NEW ZEALAND DEFENCE FORCE
Capability Branch
MINUTE

10081/CAP/4/2/02
10081/CAP/4/2/04

16 April 21

DCN
DCA

For Information:
ACCAP

PRECISION LOITERING MUNITION EXPERIMENTATION: REQUEST FOR APPROVAL TO INITIATE BATTLE LAB

References:
A. DPB Naval Experimentation Opportunities – 6 Nov 20
B. Naval Experimentation Battle Labs (Switchblade/ASV) Email from Navy Finance Business Partner dated 12 Jan 21
C. Naval Experimentation: Loitering Munition and Autonomous Surface Vessel (Littoral Warfare) Request for Approval to Commit Funds (ACF) Dated 16 Dec 20.
D. DFI 91 Chap. 14 (Previously DFO 77 Chap. 12))
E. Joint Fires Minute 03/2020 Proposed Battle Lab (Loitering Munition), dated 16 Feb 21.
F. DLS Minute 33 2021 of March 21
G. DTA Force Protection Research Tasking as generated by Maritime Domain Capability Branch, dated 11 Dec 20.

BACKGROUND

1. Ref A outlined an opportunity to advance Naval Experimentation to inform future capability initiatives. However guidance from NZDF finance at ref B has further advised that the planned fiscal approach for the loitering munition from ref A will need to be expensed in the 21/22 fiscal year as this is the planned timeframe for execution activities. The purpose of this minute is to amend the application for funding at ref C to approval to initiate a battle lab to explore a precision loitering munition, as part of the Maritime and Land Experimentation plans and to be considered for funding under the Navy and Army bids for FY21/22 respectively.

2. Force protection remains a constant challenge across the deployed NZDF force elements both at sea and on land. This is a current and a future challenge that needs to be constantly analysed in line with new and emerging technologies and capabilities. In the Maritime Domain the vulnerability of surface shipping to split axis swarm attacks by multiple surface craft is stark. The vulnerability to attack is compounded by the lack of long range anti-surface weaponry. In short, unless a ship has a fully armed and airborne force protection optimised helicopter it will likely be required to deal with multiple surface contacts at ranges of less than 1nm. Given

these contacts may be travelling at 30-50kts it gives the ship very little chance of successfully defending itself. s. 6(a) A loitering munition may help fill the gap between longer range helicopter mounted weapons and short range close-in ship mounted weapons. With a range of up to 5nm a loitering munition would allow for command to get ahead of the speed/time/distance mixed with command and control (C2) problem that force protection ultimately is.

3. Attack by fast surface craft is not just the purview of state actors and is a cheap and accessible means of attacking shipping for non-state actors, as is being demonstrated by Houthi rebels against Saudi Arabian shipping at the moment.

4. In the land domain, NZDF force elements lack the ability to engage targets beyond visual line of sight (BVLOS) with organic, precise, low collateral damage kinetic effects. Loitering munitions are a precise, low collateral damage weapon system that can be operated by a single person. They also have the ability to be 'waved off' should striking the intended target become undesirable or unachievable. Current loitering munitions available on the market have ranges and endurance ranging from 10km and 15 minutes to 40km and 40 minutes. When operated in conjunction with Unmanned Aircraft Systems (UAS), loitering munitions could be a genuine generational leap in how the Land Domain improves the sensor – shooter link.

5. This proposed battle lab would seek to examine the utility and viability of loitering munitions as a weapon system in both the Maritime and Land Domains.

Image 1. The US made AeroVironment Switchblade loitering munition being launched.

BUSINESS JUSTIFICATION AND IMPLEMENTATION

Strategic Case

6. A loitering munition is a small unmanned aerial system (UAS) designed to engage targets[1] BVLOS with an explosive warhead.[2] They are equipped with high resolution electro-optical and infrared camera that enables the operator to locate, identify and direct the munition onto target. The 'loiter' capability of these munitions allows the system to remain in orbit for a period of time, allowing the operator to detect, recognise and identify (DRI) a target thoroughly before a strike. Unlike other types of UAS, loitering munitions are not designed to be recovered after impact and are therefore classed as munitions, not UAS.

7. The precise application of combat power is critical to agility, operational effectiveness and legitimacy.[3] Loitering, precision munitions are widely used on the battlefield; from countering violent extremism in the Middle East to the recent conventional conflict between Azerbaijan and Armenia in the Nagorno-Karabakh region.

8. s. 6(a) .[4] A loitering munition could provide the NZDF with the ability to prosecute BVLOS targets with precise, lethal effects[5].

9. The precise nature of the munition will reduce collateral damage for strikes in complex human or physical terrain. Current offerings in the loitering munition market all have 'wave off / recommit' capability allowing the operator to cancel an attack mid-flight and ditch the munition harmlessly without the warhead functioning.

10. s. 6(a) For the RNZN to be able to continue to operate in a Pacific context the ships must have the ability to defend themselves against the cheap and fecund threat that small boats represent. Increasingly maritime warfare has taken on a larger 'grey zone' aspect with non-state actors being able to threaten Sea Lines of Communication particularly in the littoral area. For the maritime domain a loitering munition has the ability to be rapidly deployed and launched from a range of RNZN vessels especially those with limited force protection or defensive capabilities.

11. In the Land Domain the importance of a target is dependent on how it relates to an adversary's centre of gravity, critical capabilities, critical requirements and their vulnerabilities, and how achieving a desired effect on the target will support the achievement of the commander's mission. The development of a target is the systematic examination of the target as a system to determine the necessary type and duration of action that must be exerted on each target to create the required effect consistent with the commander's objectives.[6]

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[1] A target is an entity or an object that can be subjected to an effect. ADDP 3.14.2 Targeting Procedures. Ed 2 12 July 2018.
[2] Centre for the Study of the Drone, Bard College. 2017.
[3] Future Land Operating Concept 2035, Ed 2.
[4] Joint Fires and Effects (Land) Concept of Employment. Dated Mar 2019.
[5] In this instance neutralisation or destruction.
[6] ADDP 3.14 Targeting Ed 3 2015. Para 3.14.

12. The Joint Targeting Cycle (JTC) is a framework of six steps used to conduct joint targeting successfully and in accordance with LOAC. It's steps are:

a. End State and commander's objectives – mission, objectives, intent and desired effects;

b. Target development and prioritisation;

c. Capabilities analysis – best available means to affect targets;

d. Commander's decision and force apportionment – apportioning forces, weapons and capabilities to targets;

e. Mission planning and force execution; and

f. Targeting assessment – battle damage assessment (BDA), weapons effectiveness assessment (WEA) collateral damage assessment and future targeting recommendations.[7]

13. NZDF experimentation with precision loitering munitions will provide an additional capability during the 'capabilities analysis' phase of the targeting cycle. It will provide familiarity with a low collateral damage munition option and with its precise nature, increase the likihood of a 'first round hit,' thus reducing the requirement for target re-engagement.

Image 2. A US marine launches a Switchblade loitering munition.

[7] Ibid.

Scope

14. A representative, operationally proven loitering munition that is in-service with or under investigation by FVEY or NATO partners will be used. It must have the ability to integrate with existing and future RNZN/NZDF battle management, command and control, and ISR cueing ystems.

15. The experimentation will be conducted in a combined effort between RNZN and NZ Army. As a result, the execution of the experimentation activities will occur at Waiouru Military Training Area including on Lake Maowhango, and aboard RNZN vessels in a designated Military Operating Area (likely M204). Alternative land trials may be conducted at Kaipara Air Weapons range. Although the two services envisage different uses for the weapon the combined nature of the battle lab will allow for synergies to be achieved in training, target procurement and logistics.

16. The intent is to procure only inert munitions. This configuration will provide the ability to test fire a number of recoverable inert munitions to explore the integration and command and control requirements of operating such a capability. The multiple number of inert munitions will provide redundancy for damage or loss. Inert munitions will be recovered by a net to be constructed on the target platform for maritime and land based firings. The primary target platform for maritime trials is recommended to be the Typhoon target and provision has been made in the indicative budget to build a purpose built target net for the land based trials.

17. The experimentation will explore the command and control aspects of deploying a loitering munition as opposed to the specific kinetic effect. This will allow NZDF to understand the implications in heightened threat environment (such as straits transits and restricted waterways) rules of engagement, third party cueing launch command, munition wave off command, re engage, and then effect on target. It will also allow the exploration of how a weapon of this type fits in as part of a layered approach to single and multi-axis threats.

18. For the purposes of training to operate the inert loitering munition only, the vendor may be able to offer remote training. This will reduce the burden on quarantine facilities and the need to travel.

19. Dependent on the loitering munition vendor that is selected, there is a possibility to include within the scope of this activity an unmanned teaming serial with the Littoral Warfare UAV, or NZ Army UAS under experimentation. This would allow sensor to shooter software to be explored. This software enables the UAS to seek out targets and cue the loitering munition onto target, effectively extending sensor-shooter cueing out to 20+ km.

20. For the at sea phase of this battle lab a RNZN Fleet Unit will be required for at least 2 days. It must be aviation capable, and have the ability to lay and retrieve the target/net. Execution will be scheduled for early 2022.

Legal

21. A legal opinion has been sought from NZDF Legal as to legality of NZDF's use of a loitering precision munition. This was submitted at ref E which seeks specific

endorsement for experimentation with these munitions and subsequentlt endorsed at ref F.

NZDF Air, Land and Sea Worthiness

22. The current understanding for the inert training vehicle is that this becomes an airworthiness case as the vehicle is recoverable and reusable. This will require an approved UASOP from NZDF airworthiness authority and will need to be operated under the current flying management system by a trained NZDF operatror.

23. For future live munition experimentation, range planning and live exercise proceedures IAW other NZDF indirect fire weapon system planning paramaters will be utilised as a start point. .

Communications Plan

24. To manage the perception of NZDF's use of a precision loitering munition DPA will be engaged to manage a communications plan and any media interest which may occur during the conduct of the battle lab.

Image 3. The Warmate loitering munition made by WB Electronics of Poland.

Objectives

25. Objectives of the precision loitering munition experimentation:

a. To explore the feasibility of a loitering munition as a force protection weapon across RNZN Fleet Units with global reach but limited force protection capabilities.

b. Understand the command and control implications of, detecting, identifying targeting, engaging, waving off and re engaging with a Loitering Munition to prosecute BLOS targets with precise, lethal effects.

c. Explore the integration requirements with existing and future NZDF cueing/targeting systems.

d. Understand the PRICIE implications of introducing into service a loitering precision munition.

Benefits

26. Experimentation of the loitering munition will enable the NZDF to develop both force protection equipment acquisition and develop tactical procedures for such a weapon. The work done will feed into the recently commissioned DTA Force Protection Study and FVEY TTCP working groups.

Costs

27. This approval to initiate a battle lab request covers the delivery of the following equipment/services from each respective single service in FY 21/22:

Item	Cost (Fx)	Cost (NZ$)
LOITERING MUNITIONS		
3 x Inert training Vehicles (estimated cost only not quoted yet)	s. 9(2)(j)	
1 x Fire Control unit (2018 quote +2%)		
Optional: Sensor 2 shooter software[8] (estimate only not quoted yet)		
Training/ Hosting in NZ		
Target fabrication NZ costs only (AAL Support)		
Project Management		
Contingency		
Total (NZ$)		s. 9(2)(j)

28. Publicly available exchange rates for Dec 2020 have been used to convert the Fx into NZ$.

29. Approval to initiate a battle lab will endorse the submission of a bid s. 9(2)(j) to come from 21/22 OPEX from each respective service.

Operating Costs

30. There are no on-going operating costs associated with this purchase. If the results of this experimentation are determinative of a capability need, then an amendment to the relevant CMP will be made, and a project initiated.

[8] The Sensor 2 Shooter capability is only compatible with Switchblade and PUMA UAS, both made by US vendor AeroVironment

Experimentation Resources

31. The following key personnel resources are confirmed as being available to conduct the battle lab:

Role	Person	When
Joint Experimentation Manager (M)	Mr Colin Moore	Est 0.3 FTE for 1 year
Joint Experimentation Manager (L)	Mr Hayden Robinson	Est 0.3 FTE for 1 year
1 x DTA per	s. 9(2)(a)	Est 0.2 FTE for 3 months

Milestones and Timelines

32. The following key milestones and timeline will apply to the battle lab:

Milestone	Start Date	End Date	Approving Authority
AIP (endorsement for planning)		Jun 21	DCN/DCA
GPAB Precision Loitering Munitions/Programme of Work approved		TBC 21	DCS/DCN/DCA
Inert Loitering Munitions shipped		TBC	DMMG
Training Remote/Off Shore		TBC	DMD/DLD
Loitering Munition land based trial		Mar 22	DMD/DLD
Loitering Munition sea based trial		Mar 22	DMD/DLD
Reporting Loitering Munitions		May 22	DMD/DLD
Loitering Munitions ITV Disposal		Jun 22	DMD/DLD
Experimentation Complete		Jun 22	DMD/DLD

Implementing the Experimentation

33. Battle lab activities will be managed via existing experimentation processes. This includes the development of a programme of work for the battle lab which clearly articulates the scope, research questions and methodology for this experimentation campaign. The programme of work is to be approved by DMD/DLD DCA/DCN and key support stakeholders. Within the programme of work experimentation activities will be governed through the issue of experimentation special trial orders. These will dictate the conduct and procedures for each activity and include the risk management plan for that specific activity.

34. The remaining assets on completion of the experimentation will be disposed of in accordance with ref D. This can be achieved through destruction as a default or through an arrangement with the vendor to return any remaining assets.

Risks

35. There are number of risks to achieving the objectives of this battle lab:

a. COVID19 a further severe outbreak domestically or internationally is likely to significantly impact the timeframes for these activities. The addition of further border restrictions as of 15 Jan 21 and the emergent mutant COVID 19 strain will further impact achievability. These factors will also significantly impact training options and shipping timelines.

b. Export Licence and FMS process timeframes, these processes take time and will require extended timeframes to complete. A formal quote for loitering munitions via the NZ Embassy in Washington is still outstanding.

c. ITAR: this will impact access to loitering munitions and is another layer of process to negotiate.

RECOMMENDATIONS

36. It is recommended that DCN and DCA:

a. **note** that funding s. 9(2)(j) from each respective service has been requested to be considered in the 21/22 Navy/Army OPEX budget;

b. **note** the CONEMPs and DTA research tasking support the experimentation and the results will be used to support capability development contributing to force protection of naval vessels and joint fires effects;

c. **note** that procurement will be through FMS and DCS processes;

d. **endorse** the submission s. 9(2)(j) bid from each respective single service in the 21/22 bid, in accordance with Ref D, to enable loitering munition experimentation; and

e. **approve** the initiation of a battle lab to explore the utility of loitering precision munitions as a force protection weapon in both the maritime and land domains.

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