The North Atlantic Treaty Organization faces an increasing security threat with peer-level opposition forces possessing significant joint Fires capabilities that are highly interoperable, and capable of providing timely, accurate, massed Fires in support of maneuver operations. The alliance fire support community continues to focus on increasing its joint fire support interoperability, and synchronization of joint fire support to meet the challenge of a capable peer opponent.

Over the past few years, NATO’s focus shifted from deter and assure, to deter and defend across the full spectrum of operations. To accomplish this, NATO took its training focus from a non-Article V scenario to an Article V, decisive action/major

Figure 1. The fire control exercise concept (Courtesy illustration)
combat operation scenario. The NATO fire support community is furthering NATO efforts by providing timely and accurate joint fire support to deter and defend against a peer opponent. The joint Fires support element (JFSE), per Allied Artillery/Publication-5 (NATO Fire Support Doctrine), details corps-level requirements for joint fire support element to provide fire support command and control (C2), and manage artillery employment. Fire control requires a robust JFSE capable of providing C2. NATO Force Structures are not currently fully capable of providing fire control, necessary to engage peer-level opponents during an Article V, decisive action/major combat operation scenario. This is largely due to the lack of appropriate manning, training and existing equipment gaps that prevent responsive, deep, shaping fire support in order to shape the NATO Force Structure area of operations.

The 1st German-Netherlands Corps, a NATO Force Structure, is supporting NATO’s efforts to provide digital Fires interoperability and enhancing its own Fires warfighting capabilities to meet its military objectives. To accomplish these tasks, 1st GNC’s Fire Support and Air Space Management (FSAM) developed and executed a fire support interoperability exercise...
demonstrating 1st GNC’s capability to provide fire support interoperability, fire control and a fire support common operating picture (COP). The aim of this event was to demonstrate long-range, digital, multinational interoperability between fire support systems, with a future goal to include joint Fires interoperability. The 1st GNC fire support team incorporated digital fire control systems (the ADLER and Advanced Field Artillery Tactical Data System) from the German Army Concept and Capabilities Division and the United States Army Europe into 1st GNC’s organic and the 2nd Cavalry Regiment’s communications systems to provide fire support mission command. The German ADLER and U.S. AFATDS fire control systems use the Artillery Systems Cooperation Activities (ASCA) program (an internal program to each of the systems) to pass digital traffic between the two systems. This exercise contributed to the ongoing efforts of the NATO fire support community to provide corps/Land Component Command/joint task force multinational, joint, deep, shaping Fires in support of NATO Force Structure military objectives.

The 1st GNC fire control exercise, see Figure 1, occurred January 2018 at the Luettow-Kaserne Muenster - Handorf Barracks, near Muenster, Germany. We used a classroom setting to conduct our fire control exercise (FCX) and test our problem statement:

“How does 1st GNC plan, conduct and manage a digital, joint Fires operation between multinational units, while not having the ability to train consistently with corps enablers, different digital equipment, software and encryption?”

To answer this, we spent five days testing our primary, alternate, contingent, emergency (PACE) communications architecture, conducted interoperability testing, and further developed the corps fire control element task organization. The communications architecture, see Figure 2 opposite page, included upper tactical infrastructure i.e., internet via tactical satellite (organic 1st GNC asset), and lower tactical infrastructure (LTI) such as tactical satellite (TACSAT) and high frequency (HF) radios. The German ACCD, and USAREUR Fires cell provided personnel and fire control boxes; the German ADLER fire control system and the U.S. AFATDS respectively, to support our efforts. Communications equipment, and expertise were provided by the 1st GNC (satellite and AN/PRC-117F TACSAT radios), and 2nd Cavalry Regiment (AN/PRC-150 HF radio). Additionally, we refined our proposed future corps Fires troop concept (task organization and equipment) that will enable the 1st GNC to provide fire control organically (with augmentation), or through an attached force field artillery headquarters (FFHQ). This exercise allowed us to derive several lessons learned and set conditions for future fire control exercises.

Overall, the 1st GNC FCX was a success, validating proof of concept, but falling short of achieving maximum test results. First GNC designed and executed the FCX to verify the validity of our digital interoperability and Fires common operating picture; however, equipment challenges prevented us from fully testing the communication’s architecture. Although we did not realize our end goal, the test highlighted opportunities for improvement and provided an improved starting point for our next FCX.

The corps’ primary means of sending digital traffic is to pass data between fire control systems on two separate Local Area Networks (LAN) via 1st GNC organic tactical satellite connections in order to create a Wide Area Network (WAN). First GNC established a network intended to simulate two separate physical locations in a classroom setting, see Figure 3. One of the lessons learned was to ensure all participating nations involve their information assurance personnel earlier on in the process to ensure appropriate system’s security classification is not an issue. Although we believe the concept to be valid, we were unable to fully test the theory. However, we were able to pass digital traffic between ADLER and AFATDS via a local area network. The next step is to fully connect the fire control systems through a dedicated satellite network to verify digital interoperability. This is our focal point for the next firecontrol exercise. In the long term, NATO must adopt a mission partner environment (MPE), or a federated mission network (for this article we will use the mission partner environment naming convention) to share information across different system security classifications, see Figure 4. To accomplish this, NATO must identify information exchange requirements, using approved message formats (such as a variable message format), to pass information through a gateway using the multinational interoperability program, and agreed upon rule sets, to a mission partner environment. This MPE would allow all multinational partners to share Fires information, conduct fire control and provide a digital Fires COP at every echelon.
Our next step was to test our alternate means of communication: passing digital Fires data through a TACSAT radio. The assumption going into the exercise was that we would have challenges connecting the ADLER and AFATDS through TACSAT radio due to the model TACSAT (2x ANPRC-117F) radios we had available. The ANPRC-117F radio does not support TCP/IP protocol enabling the connection between the different fire control systems (ADLER, AFATDS). The upgraded ANPRC-117G model supports the TCP/IP protocol enabling the TACSAT connection between the AFATDS and ADLER (and any additional multinational fire control system), thus enabling digital interoperability. We will integrate ANPRC-117G model TACSAT radios into our next FCX in order to confirm TACSAT radio digital Fires interoperability.

The final interoperability test (testing our contingency plan) was the integration of a high frequency radio into the digital communications architecture. Our assumption was that the AFATDS to AFATDS connection to the AN/PRC-150 HF radio would be successful since U.S. units do this on a consistent basis, but our research showed there might be a challenge for the ADLER to connect to the U.S.-provided HF radio. The 2nd Cavalry Regiment provided the HF radio, established a HF link from Haddorf to Vilseck, Germany, and maintained a strong connection all week. The intent was to test an AFATDS to AFATDS link, and an ADLER to AFATDS link via HF radio. However, the ADLER was unable to recognize the U.S.-provided HF radio, but could pass data through a LAN to an AFATDS, which in turn passes data to another AFATDS over the HF radio. We intend to go a step further during the next FCX by linking an ADLER (or other multinational fire control systems) to the AFATDS via a wide area network and then pass digital traffic over HF. Additionally, we continue to research a workaround that would allow the ADLER (or other multinational fire control boxes) to connect directly to a U.S.-provided HF radio, thus eliminating the need for the additional WAN, or LAN connection.

NATO Force Structures are not ideally suited to conduct fire control in their current manning configurations. During our FCX, the FSAM section further refined a proposed task organization that addresses current fire control, and interoperability gaps. Figures 3A and 3B illustrate the proposed 1st GNC task organizations without a FFHQ (Figure 3A), and with an attached FFHQ (Figure 3B), the necessary equipment and personnel to conduct fire control, and manage a digital Fires common operating picture. Ideally, the 1st GNC would have an attached Force Field Artillery HQ capable of providing corps-level fire control while also providing personnel and equipment to the corps HQ to enable Fire command and control between the corps, and the FFHQ. This would also provide a robust corps digital Fires COP; enhance the targeting process; and enable more synchronized corps-level deep shaping operations. In a best case scenario, this FFHQ would be multinaitional in composition to better incorporate the diverse Fires capabilities found in the alliance, and help bridge the gap in human and technical interoperability. The future for NATO Force Structure and the 1st GNC is to continue testing corps troop concepts for Fires in future exercises to demonstrate a corps’ ability to provide robust interoperable network architecture (satellite, TACSAT and HF), plan and execute corps shaping operations, conduct corps-level fire control (ideally with an attached FFHQ), and manage a digital Fires common operating picture.

As stated earlier, the 1st GNC fire control exercise was a resounding success. We validated our problem statement, and the fire control and interoperability concept. Additionally, we established a future gated strategy to close the Fires interoperability gap with respect to personnel, equipment and training. We knew going into the exercise that there would be interoperability challenges, since this was the first time in over a decade that the corps, and a NATO Force Structure in general, attempted to bridge multiple network gaps in support of Fires interoperability. This exercise, and future exercises will establish a path for NATO and allied partners to further develop and improve fire control at all echelons. Digital Fires interoperability between multinational fire control systems via satellite, TACSAT, and HF radios are feasible, but must be trained and exercised on a regular basis to ensure the capability is present should the need arise. NATO, along with multinational partners, realizes the need to share information across different networks and systems, with different security classifications, to a mission partner environment that provides a Fires COP, and enables rapid Fires planning, synchronization and execution at all echelons. Exercises such as the Dynamic Front series, and home sta-
tion training are excellent opportunities for macro (large multinational exercises) to micro (home station training) level testing of systems and digital sustainment training. The 1st German-Netherlands Corps intends to continue to conduct future fire control exercises with our multinational partners, to include other NATO Force Structures, USAREUR, and the Royal Netherlands Army Fire Support Command in order to increase the corps’ ability to manage a Fires COP, and conduct digital fire control using fire control systems that have the ASCA protocol. Partnered training allows the 1st GNC, and by extension NATO, to plan, conduct and manage digital joint Fires operations between multinational units, and directly contributes to NATO's expanding Fires warfighting capability. Additionally, NATO must expand Fires interoperability to the joint realm, ensuring all component commands are able to share information, synchronize joint Fires and provide a common understanding for commanders and staffs at all levels. The push to increase digital Fires interoperability enables NATO to continue to provide the competitive edge required to assure deterrence and provide effective multinational fire support during potential future major combat operations.

Lt. Col. Derek Baird is the 1st German-Netherlands Corps (a NATO Force Structure) joint fire support officer. Baird has participated in numerous multinational NATO exercises from 2015-2018, and is working with a NATO team to develop a mission partner environment enabling digital Fires interoperability.

Sailors Arleigh Burke-class guided-missile destroyer USS Donald Cook (DDG 75) fire a standard missile 3 during exercise Formidable Shield 2017. Formidable Shield is a U.S. 6th Fleet led, Naval Striking and Support Forces NATO-conducted exercise which will improve allied interoperability in a live-fire integrated environment, using NATO command and control reporting structures. (1st Class Theron J. Godbold/U.S. Navy)