DRAFT EXECUTIVE SUMMARY

The Joint Fire Support in 2020 project represents a cooperative research study involving the Naval Postgraduate School (NPS) Systems Engineering and Analysis (SEA) curriculum, other student groups on campus, and more than 10 NPS faculty members. The impetus for this undertaking was a request by US Joint Forces Command (JFCOM) to both NPS and the Air Force Institute of Technology (AFIT) to study and analyze possible joint war fighting improvements. Analysis was performed in one of the many study areas described in the Joint Battle Management Command and Control (JBMC2) Roadmap published by JFCOM in 2005. The seven SEA-10 students in the Joint Fires Support project team utilized a tailored Systems Engineering Design Process (SEDP), an iterative procedure that facilitates a methodical approach to solve a design problem, composed of four phases: Problem Definition, Design and Analysis, Decision Making, and Implementation Recommendations.

During the Problem Definition phase, the Joint Fires Team conducted an extensive analysis of existing and proposed fire support systems. Stakeholders were identified and interviewed and an effective need was developed. This effective need was to define an operationally feasible Joint Fires request, coordination, and tasking architecture to maximize rapid battlefield effects through efficient target-provider pairings for the decision maker.

Metrics were identified to evaluate the performance of the competing alternatives ability to meet the objectives of the effective needs statement. The average processing time for a request to be serviced; pairing efficiency of tasked providers; and number of systems, decision points, steps, and organizations involved in the request-to-task process were measured characteristics representing system performance.

Alternative architectures were then developed that could achieve the objectives presented in the effective need. By considering current program development and maturity of technologies three distinct alternatives were evaluated as feasible architectures for a future joint fires support system.

The Status Quo Plus alternative is an expansion of the current status “as is” system based on the growth path of existing programs of record. This system alternative is based on realistic technical improvements in both capabilities and materiel during this timeframe, but retains many of the current fires support system organizations and processes.

The Centralized Joint Fires Support Network (CJFSN) capitalizes on the DoD transformation to a force with improved communications connectivity. This enables a call for fire to be sent to a single decision making organization and then allocated and tasked to a provider. The Joint Fires Support Cell is either a single organization at one physical location (like a JAOC), or geographically dispersed virtual organization. This organization will receive, acknowledge, process, pair, and task joint fire requests to a provider. This organization is a consolidation of existing organizations based on function.

The Distributed Joint Fires Support Network (DJFSN) represents a networked force, able to share fire request and tasking information globally. This alternative assumes fully internetworked capability of lower echelon units including battalions, ships, and most aircraft. The automated pairing and deconfliction algorithms are conceptually similar to the Distributed Weapons Capability. To exploit this capability, requests are sent to a fire support database via the Global Information Grid (GIG). All participating fire support providers evaluate their ability, and the ability of every other connected provider, to deliver the requested effects. Using an identical algorithm, they reach an agreed preferred shooter. The request is then automatically tasked to the best provider with Joint Force Commander exercising command by negation as a participating unit in the process.

Modeling and simulation techniques were selected in two broad categories: qualitative modeling and quantitative modeling. Qualitative modeling was used to compare aspects of the alternatives that could not be physically measured, such as degree of interoperability and usability of a system.

The tools used in quantitative modeling included discrete event simulations, agent-based simulations, and simple numerical and statistical

simulations. The software used to create these simulations and analyze the results included EXCEL™, EXTEND™, MANA, and MINITAB™ programs.

Subjective assessment of risk, implementation challenges and operational risk to expected missions was conducted. Implementation challenges were evaluated as high for DJFSN based on breadth and depth of changes required. Implementation challenges to CJFSN were medium due to recommended doctrinal and organizational changes. The Status Quo Plus was evaluated as low risk to implementation based on few changes from the current roadmap.

The expected operational risk of several failure modes were used to rank alternatives on relative reliability of the joint fires system in support of ground forces. The Acquire process rated the Status Quo Plus more likely to fail than CJFSN and DJFSN. The Target process rated the DJFSN as best, followed by the CJFSN and Status Quo Plus. The Prosecution process rated the Status Quo Plus and CJFSN as moderate to high risk, with DJFSN as high.

It is the conclusion of the project team that the Distributed Joint Fire Support Network is the best alternative. This system architecture represents the solution that provides significant improvements in performance and manages operational risks. The requirement to continue current operations during transition compelled the design team to evaluate a potential implementation method.

The magnitude of DOTMLPF changes required to implement the DJFSN alternative are more significant than the CJFSN. The path to implementing a fully distributed joint fires support network can be achieved by transitioning to a centralized joint fire support network (CJFSN). Development of the required doctrine, organization, and tactics changes will then allow a “top-down” implementation of the DJFSN.

Specifically, consolidation of the functional entities and systems will allow development of joint doctrine, training, tactics and procedures within the Joint Fires Cell. Fielding and testing of the prioritization, pairing, and deconfliction algorithms can be incorporated as tactical aides until confidence is gained that allow for distributed processing at the next lower command level. As proficiency and efficiency are gained, along with supplying more bandwidth to the edge,

further delegation can be implemented. This “build a little, test a little” approach will mitigate the risks involved with transition from status quo (plus) to a fully distributed process while also improving overall joint fires system performance.

Doctrine: Service doctrine continues to evolve towards capability-based operations. Doctrine should establish more developed ground and air combat support relationships among the services. Joint Tactical Doctrine Publications for JFS.

Organization and Leadership: Functionally equivalent organizations should be consolidated, physically or virtually, with formal organizational linkage under the JFC construct. This organizational consolidation should be used as the catalyst for functional collaboration.

Training and Tactics: Develop a core syllabus of standardized, joint training for calls-for-fire which should be included in every service’s basic combat skills list. Develop a common joint tactical publication set to reinforce this core syllabus. Development of automated tactical decision aides that will form the prioritization, pairing and deconfliction algorithms to enable transition to distributed joint fires support network should be pursued.

Material: DoD continue realignment to permit the development of interoperable systems. The DoD should assign the requirements, authority, and funding of C2 programs into a single track, possibly under a Joint Program Executive Officer as the instrument of that change. Investments in communications should continue with an emphasis on providing more bandwidth to the fielded troops, ships, and aircraft.

Personnel and Facilities: The DoD should designate a “Center of Excellence” for the development of the family of decision algorithms necessary to support automated command and control.