Commercial Aircraft Protection

Final CRADA Report

Global Security Sciences Division

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October 26, 2016

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**Non Proprietary
Final CRADA Report**

Date: October 26, 2016

CRADA Number: C1000401

CRADA Title: Commercial Aircraft Protection

CRADA Start/End Date: June 4, 2010 to September 17, 2015

Argonne Dollars: \$131042

Participant Dollars: \$0.00

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Summary of Major Accomplishments:

This report summarizes the results of theoretical research performed during 3 years of P371 Project implementation. In results of such research a new scientific conceptual technology of quasi-passive individual infrared protection of heat-generating objects – Spatial Displacement of Thermal Image (SDTI technology) was developed. Theoretical substantiation and description of working processes of civil aircraft individual IR-protection system were conducted. The mathematical models and methodology were presented, there were obtained the analytical dependencies which allow performing theoretical research of the affect of intentionally arranged dynamic field of the artificial thermal interferences with variable contrast onto main parameters of optic-electronic tracking and homing systems.

Summary of Major Accomplishments:

General Statements

Rapid development of radio electronics, expansion of EMR application in military sphere, HAW creation, local military conflicts and terrorism result in necessity to take measures on protection of civil population and development of theory and technology of REW efficient tools creation. They may be referred with IR-OECS which represent the systems of various-application, particularly civil and commercial aircraft individual protection from MANPADS with IR-OTHS in the areas of their potential application by terrorists or in the areas of local military conflicts.

Active development of the technologies of heat-generating objects' IR-protection was initiated more than half a century ago that was connected with creation of mobile DM - MANPADS with THH of high efficiency within local military conflicts. In scientific literature THH have more general name: optic – electronic tracking and homing systems (OTHS); and individual system of IR-protection is known as infrared optic-electronic countermeasure system (IR-OECS). Hereinafter, along with the specified terminology, the following terms will be applied: OTHS and IR-OECS.

According to the messages of mass media, currently the threat of MANPADS application by terrorists against the civil aircraft exists. Terrorists possess tens thousand of MANPADS manufactured in various countries that are not recorded; they can be applied any time, particularly against VIP aircraft of country leaders. According to the press, by now more than 600 civilians and more than 90 % of aircraft participating in local military conflicts were lost due to application of MANPADS against air targets.

Therefore, current terrorist threat related to MANPADS application against civil aircraft predicts the following scenario:

- the developed countries to adopt a decision on development and installation of IR- individual protection systems onboard of civil aircraft (with capacity of 100 and more passengers) of all international airlines, including commercial and cargo aircraft;
- ICAO to make decision on obligatory equipping of commercial and civil aircraft with IR-protection systems (IR-OECS) within next years;
- creation of international market of IR-OECS technologies, active struggle of leading world companies for the right to dictate the conditions of application of IR-protection systems with the purpose of exclusive possession of high technologies and obtaining economic benefits;
- the world market for aircraft IR-protection technologies is currently open and it is estimated in billions US dollar.

The purpose of the work: creation of theoretical basis of scientific concept related to development of quasi-passive systems of commercial/civil aircraft and helicopters protection from MANPADS with IR-OTHS in the areas of their potential application.

Necessity to conduct the given work is explained by the fact that existing technologies of aircraft IR-protection from MANPADS with IR-OTHS were developed only for military purposes with the specific requirements to efficiency, reliability and price of their development, manufacturing and operation. The attempts to adapt military-oriented IR-OECS to civil aviation were unsuccessful [2-4]. It resulted in

Summary of Major Accomplishments:

necessity to create new scientific approaches to solving the problem due to significance of economic requirements to development taking into account considerable fleet of civil and commercial aircraft. At the same time the requirements to the price, reliability, efficiency and safety of civil IR-OECS operation are increasing. Ideally IR-OECS for civil aviation should represent regular onboard systems for ensuring safety of flights, for example as onboard firefighting systems. Therefore the scientific development of civil IR-OECS of new generation based on new physical principles of construction and operation is required.

While performing scientific research, the systematic phenomenological approach under the formula “analysis – criticism – synthesis” was applied. Such approach allowed construction of adequate physical-mathematical models for research with optimal number of arguments of hierarchical significance values.

Summary of Technology Transfer Benefits to Industry:

Transfer of this technology from the Ukrainian inventor and developers may be possible to the US aircraft industry, for better protection of commercial aircraft from MANPADs.

Other Information/Results: (Papers, Inventions, Software, etc.)

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