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A STRATEGIC ASSESSMENT OF FULFILLING COMBAT REQUIREMENTS FOR NAVAL JOINT STRIKE ORDNANCE

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ABSTRACT

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This project provides a strategic assessment of how the naval service currently determines and fulfills the combat requirements for joint strike ordnance. A review and analysis is conducted of the Naval current processes used for computing joint strike ordnance requirements, acquiring the ordnance and managing those assets within the logistics management system. The processes are analyzed separately, followed by a combined analysis. Additionally, the Air Force processes for fulfilling combat requirements for joint strike ordnance are reviewed. Then an overall perspective is presented considering both the Naval and Air Force approaches and conclusion drawn on how to better integrate the processes to more efficiently meet our strategic joint strike ordnance requirements.

TABLE OF CONTENTS

A STRATEGIC ASSESSMENT OF FULFILLING COMBAT REQUIREMENTS FOR NAVAL JOINT STRIKE ORDNANCE

This paper focuses on the strategic issue of determining how to fulfill the combat requirements for joint strike ordnance for Naval forces. The primary emphasis for this paper are the current service procurement processes. It also provides an analysis of possible alternate processes that may gain major economies and efficiencies. For this paper, joint strike ordnance is defined as those strike weapons currently used by more than one service of the United States armed forces. [Strike weapons are those offensive weapons that are used to strike enemy targets.] The two most common types of joint strike ordnance are the Joint Stand-off Weapon (JSOW), and the Joint Direct Attack Munition (JDAM) kits which are attached to 500lbs., 1000lbs., and 2000lbs. bomb units.[1] Both the JSOW and JDAM kits are used by the Navy and Air Force.[21]

Fulfilling combat requirements for strike ordnance in the joint environment has become strategically more important for several reasons:

- In today's environment it is envisioned the strike combat phase will be very short, days or weeks at most.[3] The vision of a war lasting several years with heavy strike ordnance requirements is no longer true. Therefore, the opportunity for the industrial base to produce large quantities of strike ordnance; once combat has begun, is significantly reduced.
- Since, by definition, joint strike ordnance can be used by more than one service, combatant commanders evaluate their capabilities based on the total strike ordnance available across all services and assign strike missions based on which service is in the best position to fulfill the mission, not which service actually possesses the strike ordnance. Therefore if one service has it and another service needs it, a simple transfer of ordnance takes place. This is what has happened during recent operations in Iraq and Afghanistan regarding strike ordnance transfers and mission assignments between the Navy and Air Force.[4]
- Military procurement budgets are approved annually by Congress for each service. Strike ordnance is only a part of the overall weapons procurement budget for each service.[5]

The strategic issues associated with fulfilling joint strike ordnance combat requirements are fairly clear. The process of determining requirements is strategically important to ensure limited resources are used efficiently.[6] The combatant commanders prefer to use precise strike

ordnance in the critical early phases of combat when the enemy forces are most capable.[7] Moreover, the combatant commanders have demonstrated a preference for joint strike ordnance since it can be used by multiple services.[8] If the needs of the combatant commanders exceed the industrial base capacity to quickly produce sufficient quantities of ordnance once combat has begun, a combatant commander needs to have sufficient stocks of joint strike ordnance available at the beginning of combat to ensure the strategic combat goals of defeating the enemy, minimizing casualties to US Forces, and minimizing collateral damage can be achieved.[9]

The processes associated with fulfilling the combat requirements for joint strike ordnance can be broken down into three main categories. The first category is the processes associated with determining the actual combat requirements for joint strike ordnance; the second category is the processes associated with fulfilling those requirements through the acquisition processes and the third category is the logistics processes associated with actually delivering the ordnance to the warfighter. Each category will be examined separately.

COMPUTING JOINT STRIKE ORDNANCE COMBAT REQUIREMENTS

The Capabilities-Based Munitions Requirements (CBMR) Process detailed in Department of Defense Instruction 3000.4 outlines the way military departments should determine their annual ordnance requirements, including strike ordnance. In particular, this instruction requires each service to determine its requirements, by munition, in two general categories: the Training and Testing Requirements (TTR) and the Combat Requirements (CR).[10]

The CBMR instruction provides further guidance to the services on the generation of the Combat Requirement. To determine the CR, each warfighting combatant commander allocates targets to each service based on Operational Plans (OPLAN) or Contingency Plans (CONPLAN). The CR is the total quantity of munitions required for all OPLANs and CONPLANs that meet combatant commander strategic military objectives in all theaters.[11]

Each service determines combat ordnance requirements independently. Currently, only the Air Force and Naval forces have joint strike ordnance combat requirements. The Army has no ordnance classified as joint strike ordnance. (Marine requirements are incorporated within those of the Naval Forces – put behind Navy).[12]

NAVAL APPROACH TO FORECASTING COMBAT REQUIREMENTS FOR JOINT STRIKE ORDNANCE

The Chief of Naval Operations Instruction 8011.9A (OPNAVINST 8011.9A), the Navy Non-nuclear Ordnance Requirements (NNOR) presents the processes used to develop the

official Department of the Navy (DoN) ordnance requirements used for Program Objective Memorandum (POM) and to develop the aviation budget in accordance with the DoD capabilities-based munitions requirement guidelines.[13] To fulfill the NNOR instruction requirements, an NNOR working group meets several times annually to revise and establish munitions requirements for a ten-year horizon. Annually, the NNOR working group presents their recommendations to a panel of Admirals representing Submarine, Surface, Aviation, and Logistics specialties. Upon approval, the panel forwards their recommendations to the Vice Chief of Naval Operations (VCNO), who forwards the recommendations to the Chief of Naval Operations (CNO) for final approval. [14]

The strategic issues addressed by the working group are derived from the guidance each member receives from their parent command. Over the past three cycles, this guidance can be condensed to: which mix of weapons are most appropriate given the objectives of assured victory, minimal collateral damage and minimal attrition of US Forces.[15] Although rather detailed and mathematical, the operational and tactical processes and procedures used to fulfill the strategic goals must be explored to fully assess whether or not the overall process is appropriate.

To determine the Combat Requirement (CR), NNOR working group employs computer models operated by the Chief of Naval Operations Office for Warfare Integration, OPNAV N70. These models are based on the warfighting combatant commanders' OPLANS or CONPLANS. The Combat Requirement (CR) results from modeling the Navy and Marine Corps' role in supporting OPLANS and CONPLANS. The generated munitions requirements are those necessary for the destruction of the Department of the Navy's allocated targets, assigned by the combatant commanders, balanced by the need to support the strategic goal of minimal attrition. [16]

Specifically, in determining which munitions are most effective, the computer models evaluate the various munitions against the various targets based on two primary criteria – attrition and effectiveness.[17] Attrition is the anticipated losses that friendly forces will experience in prosecuting a particular target using a particular munition. To be more specific, within the NNOR computer models, attrition is defined solely as the expected loss of aircraft in prosecuting a target. There are no provisions within the NNOR models for evaluating the loss of a ship or submarine.[18] Effectiveness is a measure of how likely a weapon is to destroy a particular target, often referred to as a probability of kill factor (Pk). Attrition and effectiveness of a weapon against a particular target is computed for each type of aircraft that can launch the weapon. It is important to note that although it is of strategic importance to choose weapons

that will minimize collateral damage, this is not a factor considered within the computer models employed by the NNOR panel.[19]

Essentially, the NNOR models employ stochastic modeling techniques to consider numerous types of weapons delivered by various naval aircraft against hundreds of types of targets. To determine the total combat requirement for each individual type of ordnance, the NNOR models select the preferred weapon for each specified target by evaluating weapon effectiveness using attrition and Pk values. Then the NNOR models determine the total quantity of weapons needed based upon the total number of targets for which that weapon is the preferred weapon.[20]

Using the computer models is only the first step in the NNOR working group process. Following the generation of recommendations by the computer models, the NNOR working group then convenes to review the outputs from the models.[21] Of the three strategic goals the planners must consider; destroying all assigned targets, minimizing attrition, and minimizing collateral damage, the NNOR computer only considers two; destroying all assigned targets and minimizing attrition. The attrition considerations are limited to aircraft.[22] Therefore the NNOR working group reviews the output and attempts to further refine the computer's recommendations by applying their expertise to the strategic considerations of collateral damage. In accordance with OPNAVINST 8011.9A, the NNOR working group does not apply any refinement to the computer's recommendations for the issues associated with budgetary and industrial constraints.[23]

Annually, a series of very complex model computations are conducted, followed by a series of working group meetings to evaluate and adjust the outputs. These meetings are followed by a panel review, with recommendations forwarded to the VCNO and ultimately to the CNO for approval. This process generates the annual combat requirements for Naval strike ordnance. By design, these combat requirements have not been constrained by budgetary considerations or by industrial base considerations.[24]

NAVAL ACQUISITION OF COMBAT REQUIREMENTS FOR JOINT STRIKE ORDNANCE

The acquisition planners are concerned with which mix of weapons are most appropriate given the requirements, budgetary constraints and industrial base constraints.[25] Ideally, the Navy could execute the CNO approved recommendations through the rigorous requirements determination process and still be within budgetary and industrial base constraints.
In fact, data for Naval joint strike ordnance indicates that over the last five years the actual quantity of ordnance funded has been only 55 percent of the requirement determined by the

NNOR working group process.[26] This shortfall between the quantity actually funded and the quantity actually required is primarily explained by budgetary shortfalls.[27] However, even if the budget had been fully funded for strike ordnance in each of those five years, the industrial base could not have produced the quantities required.[28] Therefore, under no circumstances could the recommendations provided to the acquisition community have been executed in any of the most recent five years.[29] So, the determination of the quantities of strike ordnance actually bought is determined by acquisition professionals. As with the requirements determination process, it is necessary to focus on the key operational and tactical processes that acquisition professionals use to determine the quantities of strike ordnance munitions that are procured in any given year and then evaluate how well this overall process fulfills the strategic needs of the combatant commanders.

The ordnance acquisition process is segmented within the Navy, between the Naval Sea Systems Command (NAVSEA), and the Naval Air Systems Command (NAVAIR). NAVSEA procures weapons that are released from a ship or submarine while NAVAIR procures weapons that are released from aircraft.[30] All Naval strike ordnance that has joint usage is air launched and is procured through NAVAIR. This segmentation is important to understand because Naval budgetary dollars are allocated directly to the systems commands and it is very difficult to reprogram dollars from one systems command to another. Generally, dollars can be easily reprogrammed within the same systems command.[31] Once the budget has been segmented to the systems commands, air launched strike ordnance can only be procured using the funds that are available to NAVAIR.

Further, all programs within NAVAIR compete against each other for the overall NAVAIR budget.[32] So, within NAVAIR, JDAM kits and JSOWs have to compete against such diverse programs as new aircraft, spare parts budgets, personnel and maintenance costs and routine operational costs. Therefore, NAVAIR acquisition decisions have to be made by weighing the value of buying more repair parts against buying more JSOWs. Prior to budget dollars reaching the JDAM kit and JSOW program offices, significant decisions have already been made about the availability and flexibility of funds provided to each office.

The acquisition process between the program offices for strike ordnance within NAVAIR are relatively similar. Initially each program office reviews the approved NNOR working group requirements and compares them against current inventory levels. Then each program office determines what the delta between them is that needs to be procured. Next each program office evaluates whether or not the industrial base can produce the entire shortage requirement in two years (procurement dollars are allocated on a two year basis). Each program office then

lobbies within NAVAIR for adequate dollars to fund either the entire shortfall or the maximum quantity industry can produce in the two year span, whichever is less.[33] With the exception of the most current year (FY03) regarding JDAM kits, over the last five years the maximum quantity that industry had been able to produce over a two year span had been less than the requirements shortfall for strike ordnance. Therefore, the maximum quantity of each weapon that industry can produce has usually been the amount for which each program office sought funding.[34] It is interesting to examine how each program office executed their missions. In each of the four years prior to FY03 for strike ordnance, the total dollars allocated through the normal budgetary process by NAVAIR had been determined by reviewing four main factors:[35]

- How many of each munition was used in the previous year?
- How many of each munition is expected to be used in the next year?
- What is the Minimum Sustaining Rate (MSR) for each munition that needs to be procured to maintain the viability of the industrial base production plant?
- What is the current percentage of the total NNOR requirement held in inventory for each munition?

The process of answering these questions provides NAVAIR a decision flow path for determining the funding levels for each munition in a typical budget cycle. However, the analysis that NAVAIR applies is not focused on the requirements determined by the NNOR panel but is focused on the minimum level of each munition that is reasonable to procure given the financial and industrial base constraints.

In terms of actual data, looking at the two most common examples of joint strike ordnance, in the four years prior to the current year (FY03), the actual quantity of JDAM kits and JSOWs purchased averaged less than 60 percent of the initial requests by their respective program offices.[36] In two of the four years the quantities purchased for each munition were the minimum quantity necessary to maintain the viability of the industrial base for JDAM kits and JSOWs.[37]

The analysis of the acquisition process for joint strike ordnance within the Navy is very revealing. First, it is evident the process of determining the requirements for joint strike ordnance has very little impact on the acquisition process. The strategic considerations of providing the warfighter with the best mix of weapons to maximize the number of targets destroyed while minimizing attrition and collateral damage have little impact on the acquisition process. Those considerations are important only when developing the overall ordnance requirements. The concerns of budgetary compliance and industrial base constraints are the primary considerations within the acquisition processes. Further, regarding industrial base

constraints, it is not the maximum production level that influences the acquisition process nearly as much as the minimum sustaining rate necessary to ensure a minimum level of each munition is procured every year.

Following the acquisition process, ordnance is purchased from the manufacturer and subsequently received within the Naval ordnance logistics management system until required.

NAVAL JOINT STRIKE ORDNANCE LOGISTICS MANAGEMENT

The Naval ordnance logistics management system is focused on maintaining an accurate record for each Naval owned weapon in terms of quantity, location and condition.[38] Quantity and location are self-explanatory, the condition refers to whether or not a weapon is ready for use, or requires maintenance prior to use. Currently, the Navy maintains over 100 separate storage sites worldwide that hold naval strike ordnance, as well as over 100 ships that carry strike ordnance.[39] Due to operational requirements, the Navy averages over 500 transfers of strike ordnance per year between shore sites and ships.[40] Each transfer requires an accurate recording of quantity, location and condition between shipper and receiver in order to ensure an overall accurate record for each weapon is maintained. On average, the record accuracy for Naval strike ordnance is between 98 to 99 percent.[41] Although this is relatively high, with total quantities of strike ordnance in the thousands, a one to two percent error rate equates to numerous weapons that are improperly classified within the Naval ordnance logistics management system either in terms of location, quantity, or condition. Additionally, the logistics management system updates records within 24 hours of a transaction, or within 48 hours if operational requirements prevent a more timely update.[42] Therefore, with an average of nearly two transactions per day worldwide, it is clear that at any given instant the overall inventory record of Naval strike ordnance has some inherent inaccuracy.

In recent combat operations, the combatant commander has required daily updates regarding the total quantity of Naval joint strike ordnance available both in the theater of operations and worldwide.[43] Due to the inaccuracies discussed the Naval ordnance logistics management system was unable to provide accurate and timely updates to the combatant commander.[44]

ANALYSIS OF THE REQUIREMENTS DETERMINATION, ACQUISITION AND LOGISTICS MANAGEMENT PROCESSES FOR FULFILLING THE COMBAT REQUIREMENTS FOR NAVAL JOINT STRIKE ORDNANCE.

When evaluating the combined effects of the two processes associated with determining which munitions, in what quantities get procured for the Naval Forces a couple of key issues

stand out. Of the five main strategic concerns mentioned previously, four are afforded some level of consideration within the two separate processes of requirements determination and acquisition. These four are:

- Developing the best mix of ordnance to provide the warfighter with the maximum capability to destroy anticipated enemy targets.
- Developing the best mix of ordnance to ensure attrition of US Forces is kept at an absolute minimum.
- Ensure that annual budgetary constraints are not exceeded.
- Ensure the industrial base remains viable or not stressed beyond capacity.

Only the concern about minimizing collateral damage is not expressly covered within the documented methodology associated with the two processes.

Further, although the acquisition process appears heavily weighted to budgetary and industrial base concerns and appears to negate the requirements determination process completely, this is incorrect. In fact, a primary purpose of the requirements determination process is to identify those items that should be considered by the acquisition process. It is very important to note that the first step of analysis in the acquisition process is to evaluate the identified requirements. Without an independently established verifiable requirement, there is no acquisition process associated for any munition. Additionally, although it may seem that the attrition consideration is overly simplified in terms of evaluating the threat to Naval aircraft and not including threats to ships and submarines, this is appropriate in today's environment. In all current combat scenarios contained within the DPG the threat to aircraft is orders of magnitude greater than the threat to ships and submarines.[45]

Revisiting the strategic concern regarding collateral damage and its apparent lack of consideration within the processes, this is an overstatement. This concern that they minimize collateral damage, has become an inherent design criteria of modern precision strike weapons. Through the requirements determination process of selecting those weapons that have the highest probability of hitting their target, this also means they have the minimum probability of missing their target. This implies that these same weapons will therefore minimize collateral damage caused by hitting the wrong target.

Overall, it appears that between the combination of the two processes of requirements determination and acquisition, the strategic concerns for ordnance procurement are covered. However, the primary concern is the overall strategic assessment of fulfilling the combat requirements for naval joint strike ordnance; not simply ordnance and not simply strike ordnance, but joint strike ordnance. Previous discussions indicate the current processes for

fulfilling the combat requirements for Naval ordnance requirements from a strategic perspective are sufficient. However, today's environment is no longer service centric, particularly in critical areas such as joint strike ordnance. Therefore it is appropriate to re-examine the previously described processes with emphasis on whether they address the strategic concerns in light of joint considerations. Additionally, it is necessary to evaluate how effective the Naval ordnance logistics management system is in terms of joint considerations.

JOINT CONSIDERATIONS ASSOCIATED WITH FULFILLING THE COMBAT REQUIREMENTS FOR NAVAL JOINT STRIKE ORDNANCE

To evaluate joint considerations associated with fulfilling the combat requirements for Naval joint strike ordnance, it is necessary to briefly examine the requirements determination, acquisition and logistics management processes of the Air Force. This is required in order to provide a larger understanding of the overall joint environment, within which the Naval joint strike ordnance requirements are determined, procured, and managed.

Similar to the Navy, the Air Force conforms to the CBMR process for determining ordnance requirements by utilizing a computer model to support the efforts of a working group established to determine annual combat requirements. The combat requirements model used by the Air Force is the Combat Forces Application Model (CFAM).[46] Like the Navy's NNOR, CFAM is based on the warfighting combatant commanders' OPLANS or CONPLANS.[47] The munitions requirements generated are those necessary for the destruction of the Air Force's allocated targets, assigned by the combatant commanders. As with the NNOR models, CFAM determines which munitions are most effective based on attrition and effectiveness. Additionally, for both the NNOR and CFAM attrition and effectiveness of a weapon against a particular target is influenced by which type of aircraft is used to launch the weapon.[48]

CFAM, just as the NNOR models, employs stochastic modeling techniques, but with slightly different parameters due to differences in modeling techniques, Air Force aircraft and tactics. Specifically, the Air Force models attrition based on an assumption of the enemies weapons systems effectiveness against Air Force aircraft.[49] This is more sophisticated and complicated than the NNOR models' approach of simply applying an attrition factor based on number of sorties flown during various phases of the conflict. Total CFAM requirements for each weapon are determined based upon the total number of targets for which that specific weapon is chosen as the preferred weapon.[50] Identical to the Navy process, these combat requirements have not been constrained by budgetary considerations or by industrial base considerations.[51] Again similar to the Navy process, the CFAM working group reviews and

adjusts as they feel appropriate, the outputs from the CFAM model, prior to forwarding their recommended combat requirements to the Air Force Chief of Staff for final approval.[52]

The acquisition process for Air Force strike ordnance is similar, but not identical to, the Navy process. Unlike the Navy, the Air Force process is not segmented between different systems commands.[53] The concerns of which mix of weapons are most appropriate given the requirements, budgetary constraints and industrial base constraints are identical for the Air Force. Data for Air Force joint strike ordnance indicates that over the last five years the actual quantity of ordnance funded has been 68 percent of the requirement determined by the CFAM working group process.[54] Although better than the Navy in terms of meeting USAF requirements, there is still a shortfall. As with the Navy, the shortfall is primarily due to budget shortfalls; but even if the budget had been fully funded for strike ordnance, the industrial base could not have produced all Air Force quantities required.[55]

Once purchased, Air Force ordnance is cataloged and stored within an Air Force ordnance logistics management system. Air Force weapons are maintained by location, quantity and condition.[56] The specific ordnance condition codes used by the Air Force are slightly different that Naval condition codes, although they also generally equate to being ready for combat, or requiring maintenance.[57] Additionally, the locations used by the Air Force are completely separate from the locations used by the Naval service. Further, Air Force procedures only require an update to their management system within 72 hours of a transaction between activities.[58]

In examining the effectiveness of the overall process of fulfilling strike ordnance combat requirements in a joint environment, two key issues stand out relative to the requirements determination process. First, neither the NNOR or CFAM computer models or working groups consider targets that are assigned to other services. It is standard practice of the combatant commanders to “dual-assign” many of the targets.[59] For instance, if 100 SAM sites have been identified as targets, perhaps 70 will be assigned to the Navy and 70 will be assigned to the Air Force. From the combatant commander’s point of view, this provides an increased level of insurance that all targets will be destroyed. From a requirements generation standpoint this creates excess. Secondly, both the NNOR and CFAM models use modeling techniques that compute ordnance requirements to a level greater than expected to be necessary to kill the assigned targets. Considering the dual assignments of targets and the excess requirements built into modeling techniques; there are two elements of excess built into the overall combat requirements determination process for joint strike weapons.

The implications for determining Naval joint strike ordnance requirements within the joint environment could have a significant impact on the Naval acquisition process, since the determination process feeds directly into the acquisition process. Beyond the requirements determination process, the acquisition process can be further impacted by considering the larger joint environment in two primary ways.

First, the acquisition process is focused on filling identified shortages within the Navy. The most severe shortages are funded ahead of less severe shortages. If this comparison were done within the context of the joint environment, a different interpretation of the severity of shortages between weapons could be determined. This could have significant acquisition implications.

Secondly, the major influence on the acquisition process is the consideration of industrial constraints, particularly minimum sustainment rates. To ensure a particular industrial facility is maintained, decisions are sometimes made to fund at least a minimum quantity of all munitions that are still being used. This ensures the industrial base is maintained, in case weapon requirements increase dramatically as a result of conflict. This also means; however, that some more critical shortfalls are not funded to the maximum extent possible in order to divert funds to maintain all assembly lines. Therefore, when considered in the larger joint environment it is possible that minimum sustainment rates could be met by the overall joint acquisition requirements. Funding then would not have to be diverted from within the Navy process in order to ensure the minimum sustainment rates were met. If naval joint strike ordnance requirements determination and acquisition processes are considered within the larger joint environment, this could have significant impact on the purchasing decisions made to fulfill combat requirements.

Lastly, maintaining separate ordnance logistics management systems causes the following inefficiencies regarding joint strike ordnance:

- In order to compute the total of all joint strike ordnance assets available both in a theater of operations and worldwide, this requires summing the quantities from both the Naval and Air Force systems.
- When a transfer is required between Naval units and Air Force units due to emergent operational needs, the different logistics management systems causes additional complexity regarding accurately recording the transfer.

SUMMARY

Fulfilling combat requirements for naval joint strike ordnance is a process comprised of three sub-processes; requirements determination, acquisition, and logistics management. The requirements determination and acquisition processes consider key strategic issues associated with the decisions that determine the overall mix of joint strike ordnance procured by the navy. Combined, these two processes complement and support each other and to some extent, cover all the major strategic concerns regarding the acquisition of munitions. Additionally, the logistics system provides an accurate record of the quantity, location and condition of naval ordnance.

One shortcoming of the Naval process for fulfilling the requirement for joint strike ordnance is that it is done independently, without consideration of the Air Force process. A detailed review of the sub-processes in the overall Naval process indicates that there would likely be different requirements determined and corresponding different acquisitions if these processes took into account the larger joint environment. Further, a combined logistics management system could achieve some additional efficiencies. The primary areas of potential inefficiency of the current processes are:

- A redundancy of targets assigned to the Navy and the Air Force. If this redundancy is evaluated and eliminated from a joint perspective, this will reduce overall strike ordnance requirements.
- The severity of Naval strike weapons shortages may be evaluated differently when considered along with Air Force strike weapons shortages.
- The requirement to fund minimum sustainment rates for some types of ordnance may be re-evaluated if it is determined that the Air Force is already funding the minimum sustainment rate.
- Total ordnance visibility and inventory transfers could be improved if logistics management systems were standardized.

CONCLUSION

The combined processes of requirements determination and acquisition have served the Naval service well in providing an overall approach to determining the optimal mix of ordnance to procure based on a variety of considerations. In many instances these combined processes continue to serve the Naval service well. In the critical area of joint strike ordnance; however, the current processes of the Navy are inadequate in terms of their ability to consider key strategic concerns within the larger joint environment. When computing service requirements

for joint strike ordnance, each service must be aware of the requirements and processes of the other services that use the ordnance.

The Naval service and the Air Force need to jointly review and integrate their processes for determining joint strike weapons requirements. A combined and comprehensive requirements determination and acquisition process should then be developed to fulfill these requirements. This combined process should begin with an analysis of the requirements determination process of both the NNOR and the CFAM processes, by examining the algorithms within each model. Each model should be adjusted and validated using the most recent operational usage data. The outputs of each model should then be iteratively compared against the actual results achieved from past and current operations. A determination could then be made regarding which model, or which aspects of each model, best reflect real usage data in terms of both weapons effectiveness and target attrition. Additionally, within a combined model, a more comprehensive analysis of target-weapon-aircraft mix could be conducted, considering all joint assets (Naval and Air Force). This could result in a more effective weapons mix and also alter the strike ordnance requirements. This resultant model could lead to a more standardized joint strike ordnance requirements standard.

A combined joint strike ordnance requirements determination and acquisition process should yield significant efficiencies and improve the overall strategic decision making process associated with providing the U. S. Armed Forces with the best mix of joint strike ordnance.

Similar to both the NNOR and CFAM working group processes, the resultant model output could then be evaluated by a specified working group prior to forwarding to the Chairman of the Joint Chiefs for final approval. The approved joint ordnance requirements could then be procured through a joint ordnance acquisition process.

A joint acquisition process would likely require the establishment of a joint strike ordnance acquisition board. Ideally, this board would be comprised of members of the acquisition communities from all services. A joint acquisition process provides advantages over separate service-unique processes by providing complete visibility of all requirements for all joint munitions and allowing a joint board to make better informed decisions regarding where the greatest joint shortfalls existed. This information would then influence specific purchase decisions fulfilling the most critical shortfalls first. Additionally, a joint acquisition board could better evaluate trade-offs between funding critical shortages and the need to fund sustainment production.

Additionally, through the development of combined requirements determination and acquisition processes for joint strike ordnance, other opportunities for gaining efficiencies exist.

A standardized joint strike ordnance logistics system could be developed. This would facilitate total strike ordnance visibility, as well as allow more efficient redistribution of ordnance between Air Force and Naval units. Further, by analyzing the specific outputs of the combined requirements determination model it could be determined which target-weapon-aircraft choice was determined to be optimal for the various target profiles. This information could be used to influence OPLANs and CONPLANs by allowing combatant commanders to evaluate their current weapons-target mix and joint strike ordnance expenditure estimates. Finally, this information could also be used to help evaluate overall Naval and Air Force aircraft acquisition programs in order to maximize efficiencies and effectiveness within the joint context.

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