Next Generation Combat Aircraft Technologies - NGCAT

ACRONYM: SACITAS

Title: Low cost, highly portable Semi-Active Continuous-wave Infrared Targeting System

Duration of the project: 01/05/2025 - 01/02/2028

Key words: SACITAS, SAL, SEEKER, INFRARED, DESIGNATOR, OPTRONICS

Total budget: 2.627.454 €

of which RHID contribution: 2.380.000 €

PROJECT DESCRIPTION

The project consists of bringing together a significant part of the Belgian Industrial and Academic actors involved in laser and optronics research and ammunition development, in order to provide necessary R&T activities to further elaborate compact, low-power CMOS seeker and HRR (High Repetition Rate) designator that are using high repetition pulses as a targeting system.
By addressing key issues identified in the Key Research Area for Defence related to novel weapon systems and protection of personnel and platforms, by supporting scientific innovation, and by strengthening and promoting cooperation and an integrated approach within the Belgian defence industry and research institutes, the project fits perfectly with the objectives of the DEFRA programme. It also contributes directly to the culture of innovation in the Defence sector and to the development of a competitive and credible national industrial and technological base in the field of ammunition.

The scope of the project is to elaborate compact CMOS seeker and designator that are using high repetition rate pulses as a targeting system. Due to its size and cost, this new targeting system could be used on any remote carriers and future intelligent and guiding weaponry.
It's expected to reduce the cost, weight and volume by an order of magnitude versus current designator solutions. Therefore, this type of designator could be in the future embedded on various manned or unmanned platforms and even also on a soldier's wrist.
The main idea of this solution is to send pulses on a target at a much higher repetition rate (order of magnitude : 10 kHz) with a much smaller energy per pulse. Therefore, in the seeker, we will need new algorithms of real-time data processing, data binning, signal filtering and fusion techniques to extract accurate target information from the CMOS sensor.

In the evolving landscape of defence technology, the need for more efficient, compact, and cost-effective systems has never been more critical. Traditional laser designation systems using Nd:YAG

laser (“neodymium-doped yttrium aluminium garnet”) have served as the backbone of many targeting solutions. However, these systems are limited by their power consumption, size, and cost, which can be significant drawbacks in modern military operations that demand greater flexibility and mobility. Integration on every soldier or on UAV is also of high concern. Current designator technology implies the use of dedicated teams or integration on heavy platforms which reinforces the innovative aspect of our project.

The proposed system leverages CMOS technology, which is widely used in the semiconductor industry for imaging sensors. By adapting CMOS seekers coupled with HRR laser designation, the project introduces a ground-breaking shift in design philosophy.
Having such designation technologies will allow a better cooperation between ground troops and NGCAT.

Thanks to its compacity and cost, the HRR designator could be integrated on every soldier, allowing the usage of designation by any ground troop and not by dedicated teams anymore. This will leverage brand new operational usages of firing guided ammunitions from NGCAT, enhancing the versatility of aircraft in diverse combat scenarios.

The project will be divided into several key phases to ensure a systematic approach:
Phase 1: Feasibility study and requirements analysis

- Objective: To define the technical and operational requirements of the laser designation system.
- Tasks:
    - Conduct a feasibility study comparing CMOS technology with traditional four-quadrant systems.
    - Identify key performance metrics (e.g., range, accuracy, response time).
    - Assess the system’s power, weight, and cost requirements.
    - Analyse countermeasures or potential side effects of this system.

Phase 2: System Design and architecture Development

- Objective: To develop the overall system architecture and design specifications.
- Tasks:
    - Design the CMOS-based seeker system, focusing on high-sensitivity detection.
    - Develop the laser designation module, incorporating high repetition rate pulse technology.
    - Establish communication protocols between the seeker and other components.
    - Ensure compliance with ethical and health standards (eye safety for instance), including guidelines on civilian protection.

Phase 3: Demonstrator Development and Testing

- Objective: To build and test a demonstrator of the laser designation system.
- Tasks
    - Manufacture the CMOS seeker demonstrator
    - Develop software for signal processing and target acquisition.
    - Conduct bench tests to evaluate system performance under controlled conditions.
    - Perform initial field tests to assess real-world operation and refine the design.

Phase 4: Optimization and Validation

- Objective: To optimize the system and validate its performance.
- Tasks:
    - Optimize the design for weight, power consumption, and cost.
    - Conduct extensive field tests in various environmental conditions.
    - Validate the system against established performance metrics.

- Validate the angular measurement accuracy on elevation and azimuth and with various signal power and at extreme temperatures

AI-Generated view to illustrate a concept of the final product

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LINK(S)

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