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Joint All Domain Command & Control (JADC2) Naval Analysis

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NPS NRP Executive Summary

Art and Science of JADC2 Conceptualization from a Navy Perspective

Period of Performance: 01/01/2022 – 12/31/2022

Report Date: 12/31/2022 | Project Number: NPS-22-N184-A

Naval Postgraduate School, Information Sciences (IS)



NAVAL RESEARCH PROGRAM

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MONTEREY, CALIFORNIA

ART AND SCIENCE OF JADC2 CONCEPTUALIZATION FROM A
NAVY PERSPECTIVE

EXECUTIVE SUMMARY

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Project Summary

Joint All Domain Command and Control (JADC2) is the art and science to rapidly translate knowledge and information into decisions and actions. It seeks to integrate all services across all warfare domains and through all communication environments. The research described in this report works toward JADC2 conceptualization from a Navy perspective. A comparative case study is used to analyze command and control (C2) for a maritime focused joint task force (JTF) involving integrated fires and grey zone operations across services. Key results highlight the importance of satellite communications to enable JTF integration, and they elucidate a matrix of critical communication links that emerge in environments of denied, degraded, intermittent or limited (DDIL) communication. This DDIL communication matrix serves as a prioritized JADC2 requirements set. Recommendations center on prioritizing these requirements; articulating and disseminating clear command intent that can be understood and implemented in DDIL environments; practicing Mission Command, Battle Rhythm Dilation, and Edge C2; remembering that people remain the most important element in JADC2; and developing the new knowledge, education, training, and practice necessary for JADC2 success.

Keywords: *agile C2, command and control, C2, rapid reconfiguration, knowledge flow, Joint All Domain Command and Control, JADC2, Mission Command, Battle Rhythm Dilation, Edge C2*

Background

JADC2 seeks to address the many challenges of C2 across all domains and services, but it requires thoughtful conceptualization, especially from a Navy perspective. A comparative case study is used to analyze C2 for a maritime focused JTF involving integrated fires and grey zone operations across services. The baseline case represents a geographically distributed carrier strike group (CSG), surface action group (SAG), Air Force (AF) wing, and Marine expeditionary force (MEF) operating jointly, through conventional C2, with full communication capabilities. The comparison case depicts this same JTF without satellite communications.

Comparative analysis across these cases exposes many C2 challenges and helps to conceptualize how JADC2 must support both operational and tactical levels of war, along a continuum of communications capabilities. This analysis also provides insight into elements of C2 that extend well beyond technology; particularly the people, processes, and organizations comprising the JTF; along with the knowledge, information, and data that must flow to interconnect them.

The analysis enables us to apply theory representing the state of the art and to draw from tools and techniques representing the state of the practice in knowledge management, organization, and C2 to JTF organizations and operations. This enables us also to induce new knowledge from analysis of JTF operations, which offers potential for translation into enhanced and refined Navy C2 organizations and approaches.

Findings and Conclusions

Key findings highlight the importance of satellite communications to enable JTF integration. This applies in particular to geographically dispersed services seeking to interoperate in an integrated manner. Further, a matrix of critical communication links emerges through analysis of DDIL environments. This DDIL communication matrix serves as a prioritized JADC2 requirements set.



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Interestingly, respective Navy, Air Force, and Marine tactical operations within the CSG and SAG, AF wing, and MEF do not suffer as greatly in DDIL environments as their joint and operational counterparts seeking integrated fires and operations across services. Details remain beyond the classification level of this document.

Additionally, the prioritized JADC2 requirements set involves much more than technology. Indeed, commanders at all organization levels need to articulate and disseminate clear command intent that can be understood and implemented in DDIL environments, and subordinates at all levels must be able to understand and translate such intent into desired actions. This requires practice: Commanders at all organization levels and units at all levels need to practice operating under Mission Command and Battle Rhythm Dilation, for extended periods of time, much as the way that integrated submarine operations do. Moreover, these commanders and units need to practice integrated operations through very low bandwidth DDIL communication modes, which elucidates a compelling case for Edge C2.

Finally, people remain the most important element in JADC2. Geographically dispersed joint operations in DDIL environments can depart substantially from the kinds of education, training, and experience that most military personnel encounter. This provides a use case for additional education, training, and experience to develop and refine the necessary skills and competencies required to fight effectively.

Moreover, such operations can prompt the rethinking of standard operating procedures (SOPs); techniques, tactics, and procedures (TTPs); operational orders (OPORDs); and similar explicit knowledge. The key is to anticipate, develop and refine the kind of rich, experience based tacit knowledge that needs to permeate all organization levels from deckplate to command. Such tacit knowledge—once acquired and refined—can guide effective rethinking of SOPs, TTPs, OPORDs, and similar documents.

Navy educational institutions like the Naval Postgraduate School (NPS) represent one important locus for rethinking along these lines, as do tactical training groups: NPS can develop and teach the appropriate knowledge, which tactical training groups can translate into effective procedure and practice. **This may represent the most important finding for our study sponsor: new knowledge, education, training, and practice are necessary for JADC2 success.**

Five recommendations follow accordingly: 1) Use the Communication Matrix to prioritize JADC2 requirements that emerge from this study. 2) Teach and coach organization leaders to articulate and disseminate clear command intent that can be understood and implemented in DDIL environments over extended periods. 3) Learn and practice both Navy and joint operations through Mission Command, Battle Rhythm Dilation, and Edge C2. 4) Remember that people remain the most important element in JADC2. 5) Develop the new knowledge, education, training, and practice necessary for JADC2 success, both through continued study along these lines and through new education and training course development.

Recommendations for Further Research

We have five recommendations for further research.



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1) The Communication Matrix indicates the key communication links required for effective joint task force (JTF) knowledge and information flows across service, unit, platform and geographic boundaries; and it shows which are affected most severely by denied, degraded, intermittent or limited (DDIL) communications. This provides an opportunity for each link to be studied more deeply—in terms of associated people, processes, organizations, and technologies.

2) Teaching and coaching leaders to articulate and disseminate clear command intent that can be understood and implemented in DDIL environments over extended periods should begin with dilation of the JTF battle rhythm. DDIL may require JTF commanders to receive knowledge and information inputs less frequently, with proportionately longer periods between opportunities to direct and guide subordinate commanders and units. Training and practice will be essential. This provides an opportunity to develop the corresponding courses and exercises.

3) Mission Command is likely to be understood relatively well, but it remains unclear how frequently and persistently it is practiced in the fleet and across services. With less frequent knowledge and information exchanges, the JTF—and most subordinate commands—will encounter Battle Rhythm Dilation, and commands at different hierarchic levels will likely follow different rhythms. For commands and forces accustomed only to a 24-hour rhythm, this may require considerable adjustment and practice. This provides an opportunity to develop the corresponding courses and exercises.

Alternatively, Edge C2 is less likely to be understood well, yet it is crucial for commanders and units to integrate operations through very low bandwidth DDIL communication modes. The C2 field has accumulated over two decades of research regarding Edge C2, but surprisingly little of the corresponding knowledge has found its way into Navy doctrine and training. This provides an opportunity to develop the corresponding courses and exercises.

4) It is both easy and routine for a project like Joint All Domain Command and Control (JADC2) to degrade into a portfolio of technology efforts. However, JADC2 has a very long way to go before the Sense-Make Sense-Act cycle can be automated (if ever). This applies in particular to the latter two steps: decision makers and other people have to make sense of situations, while warriors and other people initiate and execute the associated actions. The faster that cycles become—speedy cycles represent an express JADC2 expectation—and the worse that DDIL restrictions become—severe environments represent an express JADC2 expectation—the more challenging each step of the cycle becomes. This provides an opportunity for further study.

5) Each of these recommendations for further study points to knowledge gaps. Some gaps (e.g., 2 and 3) are relatively clear and can be filled through development of additional education and training courses, along with corresponding exercises and practice, whereas others (esp. 1 and 4) are less clear and require further study.

Acronyms

AF	Air Force
CSG	carrier strike group
C2	command and control
DDIL	denied, degraded, intermittent or limited communication
JADC2	Joint All Domain Command and Control



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JTF	joint task force
MEF	Marine expeditionary force
OPORDs	operational orders
SAG	surface action group
SOPs	standard operating procedures
TTPs	techniques, tactics and procedures
NPS	Naval Postgraduate School

