

MADLx: Setting Foundations to Measure ROI

UX EXERCISE MEMO:
DI-MGMT-80227 BOLD QUEST 20.2

6 January 2021

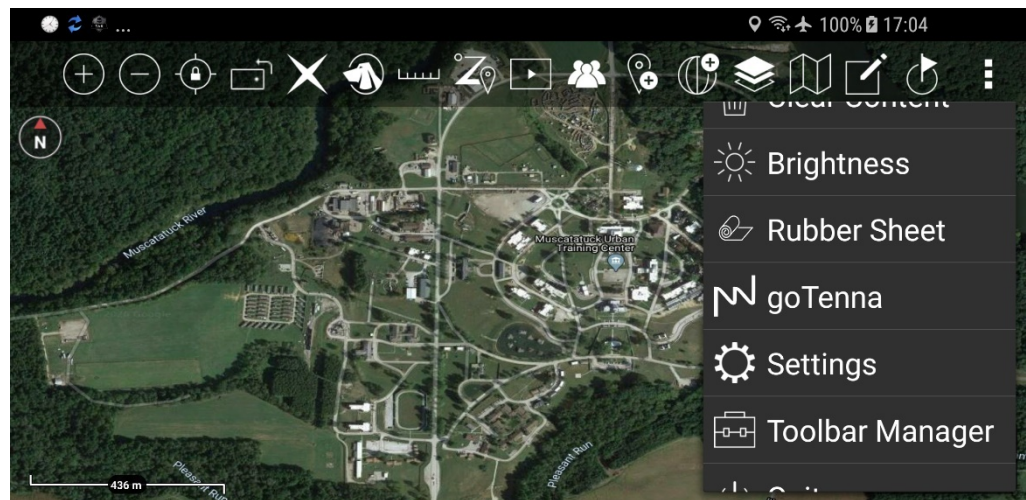
This work was supported by the U.S. Advanced Distributed Learning (ADL) Initiative (HQ0034-19-C-0027). The views and conclusions contained in this document are those of the authors and should not be interpreted as representing the official policies, either expressed or implied, of the ADL Initiative or the U.S. Government. The U.S. Government is authorized to reproduce and distribute reprints for Government purposes.



Distribution Statement A

Approved for public release: distribution unlimited.

REPORT DOCUMENTATION PAGE				<i>Form Approved OMB No. 0704-0188</i>	
The public reporting burden for this collection of information is estimated to average 1 hour per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing the burden, to Department of Defense, Washington Headquarters Services, Directorate for Information Operations and Reports (0704-0188), 1215 Jefferson Davis Highway, Suite 1204, Arlington, VA 22202-4302. Respondents should be aware that notwithstanding any other provision of law, no person shall be subject to any penalty for failing to comply with a collection of information if it does not display a currently valid OMB control number.					
PLEASE DO NOT RETURN YOUR FORM TO THE ABOVE ADDRESS.					
1. REPORT DATE (DD-MM-YYYY)		2. REPORT TYPE		3. DATES COVERED (From - To)	
4. TITLE AND SUBTITLE				5a. CONTRACT NUMBER	
				5b. GRANT NUMBER	
				5c. PROGRAM ELEMENT NUMBER	
6. AUTHOR(S)				5d. PROJECT NUMBER	
				5e. TASK NUMBER	
				5f. WORK UNIT NUMBER	
7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES)				8. PERFORMING ORGANIZATION REPORT NUMBER	
9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES)				10. SPONSOR/MONITOR'S ACRONYM(S)	
				11. SPONSOR/MONITOR'S REPORT NUMBER(S)	
12. DISTRIBUTION/AVAILABILITY STATEMENT					
13. SUPPLEMENTARY NOTES					
14. ABSTRACT					
15. SUBJECT TERMS					
16. SECURITY CLASSIFICATION OF:			17. LIMITATION OF ABSTRACT	18. NUMBER OF PAGES	19a. NAME OF RESPONSIBLE PERSON
a. REPORT	b. ABSTRACT	c. THIS PAGE			19b. TELEPHONE NUMBER (Include area code)



January 6,
2021

UX EXERCISE MEMO: DI-MGMT-80227 BOLD QUEST 20.2

The views and conclusions contained in this document are those of the authors and should not be interpreted as representing the official policies, either expressed or implied, of any U.S. or foreign defense agency. This work was supported under contract with the ADL Initiative (HQ0034-19-C-0027).

CONTENTS

BACKGROUND AND CONTEXT-----	2-3
ADL COMPONENT: ONLINE PRE-TRAINING-----	3-4
SURVEY DATA: PRE-TRAINING-----	4-5
SURVEY DATA: FFT DEVICE-----	6-8
SURVEY DATA: ATAK DEVICE-----	8
EXERCISE GENERAL OBSERVATIONS-----	8-9
ROI DASHBOARD-----	10
CONCLUSIONS-----	10-11

BACKGROUND AND CONTEXT

The Coalition Capability Demonstration and Assessment series, known as Bold Quest, fosters Joint and Coalition resource pooling, collaborative data collection, and data analysis to inform capability development on a Joint and Coalition scale. The plan for Bold Quest 20.2 was to study a population of subjects from the USA and five allied countries (Belgium, Canada, Finland, Norway, and Sweden). However, the COVID-19 pandemic obstructed participation by the international partners. Only Belgium tried to continue after the pandemic began, but it withdrew following its initial involvement in online pre-training preparation.

The participants completed a demographic survey, either online in advance or upon arrival at base camp, revealing the structure of the training audience. The Squad (SQUAD) and Leader (LDR) groups represented most of the participants. The Exercise Control group (EXCON), which comprised of one or two undisclosed members, expressed their opinions only on the first and last days of the exercise. The Anonymous group members belonged to either SQUAD or LDR, but they did not declare it. Hence, their data was put into a separate Anonymous (ANON) group, and their opinion can serve as a control group. (Figure 1)

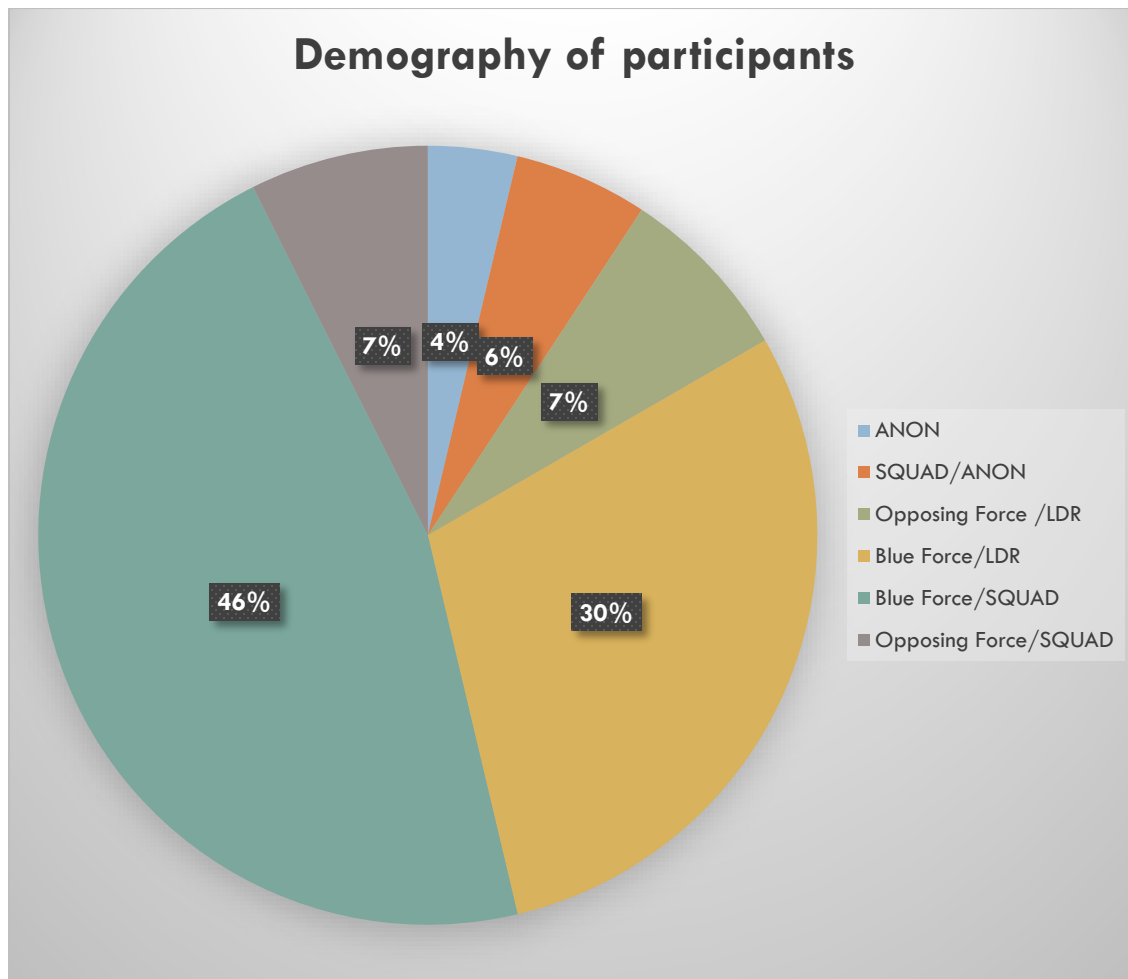


Figure 1. Participant groups

In addition to standard information, the demographic survey included questions about similar training and prior operational experience in the capabilities being demonstrated. Approximately two-thirds of participants were completely novice and had minimal exposure to the Friendly Force Tracking (FFT) technology type or did not have any experience with this technology, while the remainder had some or modest experience. (Figure 2)

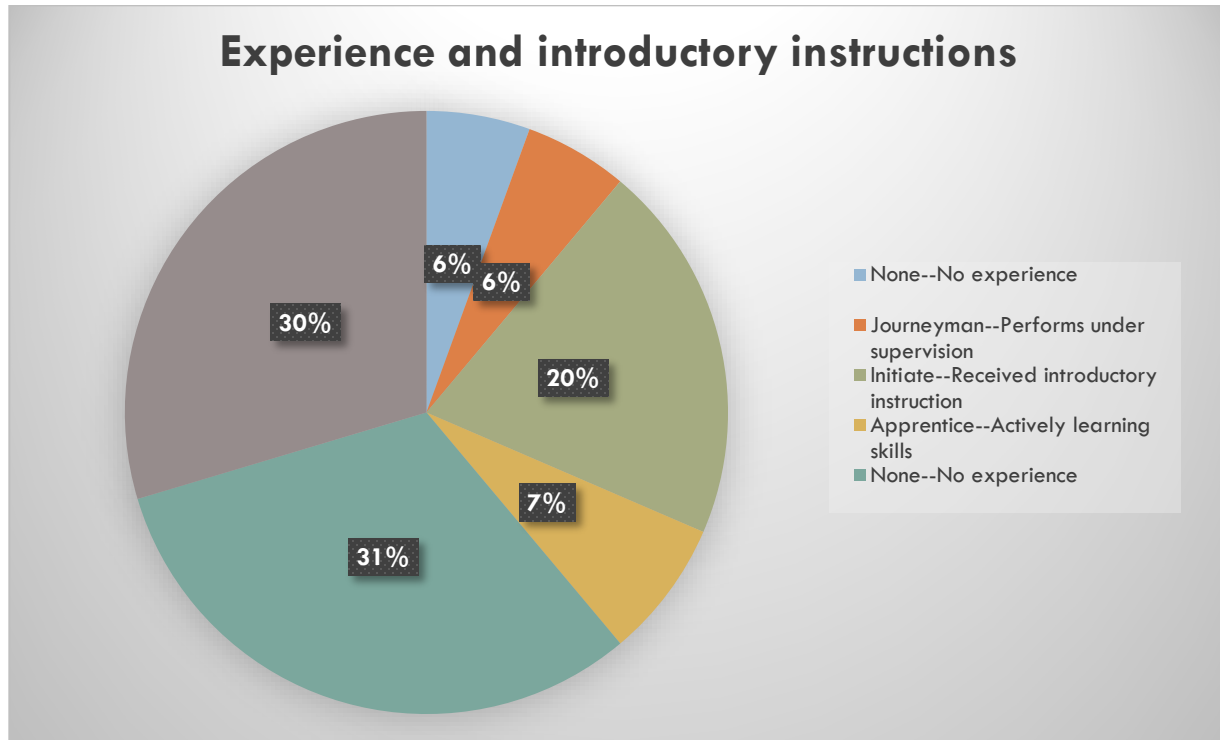


Figure 2. Participants' previous experience

ADL COMPONENT: ONLINE PRE-TRAINING

With USA JSJ6 SMEs, we developed an xAPI format online course to support teaching use of the Android Tactical Assault Kit (ATAK) device. The Advanced Distributed Learning (ADL) support was offered to international and USA participants on an independent Learning Management System (LMS) as follows:

- ATAK training course
- ATAK promotional video
- Demographic survey
- Tactical survey
- Technical survey

A Learning Record Store (LRS) collected statements for learners' experiences. Of the 108 planned participants, 12 accessed the platform, primarily Belgian personnel – before the country departed the exercise – and the USA SMEs. We collected a total of 4,164 xAPI statements. The 54 exercise participants did not access the platform, relying instead on a day-long block of hands-on, in-person training instruction

with devices prior to the exercise. This training was conducted by SMEs who accessed the LMS platform. (Figure 3)



Figure 3. LMS introductory video

SURVEY DATA: PRE-TRAINING

Self-reported data was collected every day after the mission to establish participant opinion on the experiment experience. This was achieved utilizing standard Likert-type seven-item scales for a set of questions. (Scale: 1=Strong disagreement to 7=Strong agreement). The aggregated data showed overall participant satisfaction with pre-training. Large majorities agreed with the statement that the pre-training was sufficient to use a Friendly Force Tracking (FFT) device effectively. (Figure 4)

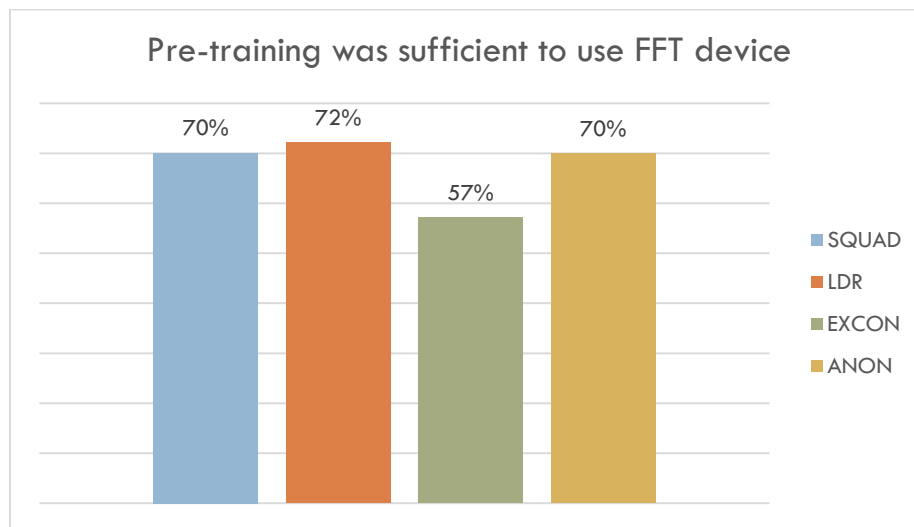


Figure 4. FFT device average training satisfaction rating

On the question of satisfaction with pre-training for effectively using the ATAK device, participant approval rose by an average of six percentage points. (Figure 5)

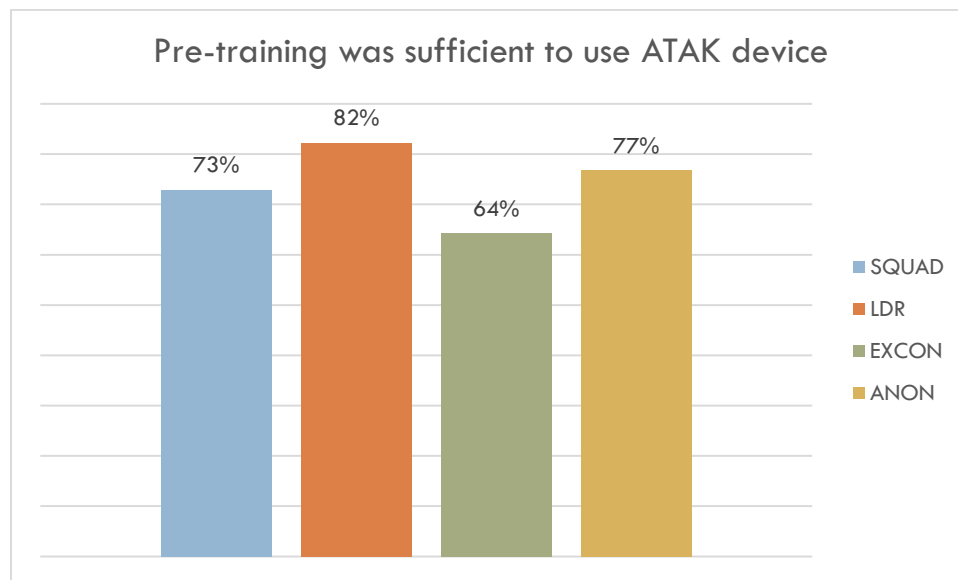


Figure 5. Average ATAK device training satisfaction rating

The participants also made general observations about the training. The text analysis of participant comments reveals that for a majority, this represents a new training experience. It also shows that though they were told to take part, the participants were motivated to learn. (Figure 6)



Figure 6. Word cloud of participants' free comments based on frequency

SURVEY DATA: FFT DEVICE

The exercise organizers used the Mission Awareness Rating Scale (MARS) system, an eight-item Likert scale that allows the participant to rate their self-assessment of their ability to identify, understand, and predict the situation they just completed, and the difficulty of functioning within that scenario (Matthews, Beal, Pleban, 2002). The Scale runs from 1 (Strongly disagree) to 7 (Strongly agree) with the option of choosing “Does not apply.”

We analyzed their answers about using an FFT device and concluded the following:

- Only the EXCON group reported that it experienced a lack of training; the other participants considered training to be more than 70% sufficient to prepare them to use the device effectively.
- All participants expressed a desire for improved battery life.
- Most participants reported experiencing adequate and easy use in daylight but less effective use during the night. Only the EXCON members expressed the opposite: that night use was perfect, and day use was worse. It is possible that EXCON members have extraordinary vision or that they made a mistake in expressing their opinion.

SQUAD:

Many SQUAD participants expressed dissatisfaction with battery life, assessing that it is not sufficient to support the mission: the average satisfaction rating was 56%. Their willingness to use an FFT system while deployed was similarly low (average of 58%). The average satisfaction rating was 60% on the question of whether the system is critical for maintaining situational awareness between coalition/partner forces; and SQUAD participants gave an average rating of 61% to the conclusion that the FFT system improved their ability to complete the mission. The SQUAD users expressed the greatest approval of the FFT system's weight (average rating of 76%), screen size (average rating of 72%), and its ease of use during the daytime hours and in direct sunlight (average rating of 72%). Fewer SQUAD participants evaluated the FFT system effective at night, with an average satisfactory rating of 65%. (Figure 7)

LDR:

The LDR group generally expressed a better experience with the device than the SQUAD group. They reported fewer technical issues while using it (average rating of 64%), though they also said that battery life is not sufficient to support mission performance (average satisfaction rating of 68%). Both their desire to use the FFT system while deployed and their assessment that it is critical for maintaining situational awareness between coalition/partner forces was low: the average rating on each was 66%. The LDR participants found the weight acceptable (average rating of 80%) and screen size adequate (average rating of 82%). They said that the device is easy to use during the day (average rating of 82%), but they were less positive about its nighttime use, giving this an average rating of 75%. (Figure 7)

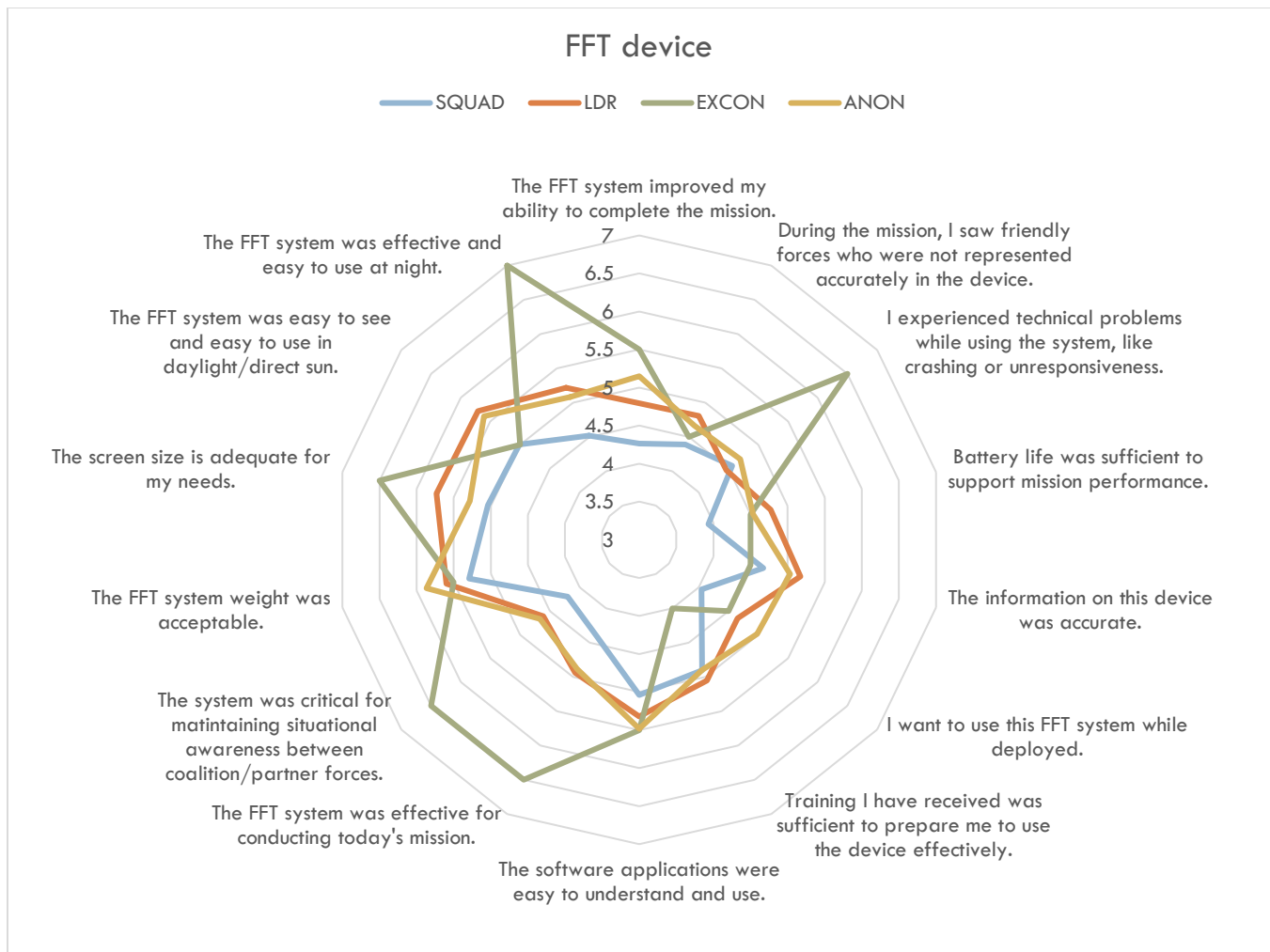


Figure 7. MARS for FFT device

EXCON:

Members of the EXCON group expressed their opinion only at the beginning and end of the exercise. They showed the lowest level of satisfaction with the training received: the average rating for whether it was sufficient to prepare for using the device effectively was only 57%. Curiously, considering the experience of the other groups, the EXCON participants gave a perfect score and 100% satisfaction rating for use of the device during the night but only 71% for use during the day. They reported having the fewest technical issues, with a high average satisfactory rating of 93%. They strongly expressed that the system was critical for maintaining situational awareness between coalition/partner forces (average rating of 93%) and that the FFT system was effective for conducting the mission, also with an average rating of 93%. (Figure 7)

ANON:

The participants who did not disclose their team also assessed that battery life is not sufficient to support mission performance, giving it an average satisfaction rating of 65%. They showed the highest enthusiasm of any group, except EXCON, that the system was critical for maintaining situational awareness between coalition/partner forces, though at a still-low average rating of 67%. The anonymous participants gave their

highest average satisfaction rating to the weight of the device (84%), followed by the ease of use during daylight (80%), and the ease of nighttime use coming in third at 73%. (Figure 7)

SURVEY DATA: ATAK DEVICE

Reported ease of understanding and using the display and symbols was higher for LDR members (average rating of 86%) than for SQUAD members (71%). The reported ease of transition to goTenna was higher for LDR (average rating of 81%) and for SQUAD members (77%) than for the ANON group, which gave it an average rating of 63%. (Figure 8)

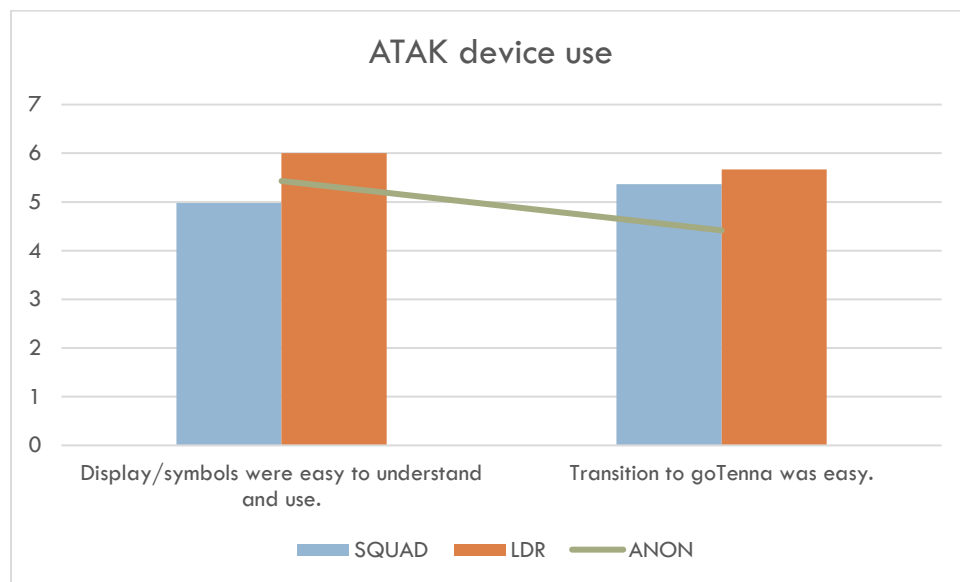


Figure 8. MARS for ATAK device

EXERCISE GENERAL OBSERVATIONS

The post-mission surveys included daily feedback on how confident the participants were about their performance during the mission, ranked on a scale of 1 (Not at all Confident) to 10 (Very Confident). Aggregated averages showed that SQUAD members had a more level opinion about their performance, with the peak occurring on the last day, while LDR members felt that their performance was lower but better on the second and last days of the exercise. The third day of the exercise appeared to be particularly tough for the ANON group, while the EXCON group thought that its performance declined towards the end of the exercise. (Figure 9)

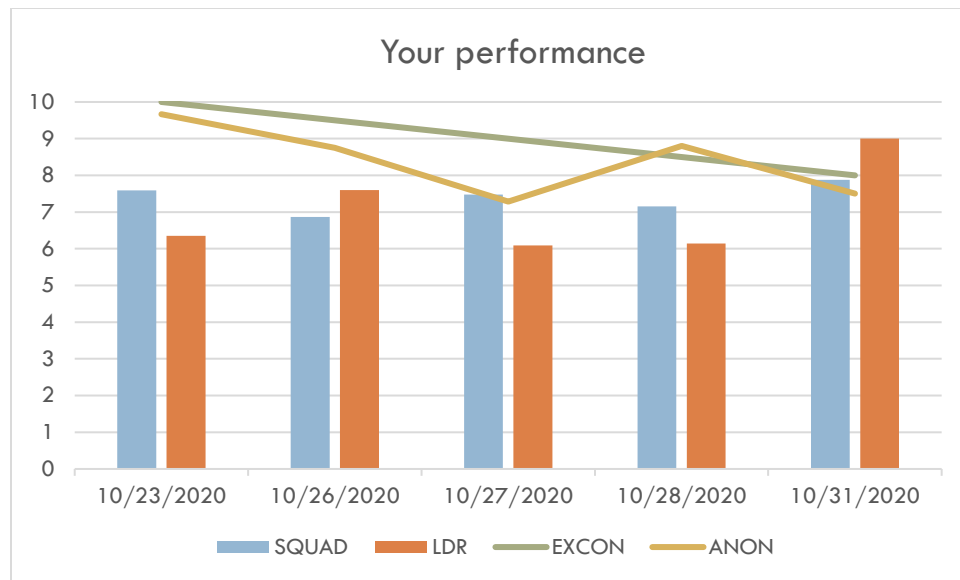


Figure 9. Participant self-observations on performance

Participants also were asked every day to rate the mission's success from their perspective, ranked on a scale of 1 (Not at all Successful) to 10 (Very Successful). SQUAD members had a slightly lower aggregated average rating of the mission than of their own performance. With only a slightly worse second day, they thought that the mission success was steady until the end. The LDR group thought quite the opposite, that the second day was better than the other days and the mission was most successful on the last day. For both the EXCON and ANON groups, mission success dropped from the first day of the exercise. (Figure 10)

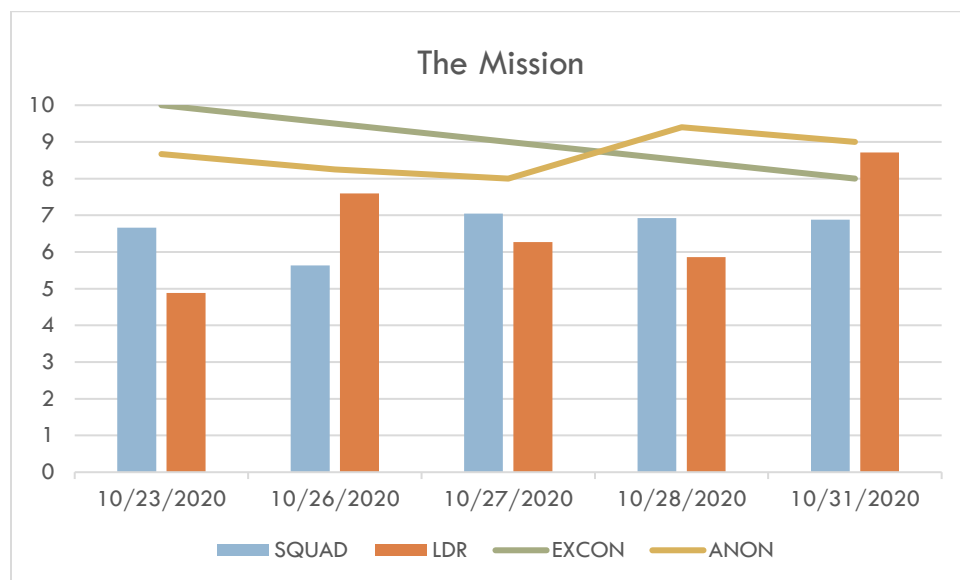


Figure 10. Participant self-observations on mission success

ROI DASHBOARD

As noted above, the virtual learning environment was used only by international participants who did not participate in the live exercise. The LMS was the sole xAPI data source. Participants spent an average of 30 minutes on the platform and achieved an average score of 100%, with all passing the knowledge check for ATAK device use. Their learning behavior, however, was not relevant for the exercise. (Figure 11)

 TIME SPENT		
 Learners	 Average Time	 Average Score
12	00:30:57	100

Figure 11. Bold Quest 20.2 LMS users

Training range applications offer sensor data that can arrive on separate real-time data streams with time-space position information (TSPI). For Bold Quest 20.2, these data became not sharable, and we could not include them in the findings. In most circumstances, these data should be converted and filtered for uses such as target acquisition, range safety, or similar activities related to mission success. Also, the ROI dashboard could not obtain the Behavioral Observations: the Behaviorally Anchored Rating Scale (BARS) and Behavioral Observation Checklists (BOCs), specifically on mission success, which are captured for each mission based on input from the white cell, lead analyst, opposing forces (OPFOR) lead and similar personnel using a four-category scale (Success/Marginal Success/Marginal Failure/Failure). Without sharable sensor data and mission success data, the ROI dashboard also was not able to utilize basic analysis algorithms.

CONCLUSIONS

In this exercise, we expected to improve operations effectiveness by participants who utilize ADL. We also aimed to enhance individual training/education effectiveness by participants who utilize ADL content. Although we were able to collect, analyze, and visualize useful data from the exercise itself, the COVID-19 pandemic undermined our ADL effort by eliminating international participation. In addition, the USA participants (except for USA SMEs) did not access the ADL content for unknown reasons. With only sharable self-assessment survey data from the exercise, and without TSPI and mission success data, we were not able to utilize the ROI dashboard or give actionable analytics on the training environment to maximize performance success and improve the learning environment.

With early integration of ADL in planning, we were able to match the eLearning courseware to the training needs and objectives. We executed a solution that is fully integrated within the planning and operations environment of the Bold Quest exercise series with a strong potential for a continuing role.