 18 month minor SCS release interval best balanced capability, schedule, costs and external stakeholder impacts.

Figure 13. Analysis Results Summary (All Parameters Equally Weighted)
However, due to limitations of the DOD acquisition process timeline, many program offices have developed acquisition plans based on existing SCS release timelines, and shifting them now could significantly impact those programs. As such, an additional analysis was completed with SCS release interval impacts to flight plan execution more heavily weighted. This analysis resulted in a 24 month major / 12 month minor SCS release interval best balancing all parameters (Figure 14).

Figure 14. Analysis Results Summary (F/A-18 Flight Plan execution weighted more heavily)

<table>
<thead>
<tr>
<th>Major / Minor SCS Release Interval (Months)</th>
<th>Fleet Preference</th>
<th>Cost</th>
<th>Throughput / Stability</th>
<th>Flight Plan Execution</th>
<th>Squadron Training</th>
<th>Air Wing Training</th>
<th>Aircrew Training</th>
<th>Simulator Training</th>
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<th>Summary / Total Score</th>
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<td>■ ■ ■</td>
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<td>■ ■ ■ ■ ■</td>
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<td>2.5</td>
</tr>
</tbody>
</table>

* Fleet preference based on survey data
* Costs Based on analysis of historical data
* Throughput analysis of SCS workload fluctuations
* Flight Plan execution is based on SCS release interval impacts on current Flight Plans
* Squadron Training is based on Typical Squadron / Air Wing Turnaround Training Plan
* Capability Insertion is based on timeline to implement new / existing capabilities
* Summary / Total Score

We completed a third analysis assuming that prior to the POM-12 budgeting cycle, a 3 year SCS release interval was socialized with all stakeholders. With the time to plan for this change, program offices would be able to align their acquisition programs schedules with the 3 year SCS schedule, minimizing the impacts of a 3 years SCS release interval. With all criteria weighted equally and assuming capability roadmaps / flight
plans on a 3 year timeline, the analysis resulted in a 36 month major / 18 month minor SCS release interval best balancing all parameters (Figure 15).

Figure 15. Analysis Results Summary (Three Year F/A-18 Flight Plan Implementation)

<table>
<thead>
<tr>
<th>Major / Minor SCS Release Interval (Months)</th>
<th>Fleet Preference</th>
<th>Cost</th>
<th>Throughput / Stability</th>
<th>Flight Plan Execution</th>
<th>Squadron Training</th>
<th>Air Wing Training</th>
<th>Aircrew Training</th>
<th>Simulator Training</th>
<th>Anomaly Resolution</th>
<th>Capability Insertion</th>
<th>Summary / Total Score</th>
</tr>
</thead>
</table>

* Fleet preference is based on survey data.
* Costs is based on analysis of historical data.
* Throughput analysis is of SCS workload fluctuations.
* Flight Plan execution is based on SCS release time impacts on current Flight Plan.
* Squadron Training is based on typical Squadron / Air Wing Turnaround Training Plan.
* Simulator Training is based on recent Simulator SCS update timelines.
* Anomaly Resolution / Capability Insertion is based on timeline to implement fixes / capabilities.

Best (+1)  Neutral (0)  Worst (-1)
IV. RECOMMENDATIONS AND CONCLUSION

A. RECOMMENDATIONS

Based on the analysis completed of impacts on cost and readiness of variations in the development and release cycle of the F/A-18 EF and EA-18G SCS, the following recommendations are provided:

Establish a funding line for software anomaly resolution. The major/minor SCS release costs the same and delivers equivalent capability as a major SCS release. However, the major/minor SCS release provides the additional benefit of delivering fixes to the fleet 50% faster than the major SCS release timeline.

Investigate contracting options for 24 month major / 12 month minor SCS release intervals. Program budgeting and contracting impacts were not evaluated as they were outside of the project’s scope and this new recommended SCS release interval has both budgeting and contracting impacts.

Socialize 24 / 12 month major / minor release impacts, schedule, and assumptions with stakeholders. The current 2 year SCS release interval does not include the minor SCS build every 12 months. Stakeholders will need to have a clear understanding of the 24 month major / 12 month minor SCS release interval schedule and assumptions.

Implement 24 month major / 12 month minor SCS release interval.

Further investigate 36 month major / 18 month minor SCS release interval. Due to limitations of the DOD acquisition process timeline, many program offices have developed acquisition plans based on existing SCS release timelines, and shifting them
now could significantly impact those programs. With the time to plan for this change, program offices would be able to align their acquisition programs schedules with the 3 year SCS schedule, minimizing the impacts of a 3 years SCS release interval.

Investigate legacy F/A-18 software similarities and differences to determine major / minor SCS applicability.

B. CONCLUSION

Based on all of our analysis, we determined that a one year interval was too short, 4 years was too long, and the optimal interval is somewhere between 2 and 3 years. This solution provides the best balance for all parameters (cost, schedule, performance and other program office roadmaps).
LIST OF REFERENCES

1. K. Berrard, Advanced Weapons Lab H6 Block Manager (personal communication, December 18, 2008).
5. W. E. Knudson, Joint Strike Fighter Program Manager, (personal communication, February 2009)
7. A. Yarbrough, F-16 Program Office (personal communication, January 16, 2009)
8. S. Logan, F-15E Model PEM (personal communication, January 16, 2009)
APPENDICES

APPENDIX A: F/A-18 SCS RELEASE CYCLE SURVEY QUESTIONS

F/A-18 SCS RELEASE CYCLE FLEET SURVEY

PMA-265 is reviewing the current interval at which F/A-18 E/F software updates are released to the fleet and investigating potential impacts to varying the SCS release interval. From your perspective, please answer the following questions:

1. Name
2. Rank 0-6
3. Activity / Squadron
4. Current Billet CO
5. How many years have you been flying the F/A-18 (A-F)
   - Less than 3 years
   - 3 – 6 years
   - More than 6 years

Answer the following questions based on the current 27 month turnaround training cycle (Figure 1), assuming no safety of flight fixes, no critical capability updates needed for cruise, no early “training releases”.

6. Prior to deployment, when is the latest time for a squadron to receive an SCS update in order to deploy combat ready? (Assuming no early “training release”)
   - 16 months prior to cruise (Start of turn around training cycle)
   - 14 months prior to cruise (prior to SFARP)
   - 10 months prior to cruise (prior to TSTA)
   - 7 months prior to cruise (prior to Fallon)
   - 4 months prior to cruise (prior to JTFEX)
   - Other

7. During the typical 27 month turnaround cycle, what is the optimal time for a squadron to receive and train with an SCS update? (Assuming no early “training release”)
   - 16 months prior to cruise (Start of turn around training cycle)
   - 14 months prior to cruise (prior to SFARP)
   - 10 months prior to cruise (prior to TSTA)
   - 7 months prior to cruise (prior to Fallon)
   - 4 months prior to cruise (prior to JTFEX)
   - Other
8. If an SCS update occurs during a deployment, based on your experience, is it better for the squadron to upgrade to the new SCS during or after cruise? (assuming no safety of flight fixes, no critical capability updates needed for cruise)
   - [ ] During Cruise
   - [ ] Post Cruise

9. Based on the complexity of the capabilities / systems being fielded in new SCS releases, on average, how long does it take an aircrew to train with the new SCS in order for them to effectively employ their weapon system?
   - [ ] Less than 3 months
   - [ ] 3 - 6 months
   - [ ] 6 – 9 months
   - [ ] 9 - 12 months
   - [ ] Greater than 12 months

10. Based on your answers to the above questions, which SCS update cycle is optimal to support your deployment and training schedule?
   - [ ] SCS released every 12 months (e.g., H4 - 2004, H5 – 2005)
   - [ ] SCS released every 24 months (e.g., H4 - 2004, H5 – 2006)
   - [ ] SCS released every 36 months (e.g., H4 - 2004, H5 – 2007)
   - [ ] SCS released every 48 months (e.g., H4 - 2004, H5 – 2008)

11. Which factor is MOST important in deciding the SCS release cycle that you recommended in question 10 (assuming no safety of flight fixes, no critical capability updates needed for cruise)?
   - [ ] Turnaround training cycle
   - [ ] Delivering capability to the fleet
   - [ ] Fixing existing software anomalies

12. Which factor is LEAST important in deciding the SCS release cycle that you recommended in question 10 (assuming no safety of flight fixes, no critical capability updates needed for cruise)?
   - [ ] Turnaround training cycle
   - [ ] Delivering capability to the fleet
   - [ ] Fixing existing software anomalies

13. Which combination of capability and anomaly resolution is optimal for an SCS? (Assuming no safety of flight fixes and no capability upgrades needed for cruise).
   - [ ] Delivering an SCS with significant capability upgrades, but limited fixes for existing software anomalies.
   - [ ] Delivering an SCS with significant fixes for existing software anomalies, but limited capability upgrades.
Delivering an SCS balanced with both significant capability upgrades and significant fixes for existing software anomalies.

Please provide any additional Comments?

Thank you for your participation in this survey. Your responses will help PMA-265 provide a better product to the fleet.
F/A-18 SCS RELEASE CYCLE VX-AWL-COTF SURVEY

PMA-265 is reviewing the current interval at which F/A-18 E/F software updates are released to the fleet and investigating potential impacts to varying the SCS release interval. In our investigation, we’ll be looking at development and testing timelines / costs, impacts to Flight Plans, trainers, JMPS, Squadron Turnaround Training Cycles as well as throughput capacity at the PMA / AWL and COTF / VX-9. We have tried to capture as many of the issues identified in the last couple of years associated with the SCS release interval in the enclosed survey.

1. Name:
2. Rank:
3. Activity / Squadron:
4. Fleet F/A-18 Experience:
5. How many years have you been flying the F/A-18 (A-F)
   □ Not an aircrew
   □ 0-3 years
   □ 4 – 6 years
   □ Greater than 6 years

Answer the following questions based on the current MAAP, a typical 27 month turnaround training cycle (Figure 1), assuming no safety of flight fixes, no critical capability updates needed for cruise, no early “training releases”.

6. Prior to deployment, when is the latest time for a squadron to receive an SCS update in order to deploy combat ready? (Assuming no early “training release”)
   □ 16 months prior to cruise (Start of turn around training cycle)
   □ 14 months prior to cruise (prior to SFARP)
   □ 10 months prior to cruise (prior to TSTA)
   □ 7 months prior to cruise (prior to Fallon)
   □ 4 months prior to cruise (prior to JTFEX)
   □ Other

7. During the typical 27 month turnaround cycle, what is the optimal time for a squadron to receive and train with an SCS update? (Assuming no early “training release”)
   □ 16 months prior to cruise (Start of turn around training cycle)
   □ 14 months prior to cruise (prior to SFARP)
   □ 10 months prior to cruise (prior to TSTA)
   □ 7 months prior to cruise (prior to Fallon)
   □ 4 months prior to cruise (prior to JTFEX)
   □ Other
8. If an SCS update occurs during a deployment, based on your experience, is it better for the squadron to upgrade to the new SCS during or after cruise? (assuming no safety of flight fixes, no critical capability updates needed for cruise)
   - [ ] During Cruise
   - [ ] Post Cruise

9. Based on the complexity of the capabilities / systems being fielded in new SCS releases, on average, how long does it take an aircrew to train with the new SCS in order for them to effectively employ their weapon system?
   - [ ] Less than 3 months
   - [ ] 4 - 6 months
   - [ ] 7 - 9 months
   - [ ] 10 - 12 months
   - [ ] Greater than 12 months
   - [ ] N/A

10. Which SCS release cycle is optimal for fixing anomalies discovered during DT and OT? Major SCS is defined as an SCS that implements new capability, fixes anomalies discovered during previous testing and requires OT. Minor SCS (+ tape) only fixes anomalies discovered during previous testing and does not require OT.
   - [ ] Major SCS released every 12 months, no minor release (e.g., H4 - 2004, H5 – 2005)
   - [ ] Major SCS released every 24 months, no minor release (e.g., H4 - 2004, H5 – 2006)
   - [ ] Major SCS released every 24 months, Minor SCS released every 12 months (e.g., H4 - 2004, H4+ - 2005, H5 – 2006)
   - [ ] Major SCS released every 36 months, no minor release (e.g., H4 - 2004, H5 – 2007)
   - [ ] Major SCS released every 36 months, Minor SCS released every 18 months (e.g., H4 - 2004, H4+ - mid 2005, H5 – 2007)
   - [ ] Major SCS released every 48 months, no minor release (e.g., H4 - 2004, H5 – 2008)
   - [ ] Major SCS released every 48 months, Minor SCS released every 24 months (e.g., H4 - 2004, H4+ - 2006, H5 – 2008)

11. Which Major SCS release cycle is optimal for delivering capability to the fleet? Major SCS is defined an SCS that implements new capability and requires OT.
   - [ ] SCS released every 12 months (e.g., H4 - 2004, H5 – 2005)
   - [ ] SCS released every 24 months (e.g., H4 - 2004, H5 – 2006)
12. Which Major SCS release cycle is optimal for supporting your Program Office Flight Plan / Roadmap Requirements?

- [ ] SCS released every 12 months (e.g., H4 - 2004, H5 – 2005)
- [ ] SCS released every 24 months (e.g., H4 - 2004, H5 – 2006)
- [ ] SCS released every 36 months (e.g., H4 - 2004, H5 – 2007)
- [ ] SCS released every 48 months (e.g., H4 - 2004, H5 – 2008)
- [ ] N/A

13. Based on your manning levels and aircraft availability, which Major SCS release cycle is optimal to support Developmental / Operational Testing?

- [ ] SCS released every 12 months (e.g., H4 - 2004, H5 – 2005)
- [ ] SCS released every 24 months (e.g., H4 - 2004, H5 – 2006)
- [ ] SCS released every 36 months (e.g., H4 - 2004, H5 – 2007)
- [ ] SCS released every 48 months (e.g., H4 - 2004, H5 – 2008)
- [ ] N/A

14. Based on your answers to the questions above, which SCS update cycle is optimal to support the fleet (balances fleet training requirements, capability introduction, anomaly resolution and your command’s throughput capacity? Major SCS is defined as an SCS that implements new capability, fixes anomalies discovered during previous testing and requires OT. Minor SCS (+ tape) only fixes anomalies discovered during previous testing and does not require OT.

- [ ] Major SCS released every 12 months, no minor release (e.g., H4 - 2004, H5 – 2005)
- [ ] Major SCS released every 24 months, no minor release (e.g., H4 - 2004, H5 – 2006)
- [ ] Major SCS released every 24 months, Minor SCS released every 12 months (e.g., H4 - 2004, H4+ - 2005, H5 – 2006)
- [ ] Major SCS released every 36 months, no minor release (e.g., H4 - 2004, H5 – 2007)
- [ ] Major SCS released every 36 months, Minor SCS released every 18 months (e.g., H4 - 2004, H4+ - mid 2005, H5 – 2007)
- [ ] Major SCS released every 48 months, no minor release (e.g., H4 - 2004, H5 – 2008)
- [ ] Major SCS released every 48 months, Minor SCS released every 24 months (e.g., H4 - 2004, H4+ - 2006, H5 – 2008)
15. Which factor is MOST important in deciding the SCS release cycle that you recommended in question 14? (assuming no safety of flight fixes, no critical capability updates needed for cruise)
   [ ] Programmatic schedule impacts, throughput issues, MAAP constraints, fleet turnaround training cycle
   [ ] Delivering Capability to the fleet
   [ ] Fixing existing software anomalies

16. Which factor is LEAST important in deciding the SCS release cycle that you recommended in question 14? (assuming no safety of flight fixes, no critical capability updates needed for cruise)
   [ ] Programmatic schedule impacts, throughput issues, MAAP constraints, fleet turnaround training cycle
   [ ] Delivering Capability to the fleet
   [ ] Fixing existing software anomalies

17. Which combination of capability and anomaly resolution is optimal for an SCS? (Assuming no safety of flight fixes and no capability upgrades needed for cruise).
   [ ] Delivering an SCS with significant capability upgrades, but limited fixes for existing software anomalies.
   [ ] Delivering an SCS with significant fixes for existing software anomalies, but limited capability upgrades.
   [ ] Delivering an SCS balanced with both significant capability upgrades and significant fixes for existing software anomalies.

18. If you could change / modify the SCS release cycle outside of the choices provided in the questions above:
   i. What would you change it to?
   ii. Why?

19. Please provide any additional comments.

Thank you for your time in filling out this survey. Your answers will allow PMA-265 to provide a better product to the fleet.
### APPENDIX B: SURVEY DEMOGRAPHICS AND RESULTS

#### I. Survey Respondents by Organization

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<thead>
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<th>Organization</th>
<th># of Respondents</th>
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**Survey Respondents by Organization**

- AWL/VX-31: 13%
- VX-23: 0%
- VX-9: 12%
- COTF: 2%
- CNAF: 0%
- PMA: 5%
- N88: 1%
- Fleet: 67%
II. Years of F/A-18 Experience

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<th>Years of Experience</th>
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<tr>
<td>&gt; 6</td>
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</table>

![Pie chart showing years of F/A-18 experience distribution]
III. Latest Time for a Squadron to Receive an SCS Update Prior to Deployment in order to be Combat Ready

<table>
<thead>
<tr>
<th>Organization</th>
<th>Timeframe (Months Prior to Deployment)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>16</td>
</tr>
<tr>
<td>AWL/VX-31</td>
<td>0</td>
</tr>
<tr>
<td>VX-23</td>
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</tr>
<tr>
<td>VX-9</td>
<td>0</td>
</tr>
<tr>
<td>COTF</td>
<td>0</td>
</tr>
<tr>
<td>CNAF</td>
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</tr>
<tr>
<td>PMA</td>
<td>0</td>
</tr>
<tr>
<td>N88</td>
<td>0</td>
</tr>
<tr>
<td>Fleet</td>
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</tbody>
</table>

![Bar chart showing latest time for squadron to receive an SCS update](chart.png)
IV.  Optimal Time for a Squadron to Receive an SCS Update during the 27 Month Turnaround Training Cycle

<table>
<thead>
<tr>
<th>Organization</th>
<th>16</th>
<th>14</th>
<th>10</th>
<th>7</th>
<th>4</th>
<th>Other</th>
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<td>VX-23</td>
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<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>VX-9</td>
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<td>1</td>
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<td>1</td>
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<td>PMA</td>
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</tr>
<tr>
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<td>0</td>
<td>0</td>
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<td>3</td>
<td>4</td>
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Optimal Time to Receive an SCS Update Prior to Cruise

![Optimal Time to Receive an SCS Update Prior to Cruise](image-url)
V. Upgrade of SCS During or After Deployment of Squadron

<table>
<thead>
<tr>
<th>Organization</th>
<th>Timeframe</th>
<th>During Cruise</th>
<th>After Cruise</th>
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</thead>
<tbody>
<tr>
<td>AWL/VX-31</td>
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<td>VX-23</td>
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</tr>
<tr>
<td>VX-9</td>
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<td>9</td>
</tr>
<tr>
<td>COTF</td>
<td></td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td>CNAF</td>
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<td>0</td>
<td>0</td>
</tr>
<tr>
<td>PMA</td>
<td></td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>N88</td>
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<tr>
<td>Fleet</td>
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</table>

![Upgrade SCS During or After Cruise](image)
VI. Length of Time to Train with an SCS to ensure Aircrew are Proficient

<table>
<thead>
<tr>
<th>Organization</th>
<th>&lt;3</th>
<th>3 - 6</th>
<th>6 - 9</th>
<th>9 - 12</th>
<th>&gt;12</th>
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</thead>
<tbody>
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<td>0</td>
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<td>0</td>
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<tr>
<td>VX-9</td>
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<td>4</td>
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<tr>
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<td>0</td>
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<td>1</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
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<td>26</td>
<td>3</td>
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Length of Time To Train with New SCS
VII. Optimal SCS Release Cycle to Support Deployment and Training

<table>
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<tr>
<th>Organization</th>
<th>Months</th>
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</thead>
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<td>VX-23</td>
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</tr>
<tr>
<td>VX-9</td>
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</tr>
<tr>
<td>COTF</td>
<td>0</td>
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<td>CNAF</td>
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<tr>
<td>PMA</td>
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<tr>
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</table>

Optimal SCS Update Cycle to Support Deployment, Training and Test

Responses

Fleet
N88
PMA
CNAF
COTF
VX-9
VX-23
AWL/VX-31

Months between SCS Releases

Optimal SCS Update Cycle to Support Deployment, Training and Test

Months between SCS Releases
VIII. Optimal Combination of New Capability and Software Anomaly Resolution

<table>
<thead>
<tr>
<th>Organization</th>
<th>Significant New Capability, Limited SW Fixes</th>
<th>Significant SW Fixes, Limited New Capability</th>
<th>Balanced SCS</th>
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<tbody>
<tr>
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<tr>
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<tr>
<td>VX-9</td>
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</tbody>
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Optimal Combination of New Capability vs. Anomaly Resolution
INITIAL DISTRIBUTION LIST

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   Monterey, California

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