



Applying AIM-9X on MiG-29 – Initial Analysis of MiG-29 Weapon System Modernizations*

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Abstract. Author, in this article, describes technical realizability of assembly AIM-9X missile on MiG-29, gives also in the introduction information about aircraft modernizations necessity. Second and third part of the article consist of technical, physical and operating data of AIM-9X air to air missile, LAU-129A/A missile launcher and missile launcher adapter. Fourth part contains mechanical and electric adaptations. Fifth part includes description of weapon control system and blocks locations. Conclusions end the publication. This article is integral part of author's scientific research and cooperation with Armament Market Analyzing Office of Ministry of Defense.

Keywords: mechanical engineering, aviation, guided missile, missile launcher adapter, mechanic and electric adaptations

1. INTRODUCTION

Poland is the only country in the world, which use American aircraft – F-16 and Russian aircraft MiG-29. This situation complicates all logistics system in the Polish Air Force. Moreover weapon systems (missiles) on Polish MiG-29 are aging and are not as effective as are NATO standards requirements.

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So modernizations of Russian aircraft are indispensable and need to meet the expected level and ensure compatibility of aircraft armament. According to that some questions need answers:

1. what do we need to change in on board weapon system to upgrade MiG-29 with AIM-9X missiles (mechanically and electrically)?
2. what kind of extra equipment do we need to apply to MiG-29 to use AIM-9X and where?
3. and simply: how make it all work?

Received all answers make possible fulfill every tasks in NATO Alliance.

In this paper author presents results of his initial analysis prepared for Armament Market Analyzing Office of Ministry of Defense concerning MiG-29 weapon system modernizations. Pictures, photos and schematic diagrams describe operational and functional ideas of the system work.

2. AIM-9X SIDEWINDER

The AIM-9X (Photo 1) is the latest generation of the sidewinder short-range, air-to-air missile family. It combines an advanced infrared seeker, a low-drag airframe, and vectored thrust control system with existing AIM-9 sidewinder components to provide increased acquisition ranges, high off-boresight acquisition and track capabilities, improved minimum and maximum ranges, and enhanced missile manoeuvrability.



Photo 1. AIM-9X [4]

3. MISSILE LAUNCHER LAU-129A/A AND MISSILE LAUNCHER ADAPTER

LAU-129A/A missile launchers (Photo 2) sometimes referred to as Modular Rail Launchers (MRL), can be suspended from stations 1, 2, 3, 7, 8 and 9. Launchers at stations 1 and 9 are attached directly to wing tip hard points. Launchers at stations 2, 3, 7, and 8 are installed on adapters that attach to hard points on the wing lower surface. The LAU-129A/A can suspend AIM-9 and AIM-120 missiles.

The Missile Launcher Adapters (Photo 3) provide sufficient separation between the missile fins and the wing surface to avoid interference at launch. The missile launcher adapter is an aerodynamically configured support for the missile launcher and provides the electrical interface between the missile and aircraft. The forward and aft faring design of the adapter ensures minimum airflow resistance during flight.



Photo 2. Missile launcher LAU-129A/A

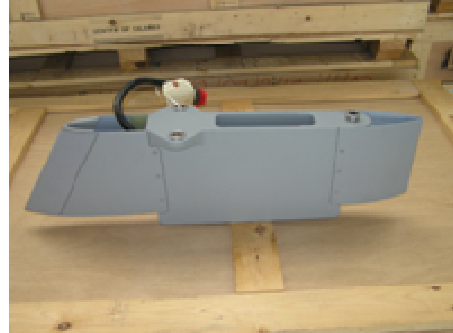


Photo 3. Missile launcher adapter

4. MECHANICAL AND ELECTRIC ADAPTATIONS

Mechanical adaptations.

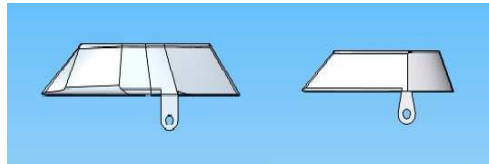
1. Airframe or adapter adaptations to launcher assembly;
2. launcher adaptations: missile detents, striker points, wire harness.

The best solution seems to be use of LAU-129 A/A launcher and modified missile launcher adapter, which provide launcher assembly on MiG-29 wings. Project of mechanical modifications are presented on Pictures 1-3.

- MiG-29 adapters stay the same (Photo 4, Picture 1)

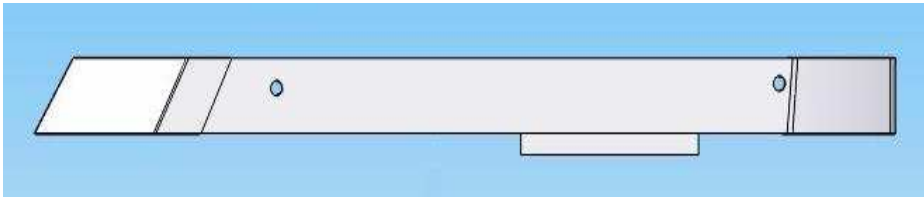


Photo 4. Number 1 and 2 MiG-29 adapters



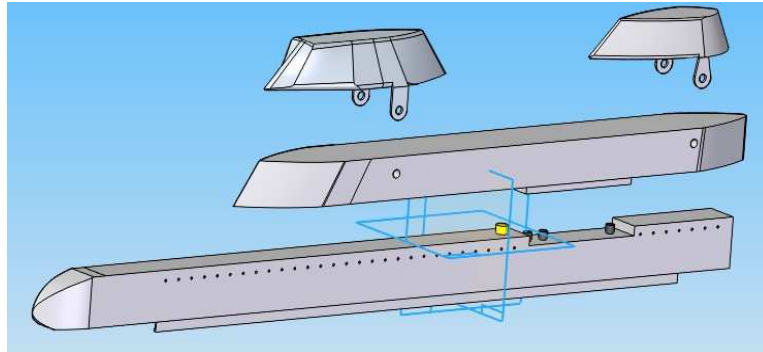
Picture 1. Adapters drawing [2]

- modified missile launcher adapter (Picture 2)



Picture 2. Modified MiG-29 missile launcher adapter [2]

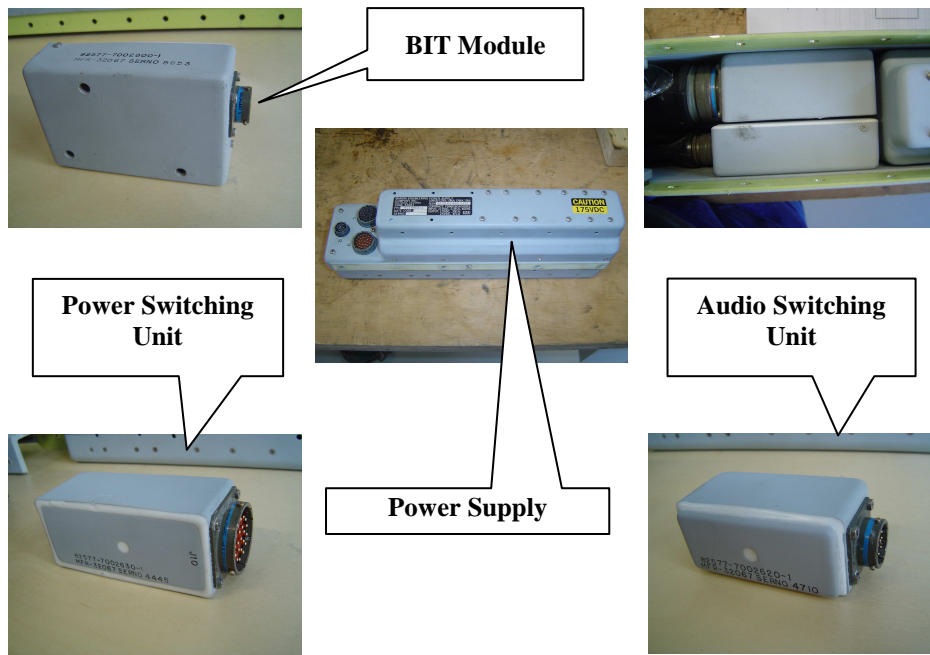
- complete suspension for AIM-9X Sidewinder (Picture 3).



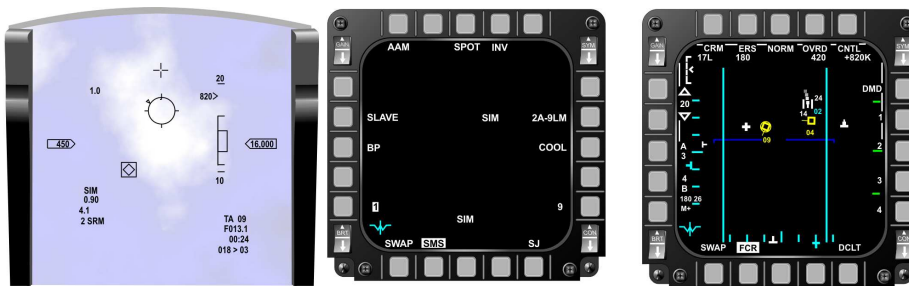
Picture 3. Project of complete suspension for AIM-9X Sidewinder [2]

Electric adaptations (Picture 4).

1. missile power supply adaptations;
2. assembly on aircraft required circuit breakers power panel with over current protection system and built-in test module;
3. use of modular mission computer, radar, control block similar to Advanced Missile Remote Interface Unit (AMRIU) from F-16 and air interception audio signal generator;
4. to display all important data information for pilot during combat mission assembly in cockpit head-up display (HUD, replacement for ILS display) and color multifunction displays (CMFD, at least two, replacement for IPW display, Picture 5);
5. supply all equipment for Joint Helmet Mounted Cueing System (JHMCS);
6. supply all equipment for Electronic Warfare System;
7. reorganized data distribution system based on multiplex bus MIL-STD.

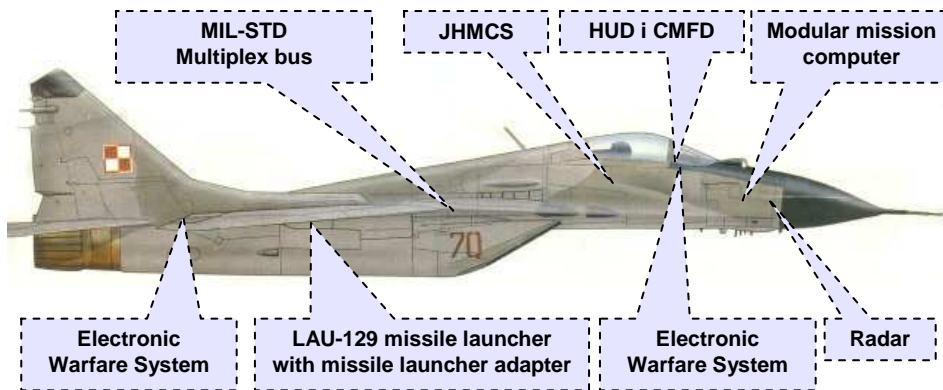


Picture 4. Electric adaptations

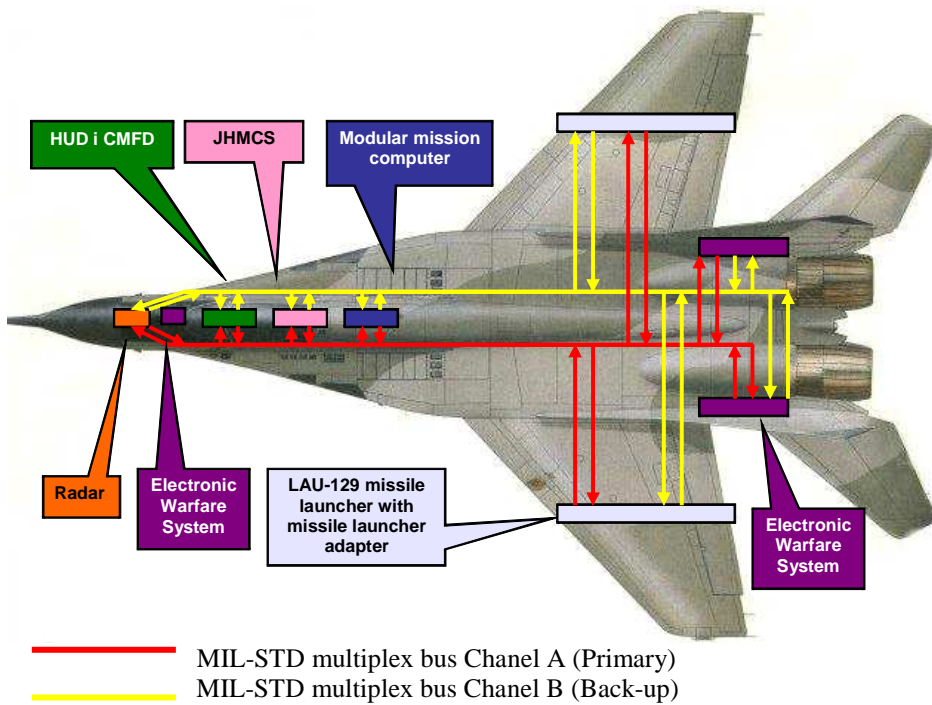


Picture 5. HUD and CMFD displays (typical for air-air missile mode)

All equipment which is indispensable for proper use the AIM-9X missile are presented on Picture 6 and 7.



Picture 6. All indispensable equipment for proper use the AIM-9X missile on MiG-29 aircraft



Picture 7. Electrical connection of all equipment on MiG-29 aircraft

5. CONCLUSIONS

This paper describes initial analysis prepared for Armament Market Analyzing Office of Ministry of Defense concerning MiG-29 weapon system modernizations. After close research author conclude that the primary problem is to assure communication (electrical control signals) between a missile and an aircraft. Power supply for all additional equipment will be a crucial factor. Selection adequate on board equipment is further problem to solve. Also the question: if modifications meet the expectations? needs the answer.

Many Polish manufactures could take part in this project. Some of them worked on Su-22 modernizations and have required professional experience.

The new MiG-29 and F-16C/D Block 52+ should be compatible not only with armament, but also with different up-to-date data displays (CMFD's – Color Multifunction Displays, HUD – Head-Up Display, JHMCS – Joint Helmet-Mounted Cueing System), modern wireless communication systems (LINK-16, AIFF – Advanced Identification Friend or Foe), search and track systems (radar, laser, FLIR – Forward Looking Infrared) and aircraft electronic structure (MIL-STD, manage by modular mission computer). Advanced development model of the new MiG-29 depends on capital expenditure.

In conclusions, MiG-29 could be modernized in armament (AIM-9X adaptation) and avionics systems. We need to remember that all modernizations need RSK MiG approval.

Complication of the project requires participations of many specialists.

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