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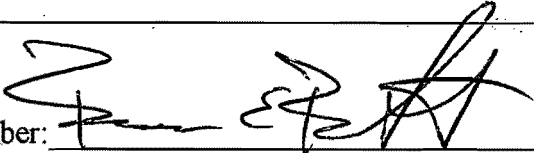
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Executive Summary

Title: Joint Strike Fighter Tactics Development: Truly Joint?

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Thesis: The United States Air Force, Navy and Marine Corps should collaboratively develop tactics for the F-35, publishing these tactical recommendations in an F-35 Multi-service Tactics, Techniques and Procedures (MTTP) manual.

Discussion: The F-35 Joint Strike Fighter is a 5th generation aircraft being delivered to Marine Corps front-line squadrons' beginning in 2012. The F-35 will bring new technologies and advanced capabilities to all of the services, requiring the United States Air Force, Navy and Marine Corps to assess how they will develop tactics for this new aircraft. All three variants of the F-35 are very similar in capability, allowing for a joint approach to the development of tactics, techniques and procedures (TTP). Before any conclusions are made as to how a joint process might be constructed, careful study is required to understand how each service develops TTP for front-line fighter squadrons today. The F-35 operational test community will begin to develop base-line tactics as part of the official Initial Operational Test and Evaluation (IOT&E). Once IOT&E is completed, the services must decide if they wish to return to the old processes for follow-on TTP development, or pursue TTP development jointly. Last, if a joint approach is adopted, a manual must be published that includes these joint TTP.

Conclusion: The F-35 community should collaboratively develop joint TTP and publish these TTP in a Multi-Service Tactics, Techniques and Procedures (MTTP) manual.

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On January 7, 2010, an F-35B fighter aircraft known as "BF-1" engaged its short takeoff/vertical landing (STOVL) system for the first time in flight, taking a major step forward for the F-35 Lightning II flight test program.¹ As the F-35 flight test program gains momentum, the U.S. Air Force, Navy and Marine Corps plan to assign this newly developed fighter to front-line squadrons within the next five years. For the Marine Corps, this timeline is more compressed. The first F-35B training squadron, VMFAT-501, is scheduled for activation at Eglin Air Force Base in April 2010, while the first operational squadron, VMFA-332, is planned to declare initial operational capability (IOC) in 2012.

The F-35 represents a leap forward in technology when compared to today's strike fighter aircraft. The F-35 is a 5th generation aircraft possessing stealth characteristics and advanced sensors. These advanced sensors will share information using newly developed data links, which will give F-35 pilots situational awareness well beyond what is possible in today's strike fighter aircraft. The U.S. armed services will need to develop new tactics, techniques and procedures (TTP) that take advantage of these technological advances. The United States Air Force, Navy and Marine Corps should collaboratively develop tactics for the F-35, publishing these tactical recommendations in an F-35 Multi-service Tactics, Techniques and Procedures (MTTP) manual.

F-35 Program History

The F-35's history began with the Joint Advanced Strike Technology (JAST) program. The JAST programs' goal was to develop advanced aircraft technologies, and once developed, these technologies could be used in future fighter aircraft. During the late 1980s and into the early 1990s, several different strike fighter programs existed, all trying to create a replacement for the Department of Defense's aging strike fighter assets. In 1994, several of these aircraft programs merged under the JAST program, and in August 1994, the Secretaries of the Navy and

Air Force and the Deputy Secretary of Defense signed the JAST program charter. The focus of the JAST program shifted from developing technologies and concepts to developing an aircraft that used these technologies. Shortly thereafter, the JAST program became the Joint Strike Fighter (JSF) program.²

In November of 1996, after successful completion of the Concept Definition and Design Research Phase, the Joint Strike Fighter (JSF) program entered into the Concept and Demonstration Phase (CDP). During this phase, two weapons contractors, Boeing with its X-32A and Lockheed Martin's X-35, built respective air vehicle demonstrators that competed for the JSF contract. In October 2001, Lockheed Martin's X-35 won the flight competition, allowing the JSF to enter the System Development and Demonstration (SDD) phase of the program.

The JSF program is currently in the SDD phase, with Lockheed Martin having developed three variants of the F-35 to meet service specific operational requirements. The F-35A, developed for the United States Air Force (USAF), is the Conventional Takeoff and Landing Variant (CTOL). The F-35A fulfills the USAF's operational need for a multi-role fighter (primarily air-to-ground) to replace the F-16 and A-10 and to complement the F-22.³ The F-35B is a Short Takeoff/Vertical landing variant for the Marine Corps. The F-35B meets the Marine Corps operational requirement for a multi-role, STOVL strike fighter to replace the AV-8B and the F/A-18 A/C/D models.⁴ Similarly, the F-35C, the Carrier Variant (CV), meets the United States Navy's operational requirement for a multi-role strike fighter to compliment the F/A-18 E/F.⁵ Although there are three different variants of the F-35; all models have the same sensors, data links and core propulsion systems.

Today, the size of the F-35 program is immense. Michael Sullivan, Director of Acquisition and Sourcing Management for the United States Government Accountability Office,

stated to congress in May 2009, "The F-35 Joint Strike Fighter (JSF) program is the Department of Defense's (DOD's) most costly acquisition, seeking to simultaneously develop, produce, and field three aircraft variants for the Air Force, Navy, Marine Corps, and eight international partners. The total expected U.S. investment is now more than \$300 billion to develop and procure 2,456 aircraft over the next 25 years."⁶

As of January 25, 2010, four F-35 aircraft are flying as part of the flight test program.

Two F-35Bs are conducting testing at Naval Air Station Patuxent River, one F-35A is located at Naval Air Weapons Station (NAWS) China Lake, and one F-35A is conducting flight operations at the Lockheed Martin's facility in Fort Worth, Texas. Another four F-35s, two F-35As and two F-35Bs, will be delivered by May 2010; all four aircraft will contribute to what Doug Pearson, Lockheed Martin's vice president of the F-35 Integrated Test Force, called the "largest flight test program in history."⁷ With the F-35 flight test program progressing, understanding how the Department of the Navy and the United States Air Force develop tactical recommendations is critical to understanding how the Air Force, Navy and Marine Corps might collaborate on tactics development for the F-35.

Department of the Navy Tactics Development

The Department of the Navy's organization that is responsible for operational test and evaluation is the Naval Operational Test and Evaluation Force (OPTEVFOR). This organization, staffed by both Sailors and Marines, "...conducts OT&E [Operational Test and Evaluation] in a realistic operational environment."⁸ OPTEVFOR tests aircraft under simulated operational scenarios and evaluates whether the aircraft is suitable for fleet use. At the completion of an operational test, the Commander of OPTEVFOR "...advise[s] the Chief of

Naval Operations on the operational effectiveness and suitability of new and improved war fighting systems and capabilities, tactics, and procedures."⁹ These tactical recommendations from OPTEVFOR are typically the starting point for two organizations within the Department of the Navy to advance these tactics, techniques and procedures.

The first organization to use OPTEVFOR's recommendations is the Naval Fighter Weapons School, commonly referred to as TOPGUN. TOPGUN instructors work with the flight test community, aircraft engineers and intelligence organizations to understand the baseline tactical recommendations provided by OPTEVFOR. TOPGUN instructors then begin their own validation process by flying Tactical Demonstration and Evaluation (TAC D&E) sorties.

The goal of these sorties is to adjust current tactics, or contribute to the development and validation of new tactical recommendations. Each mission flown is deconstructed, analyzed and assessed for validity and lethality. Before a tactic becomes an official TOPGUN recommendation, a standardization board reviews the proposed tactic. Once the standardization board approves a TTP, it becomes an official TOPGUN recommendation. TOPGUN recommendations form the foundation for all tactics taught during the TOPGUN class, which is conducted four times annually. Additionally, TOPGUN releases these tactical recommendations via several publications for the Navy/Marine Corps Fleet forces to use.

First, the Naval Fighter Weapons School produces the TOPGUN manuals, a four-volume collection, updated annually, that addresses F/A-18 employment, friendly hardware and threat systems. In addition to the TOPGUN manuals, tactical lessons learned from each TOPGUN class along with standardization notes are available to fleet squadrons via the TOPGUN SIPRNET (Collateral Secret) webpage. Last, a quarterly magazine, the Naval Strike and Air

Warfare Center (NSAWC) Journal contains articles, often times authored by TOPGUN instructors, providing explanations of current tactics or recent changes to tactical recommendations.

Another organization that uses the base line tactics provided by OPTEVFOR is Marine Aviation Weapons and Tactics Squadron One (MAWTS-1). As stated in the Marine Aviation Weapons and Tactics Training Program (WTTP), Order 3500.109, part of MAWTS-1's mission is "... to [provide] assistance in the development and employment of advanced aviation weapons and tactics."¹⁰ Within the MAWTS-1 organization, F/A-18 and AV-8B divisions, and the Aviation Development, Tactics and Evaluation (ADT&E) department, work with operational test organizations, aircraft engineers and the intelligence community to understand these base line tactics provided by OPTEVFOR.

The tactics validation process used by MAWTS-1 is very similar to the process described above for TOPGUN. The purpose of conducting MAWTS-1 TAC D&E sorties is to adjust current tactics or assists in the evaluation and feasibility of newly proposed TTP. Before the MAWTS-1 F/A-18 division will make an official change to tactical recommendations, the MAWTS-1 F/A-18 division convenes the annual Tactical Standard Operating Procedure (TACSOP) conference.

The annual TACSOP conference consists of MAWTS-1 F/A-18 instructors, former MAWTS-1 and Marine TOPGUN instructors, and Marine Air Group (MAG) representatives. The conference's goal is to review all current tactical recommendations and approve newly proposed TTPs. All approved changes are incorporated in the MAWTS-1 F/A-18 TACSOP document, which provides standardized tactical recommendations for all missions assigned to

Marine' F/A-18s.¹¹ Recommendations published in the TACSOP document are the baseline for all TTP taught at the bi-annual Weapons and Tactics Instructors (WTI) course. This seven-week course forces fleet aircrew to execute the recommended MAWTS-1 tactics, allowing MAWTS-1 F/A-18 instructors to assess the effectiveness of employment recommendations in a tactical environment.

The AV-8B division at MAWTS-1 updates and implements TTPs in much the same way as the F/A-18 division described above, with one key difference. Rather than updating a TACSOP document every year, the AV-8B division from MAWTS-1 conducts an Air Naval Tactics Techniques and Procedures (ANTTP) conference, every two years. The 561st Joint Tactics Squadron (JTS) at Nellis Air Force Base hosts this conference; an Air Force organization staffed and equipped to handle large classified conferences. This includes multiple workstations to facilitate collaborative writing and personnel uniquely skilled in graphic design and editing. The goal of this conference is to update and publish the AV-8B primary tactics document, the ANTTP 3-22-AV-8B manual. The process utilized by the MAWTS-1 AV-8B division to update and publish this manual is very similar to how Air Force fighter squadrons complete this task. Approximately six to nine months prior to the ANTTP conference, the AV-8B division assigns manual chapters to specific instructors, requiring them to review the content contained in that chapter. Proposed changes to tactical recommendations are presented to the conference. Once members of the conference approve changes, the recommendation becomes an official MAWTS-1 AV-8B tactical recommendation. Once the document content is complete and editing finalized by the 561st JTS, the MAWTS-1 AV-8B division releases the document to fleet squadrons.

United States Air Force Tactics Development

The organization that provides an objective assessment of operational test and evaluation for the United States Air Force is the Air Force Operational Test and Evaluation Center (AFOTEC). Its mission statement is, "AFOTEC tests and evaluates new weapon systems in realistic battlespace environments to provide decision makers a range of accurate, balanced and timely assessments of effectiveness, suitability and mission capability."¹² AFOTEC and the Department of the Navy's OPTEVFOR fulfill very similar roles for their respective services. Both provide objective assessments during operational testing and report the effectiveness and suitability of new war fighting capabilities to key military leadership. However, there is one important difference between these two organizations regarding tactics development. As previously stated, OPTEVFOR's operational test reports include initial tactical recommendations. Conversely, AFOTEC does not make tactical recommendations as part of their operational test and evaluation reports. Instead, within the United States Air Force, test and evaluation squadrons develop tactics. Specifically, the 422d Test and Evaluation Squadron (422 TES), 59th Test and Evaluation Squadron (59 TES) and the 85th Test and Evaluation Squadron (85 TES) are chartered to conduct operational testing and develop tactical recommendations for the USAF fighter community.¹³ Currently, the 422 TES operates and tests the A-10, F-15C, F-15E, F-16C, F-22A, and, when appropriate will operate the F-35A.

Before a new aircraft enters service with front-line USAF squadrons, an Initial Operational Test and Evaluation (IOT&E) is completed. Test and evaluation squadrons perform this testing. As part of this testing, if AFOTEC is assigned as the Ready to Test Organization (RTO), it will provide an unbiased third party evaluation, conducting its own test plan,

independent of the 422 TES's test. Based on these test results, test and evaluation squadrons will then develop initial tactical recommendations. As the fighter matures and receives substantial upgrades to its software, avionics, or sensors, a Follow-on Operational Test and Evaluation (FOT&E) test will be conducted to assess these new upgrades. For fighter aircraft, the 422 TES takes these new capabilities and incorporates them into their tactical recommendations. Test and evaluation squadrons also perform Tactics Development and Evaluation (TD&E) sorties to develop tactics for operational scenarios not yet addressed or to address deficiencies in current tactical recommendations.

The 422 TES publishes employment recommendations in the Air Force Tactics, Techniques and Procedures (AFTTP) 3-1.xx manuals. These tactical employment manuals are specific for each type of Air Force aircraft. For example, the tactics manual for the F-16C is the AFTTP 3-1.16; likewise, the tactics manual for the F-22A is the AFTTP 3-1.22. These manuals are updated annually.

In the USAF, a model manager is designated for every type of fighter aircraft. Model managers for the USAF fighter community, are assigned to the 422 TES.¹⁴ One of the model manager's responsibilities is to coordinate and conduct the AFTTP 3-1.xx conference. In addition to coordinating the conference, the model manager is responsible for capturing the conference results and then publishing these updates in the revised version of the AFTTP 3-1.xx manual. Prior to an AFTTP 3-1.xx conference, the model manager assigns responsibility for reviewing specific chapters within the AFTTP 3-1.xx manual to different pilots. The officers assigned to review these chapters are fellow test and evaluation personnel.

The 561st JTS hosts the AFTTP 3-1.xx conferences at Nellis Air Force Base. During the conference, a review of each chapter ensures all tactical recommendations are valid and supported by current tactical testing. Conference attendees include pilots from test and evaluation squadrons, Air Force Weapons School instructors and Air Force Weapons School graduates. Once editing is complete, the revised AFTTP 3-1.xx document is distributed. Once distributed, the revised AFTTP 3-1.xx forms the foundation for tactical recommendations taught at the Air Force Weapons School (AFWS).

It is important to highlight the similarities between the Department of the Navy and the United States Air Force, as it relates to their tactics development processes. First, all of the services assign highly competent and experienced personnel to the organizations that develop and teach tactics. Lethal and effective TTPs that exploit every advantage available are paramount to ensuring that U.S. strike fighter units continue to maintain an advantage over their adversaries. Second, all services enlist the expertise of the test community, aircraft engineers and the intelligence community in their tactics development process. Third, all service have an established process in place that allows for objective scrutiny, prior to the adoption of new tactical recommendations. Last, all services have a process in place to review and publish a tactics manual, that becomes the foundation for the TTPs taught at the service specific weapons courses (TOPGUN, WTI, AFWS). Any proposed process for joint F-35 tactics development must include these characteristics.

Current F-35 Program Operational Test and Evaluation Structure

The Integrated Test Force (ITF) is an organization that brings many assets together with the goal of completing both developmental and operational testing for the F-35 program. The

ITF has detachments at various locations including, Naval Air Station Patuxent River, Edwards Air Force Base, Eglin Air Force Base and Fort Worth, Texas. Specifically the operational test entity within the ITF that will conduct F-35 operational test and evaluation is the Joint Operational Test Team (JOTT). The Air Force Operational Test and Evaluation Center (AFOTEC) is the lead operational test agency (OTA) for the JOTT with Operational Test and Evaluation Force (OPTEVFOR) representing the Department of the Navy (DoN) and the Air Warfare Center (AWC) representing the United Kingdom as the two support OTAs. In 2012, the JOTT is expected to deliver their first interim operational test report regarding effectiveness, suitability and mission capability of F-35 with block 2 software. This report will inform the Marine Corps decision to proceed with initial operational capability (IOC) in 2012. Initial F-35 tactical recommendations will also be included in this report.¹⁵ Two and a half years later, in early 2016, the JOTT will release its Initial Operational Test and Evaluation (IOT&E) report for F-35 with Block 3 software. The Air Force, Navy and Marine Corps leadership have an important decision to make. The individual services could take the initial tactical recommendations from the JOTT and conduct tactics development separately. Conversely, the services could choose to develop F-35 tactics jointly, publishing these tactics in an F-35 Multi-service Tactics, Techniques and Procedures (MTTP) manual.

Why Joint?

There are several reasons why collaborative tactics development and the production of a joint tactics manual would be beneficial. First, the requirements for resources allocated to tactics development would decrease. Second, interoperability of F-35 units across the services would increase, enhancing F-35 unit effectiveness across all spectrums of conflict. Third, all services

would benefit from the lessons learned from F-35 units participating in premier training events, events that integrate assets not typically seen during day-to-day training.

A joint approach to F-35 tactics development would decrease the overall resources required to conduct F-35 tactics development. In the past, a tactics development flight conducted by one type of aircraft had little applicability to another type of aircraft. This is because different aircraft have very different capabilities. These capabilities include, but are not limited to aerodynamic performance, onboard sensors and the specific weapons an aircraft is able to employ. Therefore, a tactic developed for one type of aircraft may not be tactically sound for another. To illustrate the point, take for example an F-16 Fighting Falcon and an AV-8B Harrier. If the Air Force and Marine Corps respectively asked the same question as part of their tactics development, "at what range can a threat infra-red (IR) missile track an aircraft", two separate answers would result. Each aircraft, the F-16 and the AV-8B, has a unique IR signature, therefore, the threat missile would be able to track and launch at different ranges for each aircraft. In this example, two separate flight events, one to test the threat IR missile against the F-16 and one for the AV-8B, would be required to answer each services question. Depending on the answer to these questions, very different tactics may be required by each respective aircraft to defeat the threat missile.

Now assume that the Air Force and Marine Corps ask the same question, but now both are flying the F-35. Also, assume that the services are developing tactics jointly and publishing them in a joint tactics manual. The IR signature is essentially the same for both aircraft; therefore, only one tactics development sortie dedicated to answering this question is required. Conversely, if the Air Force and the Marine Corps are developing their F-35 tactics separately,

both services may fly the "IR" sortie, only to get the same answer, therefore being less efficient with Department of Defense resources. This is just one simple example; however, the efficiencies potentially realized by implementing a collaborative process are immense. However, to realize these efficiencies, an official mechanism or venue must be available to share tactical information across the services.

The mechanism that would facilitate communication across the services, allowing them to realize the benefit from joint tactics development, is a joint tactics conference. This would allow for a collaborative interaction between weapon school instructors, the test and evaluation community, engineers and intelligence personnel. This collaboration would focus on completed tactics development sorties and the distribution of the knowledge gained from these sorties. Additionally, coordination and assignment of future tactics sorties would avoid duplicative efforts, thereby increasing efficiency across the services. Having a collaborative approach for developing tactics jointly between the services will reduce the resources need to develop and validate tactical recommendations for the F-35.

Joint tactics development and the publication of a joint F-35 tactics manual would increase interoperability of F-35 units across the services, enhancing their effectiveness during all spectrums of conflict. As stated earlier, the total number of F-35s planned for procurement is more than 2,400 aircraft. The F-35 will constitute the bulk of the U.S. strike fighter community in the very near future. Due to this fact, F-35 units from all services will be required to integrate during complicated, high threat missions. Operational plans designed to deal with large scale contingencies require U.S. armed forces to deploy with very little notice. These plans also assume that aviation forces, once deployed, will be ready for combat operations shortly after they

arrive in theater. Last, most of these plans require the employment of fighter aviation units from all three services, requiring these units to employ as a cohesive, integrated force. The development of joint F-35 tactics and the publication of these tactics in a MTTP would facilitate service interoperability, increasing combat effectiveness during the opening days of a high intensity conflict. Many times during Large Force Exercises (LFE), units fail to integrate effectively during the opening days of an exercise, this is largely due to a misunderstanding or being unaware of service specific TTPs.

During the execution of LFE's such as Red Flag or Northern Edge, missions commonly fail during the first few days of the exercise, because integration between aviation units from different services is absent. This lack of integration between joint units is not due to a lack of work ethic, professionalism or the employment of inferior tactics at the small unit level; rather, it is because elements within the joint force many times are unfamiliar with the TTP's of adjacent aviation units. Familiarity of TTPs between adjacent units during LFE execution usually improves with time; however, these improvements can take days or even weeks.

A high intensity conflict, with a near peer competitor of the United States, will require a high level of integration within the strike fighter community. To achieve mission success, integration of adjacent aviation units will be required during the opening days of the conflict, not days or a week after the conflict begins. In a large conventional conflict, F-35 units can expect mission tasking to attack strategic enemy targets, or defend strategic interests. This tasking will require F-35 units from all services to integrate with each other in order to complete these complicated, potentially high threat missions. Executing joint tactics and having a common tactics manual will increase the probability of success for missions assigned to F-35 units.

The quality of a unit's training directly affects that unit's combat effectiveness. Across the Department of Defense, many premier training events allow strike fighter units the opportunity to integrate with assets not typically seen during day-to-day training. Examples of such assets are the U.S. Air Force's E-8C JSTARS, the U.S. Army's Patriot surface-to-air missile system, or the execution of complex missions on electronic combat ranges. Training with these assets greatly enhances a unit's ability to execute complex missions, integrate with joint assets and ultimately enhances a unit's combat effectiveness. However, the opportunity to train with these assets is limited. Training exercises that bring these assets together are limited in number, allowing only a relatively small number of units the opportunity to participate. A unit's deployment schedule may also preclude them from attending a joint training exercise that provides the integration of these assets. Last, many of these assets are regularly deployed in support of contingency operations, limiting the opportunities to train with them. F-35 units, who do have the opportunity to train with these assets, must share the lessons learned from these experiences. A joint tactics conference is a venue that would allow face-to-face collaboration, at the appropriate security level, ensuring that these lessons learned benefit all F-35 units. Additionally, the TTPs utilized when operating with these assets could be included in an F-35 Multi-service Tactics, Techniques and Procedures (MTTP) manual, ensuring that these TTPs are available to the entire F-35 community.

The Way Ahead

Clearly, the way ahead for F-35 tactics development is through a joint effort. Discussions have occurred, at the action officer level, regarding the concept of developing joint tactics for the F-35. Most recently, service representatives discussed the concept of joint tactics development

and the publication of a joint tactics manual during the November 2009 F-35 Training Systems Review Team (TSRT) conference.¹⁶ During this conference, representatives from the Navy, Marine Corps, Air Force and JSF Program Office (JPO), all came to the consensus that a joint process to develop tactics would be beneficial.¹⁷ With consensus that a joint concept is the way ahead, details that begin to describe this process are required if the concept is to become a reality.

A collaborative effort between services has informally already begun. Service representatives have worked together, over the last several years, during tactical simulator events and concept of operations development conferences. Additionally, a joint effort is currently underway, including officers assigned to the first Marine Corps F-35 training unit, VMFAT-501 and their Air Force counterpart, the 58th Fighter Squadron, two units both stationed at Eglin Air Force Base. These units are working together to catalog tactical progress already accomplished and continue to make progress on future recommendations.

The units assigned to Eglin Air Force Base are making progress; however, the implementation of a formalized process is required. This formalized process needs to begin with key leaders, from all services, endorsing a joint approach to F-35 tactics development. Further, this endorsement must be a written agreement between the services, committing test and evaluation squadrons, and the Department of the Navy's respective weapons schools (TOPGUN and MAWTS-1) to this joint endeavor.

The designation of an F-35 model manager is the next task to be completed. Given the USAF's familiarity with the model manager position, and the role the model manager plays during the AFTTP 3-1.xx process, initially the USAF should provide this key leadership

position. Next, each service would identify key personnel within the 422 TES, MAWTS-1, TOPGUN and the JOTT, that would work directly with the model manager in preparation for the first F-35 tactics conference.

The services must undertake the very complex and time-consuming task of writing the initial Multi-Service Tactics Techniques and Procedures (MTTP) manual. The most efficient and effective way to complete this task is to assign each service the responsibility of authoring specific chapters of the F-35 MTTP. Individual units within the services have extensive operational experience in specific mission areas. For example, the United States Air Force has highly trained units, F-16CJ's, with operational experience executing the mission of Suppression of Enemy Air Defenses (SEAD) and the Destruction of Enemy Air Defenses (DEAD); therefore, the USAF would be the lead service to author the initial tactical recommendations for SEAD/DEAD (See Appendix A). After release of the initial document, the USAF would remain the lead service for updating sections within the F-35 MTTP for SEAD/DEAD employment. The United States Air Force should also author the Offensive Counter-Air (OCA) mission, another task frequently assigned to Air Force units. Last, the F-35 will bring with it a very robust electronic attack/support capability. EW tactics development will require a robust EW training environment and highly trained personnel that have experience in this technical area. One of the premier training ranges within the United States is the Nevada Test and Training Range (NTTR) located north of Nellis Air Force. The close proximity of this range to the 422 TES makes the Air Force the logical choice as the EW mission sponsor; however, additional personnel from the Navy and Marine Corps EA-6B community may be required to develop EW TTPs for the F-35. This is not to say that other services do not have operational experience executing SEAD, OCA or EW missions. In fact, because the F-35 is a strike fighter aircraft that

is replacing many other multi-role aircraft, all services will have experience with these missions and should contribute to the tactics development within these mission areas.

One of the primary focuses of the U.S. Navy is the projection of power from the sea via its carrier flight decks. Because of this focus, the U.S. Navy should sponsor the Air Interdiction (AI) mission. In addition to AI, Defensive Counter Air (DCA) is another mission the U.S. Navy must sponsor. Naval Strike fighter aircraft frequently execute this mission while participating in the defense of the Carrier Strike Group (See Appendix A)

The strike fighter assets employed by the U.S. Marines Corps primarily support the Marine Air-Ground Task Force's (MAGTF) mission. This mission regularly requires Marine Aviators to employ air-to-ground weapons in close proximity of friendly forces. Because of this, the Marine Corps should sponsor the Close Air Support (CAS) mission. Due to the focus of air-to-ground employment by Marine Corps fixed wing aviators, the U.S. Marine Corps should also sponsor the missions of Armed Reconnaissance (AR) and Strike Coordination, Armed Reconnaissance (SCAR), (see Appendix A).

Having services sponsor specific missions will benefit all services. It will allow each service the opportunity to focus their Tactics Development and Evaluation (TD&E) sorties on the missions they sponsor. Assignment of specific missions to the respective services will allow each service the opportunity to investigate fully all tactical options within their assigned mission areas. Additionally, specific mission assignments will divide the work required to author the initial F-35 MTTP.

Some may argue that dividing mission responsibility will lead to the services becoming very proficient in the missions they sponsor, and will lead to tactical atrophy in the missions that they do not sponsor. Nothing could be further from the truth. Sponsoring specific missions does not preclude any of the service organizations that develop tactics, from conducting TD&E sorties in the other mission areas. Further, each service organization that develops tactics would retain a Subject Matter Expert (SME) for each mission areas. This would allow each service to remain engaged and contribute to tactics development in all mission areas. Last, the division of missions between the services will not affect fleet forces training and readiness or pre-deployment training progression. Navy, Air Force and Marine Corps front-line squadrons would still attain and maintain mission experience as dictated by individual service training and readiness directives.

F-35 Multi-Service Tactics, Techniques and Procedures Conference

The purpose of an F-35 Multi-Service Tactics, Techniques and Procedures (MTTP) conference is to provide a venue for all service representatives to collaborate, debate and reach consensus on effective and lethal F-35 tactics. The goal of the conference is to review and update the F-35 MTTP manual, a manual that would be utilized by all services. Conference attendees would include representatives from the 422 TES, 59 TES, 85 TES, MAWTS-1, and TOPGUN. Additional representation is required from operational test organizations within the Department of the Navy, VMX-22, Weapon School Instructors and graduates from each respective services weapon schools.

No later than six months prior to the F-35 MTTP conference, the model manager would confirm all mission sponsor assignments with the 422 TES, TOPGUN and MAWTS-1 staff.

Then, each service would begin to compile proposed changes to TTPs within each mission area they have been assigned. Each service would brief the proposed changes to a working group at the F-35 MTTP conference. Once a consensus on proposed changes is reached, the approved changes would be incorporated in the revised F-35 MTTP manual. For example, if the Air Force wanted to propose a change to a CAS TTP, they would forward this proposed change to MAWTS-1. MAWTS-1 would document all proposed changes to CAS TTPs prior to the execution of the conference. MAWTS-1 would present all proposed changes to the CAS working group during the F-35 MTTP conference. Once the CAS working group reaches consensus regarding changes to CAS TTPs, MAWTS-1, working with the model manager and the 561st JTS, would ensure all changes are incorporated into the revised version of the F-35 MTTP. During the last day of the conference, all working groups would provide a summary of changes brief to the conference, so that all personnel are aware of forth coming changes. After the conference has concluded, the model manager and mission sponsors would work with the 561st JTS for the editing and release of the updated manual.

Conclusion

A great opportunity is available to the U.S. strike fighter community. The commonality among the three variants of the F-35 will allow for the Air Force, Navy and Marine Corps to implement a joint process for developing and publishing tactics, techniques and procedures (TTPs). A joint approach will ensure the realization of economies of scale during the conduct of tactics development. Additionally, interoperability of F-35 units will increase, enhancing mission accomplishment. Last, a collaborative effort to develop F-35 tactics will allow all F-35 units the opportunity to benefit from other F-35 unit participation in premier training exercises.

This participation will enhance overall F-35 combat readiness and contribute to mission success in future conflicts.

The processes currently utilized by each service to develop tactics are very similar. All services assign highly qualified personnel to accomplish the task of tactics development. Additionally, each service employs the expertise of engineers and intelligence organizations as part of their tactics development process. Last, all services have a review process that scrutinizes proposed changes to tactical recommendations ensuring TTP are executable and supported by operational testing results. Any proposed joint process for developing tactics must include these attributes.

The way forward for F-35 tactics development is through a formalized inter-service process. A formal tactics development process must begin with key leaders from each service committing resources from Air Force test and evaluation squadrons and the Department of the Navy's TOPGUN and MAWTS-1. Next, the designation of an F-35 model manager is required, to coordinate inputs needed to develop and publish an F-35 Multi-service Tactics, Techniques and Procedures (MTTP) manual. As part of this process, each service would be assigned specific missions, giving them the responsibility to author and update specific sections within the F-35 MTTP manual. This process will help to avoid duplicative efforts and allow the F-35 MTTP manual to benefit from individual service strengths.

Implementation of a joint process to develop tactics for the F-35 will have immense benefits for all the services involved. Certainly with the introduction of a new process, issues will arise that will require innovative solutions. However, the benefits gained by implementing a joint approach will far exceed any potential setbacks. A collaborative approach to develop

tactics between the Air Force, Navy and Marine Corps will make the F-35 a true Joint Strike Fighter.

Notes:

¹ F-35 Joint Program Office, <http://www.jsf.mil/news/>, accessed January 15, 2010.

² U.S. Department of Defense, F-35 Lightning II Joint Strike Fighter (JSF) Program Charter, signed by Gordon England, Deputy Secretary of Defense. Arlington, VA: Department of Defense, 2008, 4.

³ "JSF Charter," p4

⁴ "JSF Charter," p4

⁵ "JSF Charter," p4

⁶ Government Accountability Office, *Joint Strike Fighter: Strong Risk Management Essential as Program Enters Most Challenging Phase*: (Washington, DC: Government Accountability Office, 2009), 1, <http://www.gao.gov/new.items/d09711t.pdf> (accessed December 29, 2009).

⁷ Senior Airman Julius Delos Reyes, Edwards Air Force Base, http://www.edwards.af.mil/news/story_print.asp?id=123120982

⁸ Operational Test and Evaluation Forces (OPTEVFOR), <http://www.cotf.navy.mil/>, Accessed on 04 Jan 10.

⁹ Operational Test and Evaluation Forces (OPTEVFOR), <http://www.cotf.navy.mil/>, Accessed on 12 Jan 10.

¹⁰ Commandant of Marine Corps, Marine Corps Aviation Weapons and Tactics Training Program, MCO 3500.109, January 16, 2007, <http://www.marines.mil/news/publications/Documents/MCO%203500.109.pdf> (accessed December 22, 2009).

¹¹ Major Bowmer, telephone conversation with author, January 10, 2010. Major Bowmer is the current F/A-18 Division Head at Marine Aviation Weapons and Tactics Squadron One.

¹² Air Force Operational Test and Evaluation Center (AFOTEC), <http://www.afotec.af.mil/>

¹³ Major David Berke, telephone conversation with author, January 27, 2010. Major Berke is currently assigned to the 422 Test and Evaluation Squadron, Nellis Air Force Base, as the U.S. Marine Corps F-22A exchange pilot.

¹⁴ Major David Berke, telephone conversation with author, January 27, 2010. Major Berke is currently assigned to the 422 Test and Evaluation Squadron, Nellis Air Force Base, as the U.S. Marine Corps F-22A exchange pilot.

¹⁵ LtCol Michael Dehner, interview with author, November 13, 2009. LtCol Dehner is the JSF Test/Plans Coordinator for Aviation, Plans, Policy and Budget (APP-43T), Headquarters Marine Corps.

¹⁶ Training Systems Review Team (TRST) conference attend by author, November 18-20, 2009.

¹⁷ Training Systems Review Team (TRST) conference attend by author, November 18-20, 2009.

Bibliography:

U.S. Department of Defense. *F-35 Lightning II Joint Strike Fighter (JSF) Program Charter*, signed by Gordon England, Deputy Secretary of Defense. Arlington, VA: Department of Defense, 2008.

Government Accountability Office. *Joint Strike Fighter: Strong Risk Management Essential as Program Enters Most Challenging Phase*. Washington, DC: Government Accountability Office, 2009.
<http://www.gao.gov/new.items/d09711t.pdf> (accessed December 29, 2009).

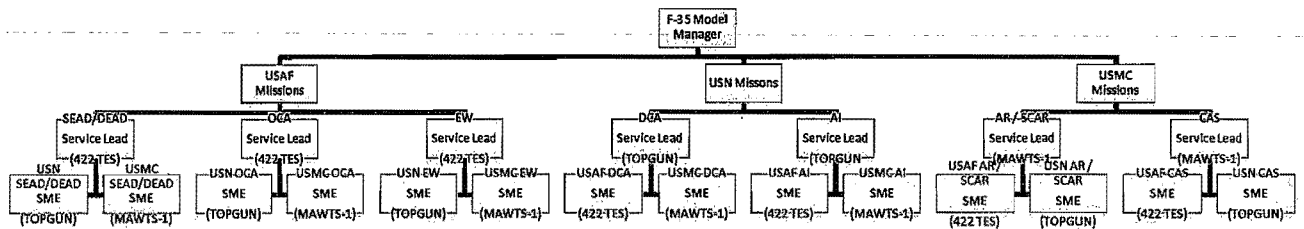
Commandant of Marine Corps. *Marine Corps Aviation Weapons and Tactics Training Program*. MCO 3500.109, January 16, 2007. <http://www.marines.mil/news/publications/Documents/MCO%203500.109.pdf>

David Aronstein. 2001. *Joint Strike Fighter (JSF) Program History 1993-1997*. Washington, DC: Government Reprints Press.

Sweetman, Bill. 1999. *Joint Strike Fighter : Boeing X-32 vs Lockheed Martin X-35*. Enthusiast color series. Osceola, WI: MBI Pub.

United States. Government Accountability Office. 2007. *Joint Strike Fighter: Progress Made and Challenges Remain: Report to congressional committees*. Washington, D.C.: U.S. Government Accountability Office, <http://www.loc.gov/catdir/toc/fy0802/2007395300.html>.

Appendix A: Proposed Staffing for F-35 Multi-service Tactics, Techniques and Procedures Conference.



Proposed F-35 Staffing created from various sources.