PROJECT ARMA

Architettura Radar per la Minaccia ipesonicA

The aim of this project is to 1) define the essential and sufficient requirements to be able to detect and track next generation Hypersonic Threats (HT) for interceptor missile on-board radar and sensor systems and 2) to study radar and RF sensor architectures on board the interceptor missile in order to meet these requirements, taking into account the state of the art and current scientific and technological gaps. To achieve the aim of the project, the study will address the following topics:

- Analysis of the plasma layer around objects in hypersonic regime. The aerothermodynamic field around representative forms of MI will be simulated numerically through computational fluid dynamics in different conditions of hypersonic regime to verify the presence of plasma and calculate its eventual distribution.
- Interaction of the EM wave with the representative model of the object and the plasma volume for the determination of the RCS as the frequencies, angles of incidence, phase (and height) of the flight, hypersonic speed, etc. vary. (applied electromagnetism). Analysis of the distortion of the radar signature of the model due to the effect of timevarying plasmas at the various transmission frequencies.
- Study of the characteristics of existing radars: the performance of radar systems sized for “conventional threats” need to be re-evaluated in HT scenarios, where the threat, flying at lower altitudes, appears on the radar horizon at lower ranges and remains immersed in the superficial clutter.
- Study of the interaction of RF sensors, Seeker RF, on board the missile due to the presence of plasmas.
- Study of the architecture of the single radar sensor (ground sensors, seekers, sensors on air and space platforms) and of the radar networks (on various platforms) to meet the requirements necessary for the detection and tracking of HTs.

Technical Sheet

Funding institution:

Italian Ministry of Defence (MoD)

Project partners

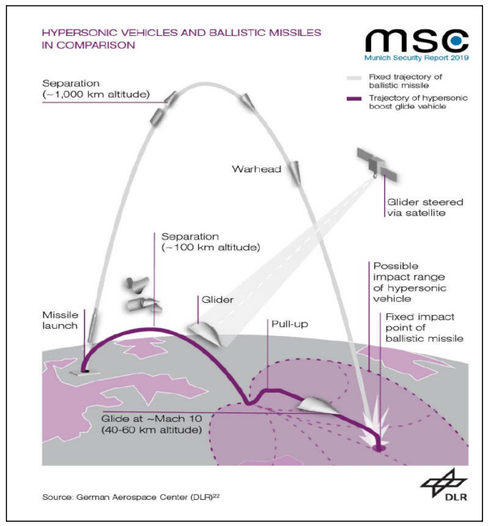
LEONARDO S.p.A, MBDA, LINKS, POLITECNICO DI TORINO

Project duration

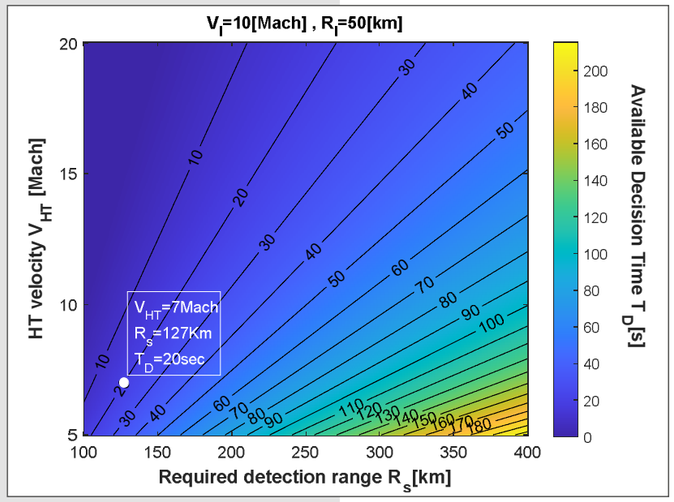
February 2022 - March 2023

Involved countries

Italy



(a) Trajectory Comparison between ballistic missile and hypersonic weapons



(b) Decision Time as a function of Hypersonic Threat speed and required detection range

PROJECT ARTURO

Advanced Radar Technology in eUROp

The ARTURO (Advanced Radar Technologies in eUROpe) project proposes a solution to fulfil future operational needs based on extended use of emerging technologies. More specifically, studies of ARTURO project will be focused on:

- Representing end-users vision in terms of needs and high-level requirements for the future most demanding scenarios and environments.
- Defining an innovative Sensor Architecture and the most efficient applicable technologies to be implemented in the future development.
- In-depth analysis of the new threats and the environment surrounding the radar which produces an accurate definition of the various operational scenarios (air, land and naval) the new class of radar is expected to cope with.
- Carrying out the study of modern HW (hardware) and SW (software) technologies that provide the constituent elements of the new class of radar. New approaches to design (i.e. cognitive) and modern technologies such as Artificial Intelligence will be disseminated within the design.
- Supporting the above topics by selecting a specific preliminary development of key components of the new architecture.
- Proposing a roadmap for future developments based on the results derived by the current research.
  The ARTURO research addresses the future defence needs (keeping in mind civil world as well) and proposes a new class of sensors based on feasibility studies and high level specifications. From an architectural point of view, the proposed approached is based on the scalability as a key driver of design, i.e. a modular design for extending the same components on different platforms with a consequent reduction of non-recurring and logistic costs. The design is then based on an elementary and fundamental component for all the new class of radars while the different sensors for different domain applications are formed via aggregation of the elementary component. As a matter of fact, the ARTURO project will analyse and study a wide set of technologies to evaluate the benefits they could bring in new generation of radar systems and to indicate which are relevant depending on the CONOPS. In particular, a roadmap for sensors will be elaborated based on the study results provided by various technological analyses. This roadmap will figure out the most appropriate sensors according to their domain and use cases, their class of performance, their level of maturity, their cost benefit analysis and their complementarity regarding other competing technologies.

Technical Sheet

Funding institution:

EU EDF

Project partners

Scalinix, Sentech Srl, Thales DMS France SAS, Thales Nederland BV, Totalforsvarets Forskningsinstitut, Universidad de sevilla, Università degli Studi di Pavia, XY-Sensing, Leonardo SpA, Aalto Korkeakoulusaatio sr, Airbus defence and Space, Baltijos Pazangiu technologiju Institutas, CoreHW, Echoes srl, Hensoldt, Indra, Marduk Technologies, TNO, Pitradwar, Rheinmetall Italia, SAAB, SATWAYS

Project duration

September 2023 - August 2026

Involved countries

Italy, France, Germany, Netherlands, Sweeden, Spain, Poland, Finland, Lithuania, Estonia, Greece