19 May 2022

DOCUMENT
AC/259-D(2022)0040
Silence Procedure ends:
03 June 2022 15:30

+ NIAG Distr.

CONFERENCE OF NATIONAL ARMAMENTS DIRECTORS (CNAD)

Proposed NIAG Study on Development of Innovative Artillery Ammunitions

Note by the Secretary

References:
a. AC/259-D(2021)0068 – Proposals for Advisory Studies by the NIAG in 2022 dated 06 December 2021 and action sheet dated 12 January 2022
b. NIAG-N(2022)0010 – Agenda for the Exploratory Group meeting, dated 11 April 2022

1. BACKGROUND

1.1. Joint Fires Land Common Capability statement 2.04 indicates the capability to deliver no lethal munition/guided munition and minimize collateral damages. Currently NATO has a limited portfolio of non-lethal ammunitions. The EMP ammunition will increase the capability to suppress/neutralize the opponent activities disrupting the C2 combat function.

1.2. If this EMP ammunition/payload or an existing explosive payload is combined with a loitering munition this kind of ammunition will further increase the capability to suppress/neutralize/destroy the opponent activities, and give the capability to conduct initial BDA and minimize collateral damage being guided by the operator.

1.3. If the loitering munition is integrated with an AI module capable of target identification and strike target delivering the appropriate effect based on the type of target this will further increase the capability to suppress/neutralize the opponent activities, to reduce the number of volleys delivered, minimizing the time of

vulnerability to enemy counter fire and maximizing the effectiveness of the ammunition, minimizing collateral damage.

2. OBJECTIVES OF THE STUDY

2.1. The study will investigate the possible development of a 155 mm artillery grenade or an (artillery) rocket with innovative effect and capability. In particular the study will focus on, without exclusion of any other potential solutions

2.1.1. Ammunition capable of delivering non-lethal EMP effects releasing an electromagnetic impulse capable of neutralizing such electronic devices located in the surrounding area aimed at interfering/disabling electronic devices (e.g. transmission systems, computers, navigators, etc..) of the opponents;

2.1.2. Loitering munition capable of seeking, identifying, monitoring and engaging targets. Also capable to effectively “defeat” APS (active protection systems) mounted on (armoured) vehicles;

2.1.3. Smart munition integrated with an artificial intelligence (AI) module capable of analysing the battlefield; identifying a target in a pre-charged target set and providing appropriate effect, specific for the identified target. For e.g. discriminate a heavy armoured enemy vehicle from an infantry dismounted squad and deliver in the first case a HEAT effect and in a second case a HE fragmentation effect or non-lethal effect (for e.g. EMP).

2.2. The Objective of the study is to design a SYSTEM that will create favourable conditions for operations conducted by conventional or special forces, in order to increase the fire power and RESOLVE critical situations through fires in depth (beyond line of sight).

2.3. The “System” will basically be:

- a 155 mm artillery grenade and/or artillery rocket capable of detecting and disrupting electronic devices (e.g. transmission systems, computers, navigators, etc..) of the opponents in a limited target area;

- a 155 mm artillery grenade and/or a canister launched artillery rocket capable of loitering on a specific target area, ensuring adequate surveillance. Once identified a target (fixed or mobile), the ammunition should ensure the following actions:

    - Engage and impact (lethal) the target or release non-lethal effect;
    - Deliver the ammunition on the intended target and perform a 1st level BDA with a second loitering munition to evaluate the achieved effects;
    - Cancel the kinetic mission and continue the surveillance activity;
    - Re-address to a new target.

- a 155 mm artillery grenade and/or canister launched artillery rocket integrated with an AI module capable of identification of the target and best effect delivery, also on moving and armoured targets.

2.4. The “system” will utilise the emerging and disruptive technologies such like Artificial Intelligence, Big Data Analysis, Autonomy to reach its aim. The maintenance of the technological edge of the Alliance through long(er) ranges, accuracy and superior firepower is the aim. On the other hand, the feasibility of the solutions remains an important element, which includes affordability.

2.5. The operational scenario can be a conventional environments (Ukrainian War 2022 - Nagorno Karabakh War 2020) or asymmetrical conflict (Afghanistan - Iraq - Syria).

2.6. The peculiarities to be explored are the following:

- Low observable to enemy radar and air defence;
- Sense and avoid enemy radar and air defence;
- Immunity against jamming attempts;
- Propelled with low acoustic signature motor;
- GPS independent;
- Scene-matching;
- Autonomous pre-programmed flight patterns;
- Surveillance and reconnaissance of target through optical electronic sensor, linked to television system for images transmission;
- Connectivity to fire support information systems;
- 50 km range for 50 minutes activity;
- 90° attack angle;
- Wide range of warhead types: Thermobaric warhead, High Explosive Anti-Tank, High Explosive Fragmentation;
- Capability to handover control (transfer of LM to other users in the area);
- Internal communication during flight between two or more loitering munitions equipped with AI in order to coordinate an engagement on two or more (identified) targets (swarming);
- Focus on minimizing education and training efforts (simulation);
- 24/7 and all weather capable.

2.7. The study scope is primarily on the artillery-launched munitions, typically 155mm and artillery rockets. However, this study will provide valuable information for other such munitions, to include missiles, rockets, and other such munitions launched from the land, navy and air platforms. Innovative munitions can be developed for launch from different platforms. Different force elements like soldier (infantry mortar) and various land platforms, ships (gunfire, missiles, rockets), and air platforms will benefit from the outcomes.

2.8. The study will primarily focus on innovation in the field, and application of emerging and disruptive technologies, considering the cost effectiveness and affordability, to include potential impacts of doctrine, training, logistics, personnel and other capability areas.

2.9. The study will also consider the potential effects of legal and ethical dimensions of the application of novel technologies. The potential impact of the use of adversary effects (spoofing, jamming, denial of connections/GPS etc.) need to be analysed and considered.

2.10. Also important is the collateral damage that these solutions could bring to bear and potential mitigation solutions (deactivation, self-destruction, retargeting etc..). Similarly, the non-lethal or scalable effects of the munitions are to be analysed.

2.11. Specific issues to be addressed include a listing of the new technologies that could be utilized to develop new generation munitions, and the feasibility (including estimate timelines, cost and life cycle parameters) of such innovative munitions. The current industrial perspectives (with the fruition timelines) for the new/innovative munitions will be very helpful for nations to plan ahead their future acquisition activities. Industry views on what should NATO and Nations do to facilitate a speedy realization of these new munitions. A demonstration of the existing solutions, relatively mature prototypes, and theoretical models for future developments would be very desirable.

2.12. The report would also support NATO activities in standardization (e.g. making the necessary allowances for technological developments in the filed in the work to draft standards and update existing standards), seeking multinational development options, as well as shaping the agenda of the expert communities.

2.13. The expected study output will be a report on the feasibility of an ammunition with the aforementioned set of capabilities, possibly accompanied with project/s or demonstration on how it will work at least in a theoretical model that can prove that the ammunition can be actually realized.

2.14. The final report will document the proposed innovative 155 mm munitions and artillery rocket solutions with:

- The associated capabilities and limiting factors;
- Their expected effects on the platforms, personnel, doctrine, training…;
- The expected magnitudes of cost and the timelines for implementation;
- The suitability for application of the suggested solutions/technologies in similar munitions and launch systems.

Study Report

2.15. The output from this study shall be in the form of a written report that documents the assumptions, inputs, methodologies, assessments and analyses by the study team to reach its conclusions and recommendations.

2.16. The study is open to industries from NATO nations and will be conducted at NATO Unclassified level.

2.17. The study should also produce an unmarked executive summary (one page maximum) that, subject to validation by the sponsor, is made publicly available for NIAG promotion and visibility purposes. Additionally the report will include a list of minimum ten keywords that will be used as metadata for future NIAG reference. The keywords will be strictly specific to the study, and will not include obvious elements such as NATO, NIAG, CNAD.

3. THE STUDY ORGANISATION

3.1. Industrial experts met virtually (via Teams) as a NIAG Exploratory Group, under the Chairmanship of the NIAG Vice-Chairman, Mr. Pablo Gonzalez, on 09 May 2022 to address the study requirements with representatives of the study sponsor and agreed to form a NIAG Study Group, to be designated **SG282**, to carry out the study.

3.2. The Exploratory Group noted that the final report is expected by June 2023.

3.3. The Exploratory Group elected the Study Management team as follows:

Chair	Piñeiro Juan (E&Q, Spain)
Vice-Chair	Feuray William (Nexter Munition, France)
Rapporteur	Urbanovsky Claudia (AOS, Belgium)

3.4. Subject to CNAD approval, the Exploratory Group will hold a kick-off meeting, to be arranged by the newly elected Study Group Management Team, on 13 June 2022.

3.5. The sponsor advised that the Quick Reaction Team to support the study was led by Mr. Eros Larocca (NAAG/ICGIF).

4. THE STUDY BUDGET

4.1. NIAG studies budgets are determined considering length/complexity of the study but also the number of participants to ensure a fairly comparable level of effort per participant across the NIAG study portfolio. Considering the number of participants at the Exploratory Group meeting and expected participants at the study kick-off meeting, it is proposed to allocate a budget of €300,000. The amount for the other NIAG studies to be executed in 2022 will be adjusted in order not to exceed the total approved budget for NIAG studies: €2,450,000.

4.2. The Exploratory Group noted that the study budget was equivalent to 669 'person-days' contribution, and estimated that the Industry involvement would be in the order of 30 experts from 12 participating countries.

5. RECOMMENDATIONS

5.1. The CNAD is invited to approve this study on reliability prediction of electronic equipment, under the sponsorship of the NAAG/ICGIF as proposed and to a cost of €300,000.

5.2. **Unless I hear to the contrary by 15:30 hrs on 03 June 2022**, I shall consider paragraph 5.1 approved. The Study Order will be issued accordingly.

(Signed) Silva Aher

Action Officer: JS VAUTIER (+6924)

Original: English