

WEAPON SYSTEMS AND MISSIONS SPECIFIC TO THE F16 AIRCRAFT IN THE ROMANIAN AIR FORCE

Ionică CÎRCIU, Eduard MIHAI

“Henri Coandă” Air Force Academy, Braşov, Romania (circuionica@yahoo.co.uk,
mishued@outlook.com)

DOI: 10.19062/2247-3173.2023.24.18

Abstract: *The vision of gradual realization of the air defense capacity within the program “Multirole aircraft of the Romanian Air Force”, with the gradual realization by continuing the endowment with the squadrons of F-16 aircraft up to three squadrons. Modernization of the armament line with the latest generation of air-to-air weapons.*

Keywords: *integration, upgrade, variants of armament, enhanced agility.*

1. INTRODUCTION

The military response potential is represented by the armament in the endowment and by the combat technique.

In the article I proposed to analyze these aspects at the endowment level of the Romanian Air Force, focusing on the acquisition of the F-16 aircraft. It should not be forgotten that the MiG-21 LanceR aircraft has served this country for a long time and the knowledge of the pilots regarding the use of this aircraft could be further exploited on the F-16 MLU 5.2.R aircraft.

A multirole or omnirole combat aircraft is intended to perform various tasks or missions in combat, such as air-to-air, air-to-surface, reconnaissance, electronic warfare, air support, escort-escort, or deterrence [1].

Analyzing the current war, it can be observed that the composition aerospace is one of major importance in determining the outcome of military action.

In this framework, fighter-bomber aviation came to be a necessary component in confrontations current. The term multirole or omnirole has been assigned to aircraft designed to use the same basic structure that is flexible and can be adapted to various missions. If we make a breakdown of the roles in which the F16 aircraft can be used, specific to us, we can conclude:

| | | |
|----------------------------------------|--------------|--------------------------------|
| Attack | Interception | Maritime patrol |
| Aerial reconnaissance and surveillance | | Electronic warfare in aviation |
| Air support | | Bomber |

2. THEORETICAL ASPECTS OF THE ARMAMENT ON BOARD

The use of artillery armament with the optimal caliber, sufficient to have the desired effect with a sufficiently high rate of fire, thus 20-37 mm caliber guns are used, depending on the tactical destination.

Artillery armament is complemented by reactive armament, the two are complemented by the fact that reactive armament has the advantage of firepower, long firing distance and a high firing accuracy for the directed one and the disadvantage of a small amount, which artillery armament can compensate [3].

The ammunition reserve must be well calculated and optimized according to the number of possible attacks.

Consider, for example, the mission of the fighter plane, which can deliver 3-4 attacks with a fire autonomy of 10 seconds.

Fire control must be optimized by number of shots and types respectively automated.

To ensure the necessary firepower, the armament is allocated up to 12% of the aircraft's flight weight.

Its placement is done in the optimized points to reduce the effect of the recoil on the flight and to maintain the accuracy required for the fire in the case of artillery weapons [3].

3. SEVERAL TYPES OF ARMAMENT SPECIFIC TO THE F16 MLU /5.2.R AIRCRAFT

When designing the plane, the realization of standardized connectors is taken into account, which allow the modernization of only some components over time without replacing the entire assembly.

The F-16 Block 15 MLU/5.2.R is the variant with superior modifications to the previous variants, incorporating advanced weapons.

| The aircraft F=16 Block 15 MLU can access among other weapons: | | |
|-----------------------------------------------------------------------|--------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Air-to-air missiles | AIM-9X Sidewinder | The AIM-9X Sidewinder missile is a triple-threat missile that can be used for air-to-air engagements, surface-attack and surface-to-surface launch missions without modifications. The AIM-9X Block II, II + missile adds a redesigned fuze and a digital ignition safety device to improve handling and in-flight safety. It's equipped with updated electronics, including a lock-on-after-launch capability using a new weapon datalink to support beyond visual range engagements [5]. |
| | AIM-120(C7/D) Advanced Medium Range Air-to-Air Missile | The AIM-120 AMRAAM is an all-weather, all-environment radar-guided missile (active principle) developed to improve capabilities against very low-altitude and high-altitude, high-velocity targets in a hostile electronic jamming environment [3]. |
| Air-ground rockets | AGM-65 H Maverick | Maverick is a precision-guided weapon that can be used for defence suppression, close air support and interdiction missions. [4] |

| | | |
|------------------------------|---------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------|
| Unreacted reactive weaponry: | CRV 7 | The CRV 7 , short for “Canadian Rocket Vehicle7”, is a 2.75-inch (70 mm) folding-fin ground attack rocket. [3] |
| Unruly Bombs: | MK 82&84; MK 82 “SNAKEYE” | The MK 82&84 is one of a series of long-drag, general-purpose aerial bombs, which are collectively known as the MK 80 series of bombs. [3] |
| Bombs directed: | GBU-10/12/49 Paveway II | Paveway II is a laser-guided, free-fall bomb for use against surface targets at short to standoff range. [6] |
| Electronic Warfare Pod | CHAFF/FLARE | Chaff and Flares are defensive counter measures used on aircraft to confuse radar and heat seeking missiles. [3] |
| M61A1 Vulcan | 20 mm (TP) training munitions; 20 mm incendiary ammunition (HEI) | The General Electric M61A1 Vulcan is a 6-barrel 20 mm cannon. [3] |

Below we propose three arming options for attacking ground targets, Fig.1.

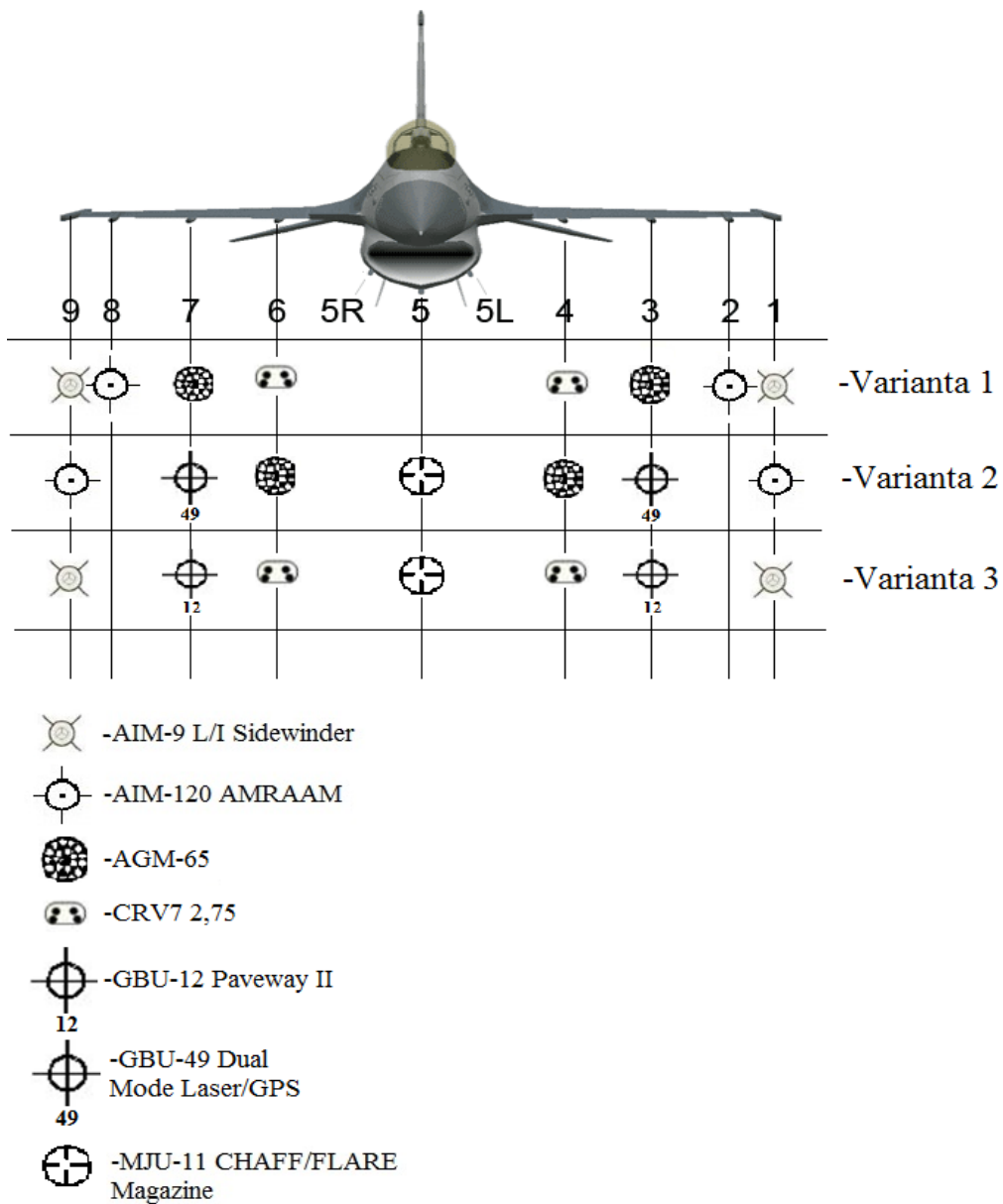


FIG. 1 Arming variants [3]

Installing software on the on-board computer, which over time can be replaced with better ones, improves the aircraft's qualities.

The possibility to replace the control surfaces over time and the systems that ensure the kinematic chain of the handle-control surface, make it possible to adapt the aircraft to new conditions imposed by the development of the war phenomenon.

4. EFFICIENCY CALCULATION

The maximum effectiveness (E_M) is defined as the sum of all the proposed targets ($\sum_{i=1}^n n_i$) wanted to be destroyed and their destruction weight (Ω_i), related to the number of aircraft exits ($\sum_{j=1}^n i_j$) multiplied by the number of aircraft per exit (M) [7,8].

$$\Omega_i = \frac{\sum_{k=1}^n p_k}{N} \quad (1)$$

Where

$$E = \frac{\sum_{i=1}^n n_i + \Omega_i}{\sum_{j=1}^n i_j \cdot M} \quad (2)$$

$\sum_{k=1}^n p_k$ represents the sum of hits/target to destroy it, - the number of targets;

We have:

4 targets (a command center, a weapons and ammunition depot, a radar station, a multiple rocket launcher),

9 F16 multi-role aircraft scheduled in 3 departures of 3 aircraft each.

The following armament is used: GBU-12 and AGM-65 H.

$$\Omega_i = \frac{3+4+5+6}{4} = 4,5$$

$$E_M = \frac{\sum_{i=1}^n n_i + \Omega_i}{\sum_{j=1}^n i_j \cdot M} = \frac{8.5}{9} = 0,94 = 94\%$$

94% efficiency is achieved provided it takes 3 hits to destroy the first target, 4 hits to destroy the second target, 5 hits to destroy the third target, and 6 hits to destroy the last target.

This weighting is achieved using advanced sensors and modern weaponry diversified in relation to the minimum number of hits. The great ability to survive in a hostile environment, in the conditions of electronic warfare, refers to the possibility of attaching specialized containers from the electronic warfare range, which can ensure the information of the pilot about the real threats, the possibility and the way of creating

active jamming, both for communications and for enemy radars or enemy sensors. The high survivability in a hostile environment can be increased by the use of passive jamming systems (Chaff/Flare), the creation of absorbent surfaces and under deviant angles for the aircraft, which lead to the reduction of the radio footprint [3]. Equipping the aircraft with a threat warning system (RWR - Radar Warning Receiver), provides data to the pilot regarding the distance and number of threats, in case the pilot is left without passive jamming systems, and is tracked by a surface-to-surface missile air to perform evasive maneuvers to try to escape the threat.

5. CONCLUSIONS

- The armament on the F-16 MLU/5.2.R aircraft is very efficient, agile and flexible, with 9 points on which missiles, bombs, of the latest generation can be attached. The equipment of the aircraft with high-performance air-to-air ammunition is noted, which indicates the direction towards the air police mission.
- Air supremacy is the basic role that provides an essential added value in an armed conflict of any size. By increasing the number of F16 aircraft (+32) and by modernizing all of them with optoelectronic search and sighting equipment, with superior electronic warfare systems and the diversification of smart weapons and ammunition, the Romanian military aviation will be a critical point of thought for any external threat.

REFERENCES

- [1] *** Cer Senin –Rev. Forțelor Aeriene, *Programul Avion Multirol - o nouă etapă*, 2015;
- [2] D. Vlad, *TOPGUN F-16, „Fighting Falcon”*, (2005);
- [3] *** http://www.f-16.net/f-16_versions_article_9.html;
- [4] *AGM-65 Maverick Tactical Air-Ground Missile, United States of America*, Airforce Technology.com. Archived from the original on 22 July 2015. Retrieved 17 July 2015;
- [5] *Portuguese Air Force Joining AIM-9X Block II Sidewinder Air-to-air Missile Operators Group*, 11 November 2022. Retrieved 12 January 2023;
- [6] *Guided Bomb Unit-12 (GBU-12)*, GlobalSecurity.org. GlobalSecurity.org. Archived from the original on 9 October 2020. Retrieved 11 April 2021;
- [7] Gh. Constantinescu, *Bazele și construcției sistemelor de armament*, Ed.ATM Buc. 1994;
- [8] N. Petrescu *Manual de trageri și bombardament*, vol.1,2, Ed.MApN, 1992.